Climate Change, Hydro-conflicts and Human Security

SEVENTH FRAMEWORK PROGRAMME

D4.1 Review of international and national policies and institutional frameworks

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Abstract

The Mediterranean, Middle East and Sahel region (the MMES region) is a climate change "hot spot" and is expected to experience large changes in climate mean and variability. Whether or not climate change undermines human security and/or creates conflict or cooperation over water resources depends – amongst other factors – on the institutions in place and policies adopted in these areas. The main focus of this report is to provide an initial insight into the current policy landscape on climate change adaptation and water resources management and the extent to which it already addresses impacts of hydro-climatic hazards on human security. Using a case study approach, selected policies have been reviewed (as case studies) in specific countries in the MMES region; case studies of individual strategies and initiatives were also conducted at the United Nations and European Union level. As the case studies have shown, very few policies today explicitly address the link between climate change, water, human security and conflict or cooperation. Of the few policies that explicitly address the link, most are located at the international level. However some adaptation and sectoral policies do address risks for human security linked to water and climate change in more indirect manners. This paper is drafted in the context of the CLICO research project funded under the 7th Research Framework Programme of the EU.

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1 Introduction

1.1 Background

According to the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC), the term climate change is defined as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."[1] The Mediterranean, Middle East and Sahel region (the MMES region) is a climate change "hot spot"—a region that is highly susceptible to climate change which "will experience large changes in climate mean and variability."[2] According to the IPCC, precipitation is very likely to decrease and the risk of summer drought likely to increase in most of the Mediterranean area.[3] Climate change projections show that the region can expect decreases in precipitation of up to 30% and increases in temperature exceeding 4 -5°C.[4] Water availability could decrease by between 20% and 40% by the end of this century.[5] Additionally, extreme heat and drought events are also expected to increase.[6] A recent analysis shows significant expansion of arid lands, especially in the Iberian, Italian, Hellenic and Turkish peninsulas and in South-Eastern Europe.[7]

As a result of these changes in environmental conditions, climate change in the Mediterranean area (but also in other climate-vulnerable areas of the world) raises concerns regarding the potential for negative impacts on human security, if no appropriate counter-measures are taken. The UN defines human security as a situation where the social, political, environmental and economic conditions conducive to a life in freedom and dignity are present.[8] Human security is multi-faceted, including notably freedom from diseases, hunger, unemployment, crime, social conflict, political repression and environmental hazards. Climate change is intimately linked to some of them (e.g. hunger), and less directly related to others (e.g. crime). Water security is a sub-aspect of human security. Water security entails "the sustainable use and protection of water systems, the protection against water related hazards (floods and droughts), the sustainable development of water resources and the safeguarding of (access to) water functions and services for humans and the environment".[9]

There is also an ongoing debate on how climate change is related to conflict or cooperation. Whether scarcity of resources leads to conflict or cooperation is the subject of a long-standing dispute in social science research.[10] Some observers expect climate change to act as a catalyst for (violent) conflict.

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[1] UNFCCC, "Full Text of the Convention," Retrieved on May 12, 2011. Available online at: http://unfccc.int/essential_background/convention/background/items/1349.php

[2] Iglesias et al. (2011), "Re-thinking water policy priorities in the Mediterranean region in view of climate change," Environmental and Policy, p. 4; Elasha (2010), "Mapping of Climate Change Threats and Human Development Impacts in the Arab Region", p. 12, for the MENA region in particular.

[3] Christensen, J.H., et al, (2007): Regional Climate Projections. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* p. 872.

[4] Giorgi/Lionello (2008), "Climate change projections for the Mediterranean region," *Global and Planetary Change 63*, p. 91

[5] Iglesias et al. (2011), p, 5

[6] Giorgi and Lionello (2008), p. 91

[7] Gao/Giorgi (2008), p. 14

[8] UNDP 1994. New dimensions of human security- Human Development Report, New York.

[9] Schulz/Uhlenbrock 2007. 'Water Security': What Does It Mean, What May It Imply? Discussion Draft Paper for the session on Water Security, Delft, www.unesco-ihe.org/.../3.paper%20water%20Secur%20Box%20draft.pdf

[10] For an overview of the debate see WGBU (2007), Climate Change as a Security Risk, Eartshcan, London, p. 25ff; see also section 2 below

Water scarcity may lead to regional and national tensions among groups who control and use the water, especially along transboundary basins.[11] Water scarcity in the Mediterranean thus leaves this region particularly exposed to conflicts over limited water resources. Water and its role in international conflict and cooperation between states in the Middle East is a relatively well studied topic;[12] however, there are also conflicts over water at the national or local level in other countries.[13]

Despite the expectation of conflict, however, studies point also to many examples of cooperation. According to a study published by the Worldwatch Institute, 507 conflicts over water resources were outweighed by 1,288 examples of cooperation in the last 50 years.[14] Both at the local and national level, evidence shows that the success of most examples of cooperation depended on the institutions responsible for water management.[15] The greater the capacity of these institutions to manage water resources, the more likely it is that conflict will be prevented.

Indeed, whether or not climate change undermines human security and/or creates conflict or cooperation over water resources largely depends on political, cultural and socio-economic factors that shape the behaviour of social actors. Policies adopted on climate change adaptation, water resources management and human security are among such political factors. For example, areas with high water scarcity require policy actions in the form of demand restrictions and improved water management. The imposed demand restrictions would have to be on a par with the reductions in water availability resulting from climate change.[16] Increasing water conservation by reducing loss, increasing water efficiency, and encouraging water recycling are also key actions.[17] There exists, however, so far no systematic review of policies at the national or international level which (could) promote adaptation, peace and security in the face of hydro-climatic hazards.

1.2 Aims and scope of this report

This report aims at filling this gap and reviews existing policies, which are relevant to climate change adaptation and enhancement of human security in the face of hydro-climatic hazards. Nevertheless, the review is not exhaustive and is only intended as an initial insight into the current policy situation, which will require more in-depth analysis. This report is based on a broad definition of policy, including any decision by a public entity oriented towards a long-term purpose or to a particular problem. Policies covered in this review include regulations but also other types of steering mechanisms such as strategies, action plans, advisory bodies, initiatives as well as certain specific actors' responses to resource scarcity via infrastructure projects.

The geographic focus of the report is on the Mediterranean, Middle East and the Sahel region (MMES). Selected policies have been reviewed in detail in the following countries of the MMES: Spain, Italy and Cyprus (as EU Mediterranean countries), Egypt, Morocco and Turkey (as non-EU Mediterranean countries), Israel and Palestine (Middle East) and Niger (Sahel region). In all these countries, areas of hydro-security concerns have been identified in the conceptual set-up

[11] Iglesias et al. (2011), p 1

[12] See for example Bulloch/Darwish, Water Wars (1993), Coming Conflicts in the Middle East. Victor Gollancz, London; Wolf (1995), Hydropolitics along the Jordan River: scarce water and its impact on the Arab-Israeli conflict. United Nations University Press, 1995, Sosland, Cooperating Rivals (2008), The Riparian Politics of the Jordan River Basin. SUNY Press; Selby (2005), The Geopolitics of Water in the Middle East: fantasies and realities, Third World Quarterly, Vol. 26:2, pp. 329 -349

[13] See Tawfic/ Loutfy (2011) for Egypt, Schwörer (2011) for Spain

[14] Wolf, Aaron et al. (2005): Ch. 5: "Managing Water Conflict and Cooperation," *State of the World: Redefining Global Security*, Worldwatch Institute, p. 85.

[15] Ibid, p. 82.

[16] Iglesias et al. (2011), p. 5

[17] Iglesias et al. (2011), p. 10

of the CLICO project; thus, there are good chances that the institutional and policy framework in these countries has responded (or at least has been exposed already) to issues related to human security, hydro-climatic hazards and adaptation. In addition, international developments at the UN and EU level are included in the review because of their relevance and impact on the policy framework of the MMES region now and in the future. Although the review at national level has pointed to the importance of certain local level developments, local level policy and institutions have not been systematically addressed in the context of this report.[18]

The main focus of the report is to gain an understanding of the current policy landscape on climate change adaptation and water resources management and, especially, the extent to which it already addresses impacts of hydro-climatic hazards on human security. The characteristics of current policies and institutional settings are being examined in this light, emphasising advantageous and less advantageous aspects of different policy examples.

Overarching research questions which frame the review include the following:

- What types of policy interventions exist to reduce risks from climate and water-related stressors and (directly or indirectly) improve human security? Are there any specific policies that address climate change, water management and / or security (simultaneously)?
- What constitutes the capacity of states to implement the changes necessary for adapting to climate change and preventing, to the extent possible, negative effects of climate change on human security?
- Has water scarcity led to conflict or cooperation in the past? To what extent do existing policies exacerbate or mitigate water-related conflict? What determines their effectiveness, especially in terms of mitigating conflict and enhancing human security?

Concerning the substance of policies covered, the starting point of the review was an examination of policies from different sectors either explicitly or implicitly relevant to the interface of climate change, droughts/floods, adaptation and security. The focus was thus concentrated on (but not limited to) climate change adaptation policies, national water policies and security policies. Not included in the scope of the review are broader social policies related to issues such as poverty, health and migration as well as mitigation policies, i.e. greenhouse gas reduction policies such as emission trading, energy efficiency or renewable energy policies. As elaborated in the methodological section 3 of this report, the review followed a case study approach. The focused assessments of selected policies or initiatives provide the material for this policy review.

1.3 Structure of the report

The report is structured as follows: Section 2 sets out the analytical approach linking this review to theoretical elements of the academic discussion on climate change, resource availability and human security. Section 3 briefly describes empirical, methodological issues underpinning the review. Section 4 is dedicated to the findings of the review, which are presented according to the key research questions and the concepts set out in the analytical approach in section 2. Section 5 draws key conclusions and revisits the key questions and analytical starting point. The original case studies on national and international policies are listed in the references section and are available online. The case studies are the core background material to this policy review and readers should refer to them for detailed information on the individual policies discussed in this document.

[18] The local level is, however, addressed in parallel case studies of the CLICO research project and insights on local level policies and institutions will be considered in the final project synthesis and policy recommendations.

2 Analytical approach

The CLICO research project, of which this report is a part, investigates the causal links between climate and water related stressors, conflict/cooperation and human security. It also looks at how political and economic factors influence these causal links. To understand, what role policy can potentially play in this regard, it is necessary to first understand in greater depth how climate change and associated water-related hazards, notably drought, sea-level rise and floods, are connected to human security and conflict.

The most obvious link between **climate change and human security** is that climate change is likely to have detrimental effects on various aspects of human security. There is no clearly defined, agreed concept of human security.[19] UNDP, in its 1994 Human Development Report, used a broad definition. According to the report, human security has two main dimensions: "It means, first, safety from such chronic threats as hunger, disease and repression. And second, it means protection from sudden and hurtful disruptions in the patterns of daily life-whether in homes, in jobs or in communities."[20] Human security has multiple sub-dimensions, such as water security or food security. The direct impact of climate change is likely to be stronger in the first of these two dimensions, but its effects may also be felt in the second one. Some likely effects of climate change on human security include the following:

- Climatic variations and changes in soil quality resulting from changed patterns of water availability and sea-level rise may lead to a decreased agricultural production in many countries and as a consequence reduce food security, in particular for poor small-scale farmers in developing countries.[21] There are estimates that as a result of climate change 30–170 million additional people worldwide may suffer from malnutrition and hunger by 2080 when compared with today. [22]
- Climate change is likely to raise the costs for states to provide certain social services and maintain infrastructure. This may produce negative impacts on the human security of people that depend on for example state-funded infrastructure or services for their food or healthcare.[23]
- Climate change is also likely to lead to increased incidence of certain diseases, increases in heat-related mortality, and declining quantity and quality of drinking water, particularly in developing countries, thus undermining the physical well-being of human beings.
- Extreme weather events which are likely to become more frequent and intense as a result of climate change are likely to lead to sudden disruptions in the lives of an increasing number of people.[24]

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[19] See for an overview Brauch (2009), Chapter 74: Human Security Concepts in Policy and Science. In Brauch et al. (eds), (2009), Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts, Vol. 4, pp. 966-989

[20] UNDP (2004): Human Development Report 1994 - New dimensions of human security, p. 23

[21] WGBU (2007), Climate Change as a Security Risk, Earthscan, London, p. 72ff

[22] WGBU (2007), p. 76

[23] Barnett/Adger (2006), Climate Change, Violent Conflict and Human Security.

[24] See for the MENA region Elasha (2010), "Mapping of Climate Change Threats and Human Development Impacts in the Arab Region", p. 16ff.

It is important to note that the way in which climate change impacts upon people will depend on a variety of factors apart from physical changes, including political, cultural and socio-economic factors. In this context, effective and adequate policy interventions in order to decrease people's vulnerability to climate change and enhance their adaptive capacity are important. However, international organisations and states may not always be in a position to develop and implement adequate policies, as a result of factors such as weak institutions, lack of capacity, lack of funds, political opposition or other problems that need to be addressed as a priority. This paper will therefore analyse, inter alia, what constitutes the capacity of states and their institutions to implement the changes necessary to prevent, to the extent possible, negative effects of climate change on human security. Even where policies are adopted, they may not always be effective in reaching their aims, again, for a variety of reasons, including inadequate design, lack of resources to implement it, insufficient coordination or opposition from the people addressed by the measure. In section 4, we will therefore summarise what may be learnt from case studies on the type of policy interventions might be suitable for reducing risks and improving human security associated with climate and water related stressors, either by reducing vulnerability and increasing adaptive capacity or by modifying the hazards.

The academic research on the link between environmental factors in general, and climate change in particular and **conflict/cooperation** paints a complex and controversial picture. Conflict does not just refer to armed conflict between nations, but also involves "a range (of) negative interactions that encompass mild verbally-expressed discord and cold interstate relationships, as well as hostile acts or declarations of war" (Goulden et al., 2009: 806).[25] In policy discourses the assumption that climate change is likely to contribute to violent conflict and constitutes a risk for international and national security has recently gained prominence, involving, military actors in particular.[26] Most scholars however, adopt a more cautious approach and stress that conflict is usually a result of many factors, among which may be environmental ones.[27] The following potential causal chains including climate change and conflict have been identified:[28]

- **Climate change – hunger – conflict/violence:**[29] Reduced food availability and difficulties for subsistence farmers may, in association with other factors, lead to popular uprisings, coup d'états or similar events usually associated with a certain degree of violence.

- **Climate change – livelihood – migration – conflict:**[30] Migration is a possible consequence of climate change making certain regions uninhabitable (as a result of sea level rise for instance) or making it harder for people to secure their livelihoods.[31]

[25] Goulden et al., 2009: 806.

[26] See for an overview Spencer et al. (2009), "Climate Change & The Military: The State of the Debate"

[27] See for example Homer-Dixon (1999), Environment, Scarcity, and Violence, Princeton University Press, Princeton; Barnett (2001), Security and Climate Change, p. 5ff

[28] WBGU (2007); Wisner et al. (2007). The WBGU also discusses the more frequent occurrence of extreme weather events as a "conflict constellation", p. 103ff. However, as the more immediate impact of extreme weather events is on human security, we do not follow the WBGU approach here.

[29] On hunger as a factor behind armed uprisings and government overthrows, see in addition Messer/ Cohen/D'Costa (1998), Food from Peace - Breaking the Links between Conflict and Hunger, IFPRI, p. 9ff; Homer-Dixon (1999), p. 151ff

[30] On climate change and migration see in addition Warnecke/Tänzler/Vollmer (2010), "Climate Change, Migration and Conflict: Receiving Communities under Pressure?", Reuveny (2007), Climate change-induced migration and violent conflict.

[31] It should be noted, however, that environmental factors alone usually do not cause migration. Instead, it is methodologically very extremely difficult to identify migrants that have left their homelands solely due to environmental stressors, see Warnecke/Tänzler/Vollmer (2010),

Migration does not automatically lead to conflict, but there is evidence to suggest migration increases the potential for conflict.[32]

- **Climate change – water – conflict:**[33] Some studies suggest that water scarcity is a source of conflict and instability; this situation could become graver as a result of climate change.

However, conflict is not the only, nor necessarily the most likely consequence when natural resources are scarce or environmental conditions change. Instead, there are many instances of cooperation over scarce natural resources.[34] Such cooperation can happen at the international level, with transboundary water agreements as an important example, as well as at the national or at the local level. Nonetheless, establishing cooperation is a costly and lengthy process and hence states, institutions or individuals whose livelihoods or access to resources are insecure may have little available resources for investing in cooperation. However, where the costs of non-cooperation are particularly high, cooperation may still be the preferred avenue.

There is also a strong link between (violent) conflicts and human security. It is clear that violent conflicts have the potential to undermine human security. Conversely, however, there is evidence that fragile human security, e.g. due to poverty or lack of appropriate governance structures, is more likely to turn into situations of (violent) conflict than situations where people are secure.

Policies may intervene at various stages along these causal chains, or even start new causal chains. Policies saving water or increasing water supplies could be an intervention along the climate change-water-conflict trajectory for example; policies that enhance the food security of poor people, e.g. by providing them with access to land or seeds could break negative dynamics along the food-climate change-conflict chain. Equally, creating institutions and fora for dialogue and cooperation may lead to a situation where people cooperate, rather than fight. Adaptation policies may, however, also create new conflicts. Section 4 therefore also describes the lessons that case studies have revealed on the conditions under which policies of adaptation to climate change increase the vulnerability of some groups and/or exacerbate social conflict.

3 Methodological approach

The methodological approach chosen for this review of policy with relevance to the nexus of climate change, water resources and human security in MMES consisted of:

- A screening of policies covering climate change, water resources or human security at national, UN and EU levels. The aim of the screening was to give a broad overview of types of policies and institutions currently in existence.
- Selected case studies as a research strategy for a more in-depth insight on "how" certain policies and institutions can improve human security and reduce risks from climate and water-related stressors in the MMES and at the international level.

The following describes the working steps followed in more detail.

The CLICO partners involved in this review screened existing policies at national, EU and UN levels, which appeared to be suitable for further study, especially due to their relevance to climate change, droughts/floods and security/adaptation. On this basis, a set of 41 potentially

[32] Ibid.

[33] On climate change and water conflicts see in addition Elasha (2010), "Mapping of Climate Change Threats and Human Development Impacts in the Arab Region", p. 25ff.

[34] Breitmeier (2011), "Klimawandel und Gewaltkonflikte", p. 222f.

interesting policies were proposed (see Annex I: Overview of policies screened for an overview per country, UN and EU level). A final selection of 25 policies was made, with 2-3 policies selected per country to maintain regional balance. Consideration was given to ensure that each theme of the CLICO nexus (climate change, water, (human) security) was represented adequately. Preference was given to policies that had already been in place for some time or that had tangible impacts to analyse. Where this was not possible, those that were still in the initial stages of drafting or implementation ("new" policies) were also selected.

A broad array of policies were included in the final selection of case studies to be examined further: insurance policies (Turkey); a national service of civil protection against natural disasters (Italy); desertification, pastoral and water legislation (Niger); sewage water system management (Cyprus); national agricultural and water strategies (Morocco); water policies and plans (Israel/Palestine/Jordan); drought management plans (Spain); early warning systems for flash floods (Egypt); European Security Strategy (EU); peace building (UN); and adaptation funding mechanisms (UN) (see section 4.1 for more details).

The individual case studies were mainly desk-based and involved a comprehensive review of existing documentary material (such as laws and regulations, ministry reports, research reports and academic publications). However, informal background or more formal semi-structured interviews were also carried out by most case study authors to supplement the academic and grey literature used.

The common framework for reporting information in each case study included an introduction to the country context and to national policies related to hydro-climatic conflicts, climate change adaptation and security and description of the background of policies, including, actors responsible and main mechanisms in place (e.g. funding, scope, administrative procedures, duration). In addition, case study authors were requested to evaluate the policies, using the key criteria proposed by the OECD for the evaluation of development cooperation projects and principles. These principles were considered appropriate for the purpose of evaluating policies, as they constitute a widely accepted approach for assessing how certain measures translate into socio-economic, political and individual change in developing countries. As described, the effects of climate change are likely to be felt most strongly in developing countries, and policy interventions targeting these countries are thus most likely to have a positive effect on preserving human security and preventing intra- or inter-state conflict. The OECD Principles for the Evaluation of Development Assistance are the following:[35]

- Relevance, i.e. extent to which the policy is suitable (e.g. do the mechanisms and defined outputs address the interface between climate change, droughts/floods and security/adaptation?)
- Effectiveness, i.e. extent to which the policy is achieving/likely to achieve its objectives and main factors influencing achievement/non-achievement
- Efficiency, estimating outputs (qualitative and, where possible, quantitative) in relation to inputs, e.g. cost-effectiveness[36]
- Impact, i.e. main impacts and effects (intended and not intended; positive or negative) resulting from the policy on local environmental indicators.

In a final step, the authors of this review report analysed and summarised the overall messages from the case studies on the basis of the key analytical concepts presented in section 2. Thus, the

[35] OECD (1991): The DAC Principles for the Evaluation of Development Assistance

[36] In general, researchers working on the case studies were not expected to produce original efficiency-calculation studies but to use already published data and studies, where available.

analysis concentrated on the capacity of states and other organizations to implement change necessary for dealing with climate change impacts on human security, on the types of policy interventions observed to improve human security and reduce risks, as well as on the role of policy in the creation of cooperation or conflict as a result of hydro-climatic change.

4 Current policies and institutional frameworks

The following section 4.1 provides an overview of the policies and other steering mechanisms analysed as case studies. Section 4.2 examines what can be learnt from the case studies with regard to the three research questions asked above (section 1.2). On this basis, some preliminary conclusions are drawn both for the analytical framework described above and for formulating appropriate policies. However, it should be kept in mind that the policy screening covered only a restricted number of countries, and an even smaller number of policies were subject to a more in-depth review. Thus, the overview below is intended only as an initial insight into the current policy situation, into which more in-depth analysis is necessary.

4.1 Overview of current policies

Climate change has gained political prominence relatively recently, and this is even truer for its potential links with human security or conflict. So far, there are a number of questions surrounding what appropriate climate change adaptation policies should look like.[37] This uncertainty is even greater in the case of policies addressing risks to human security or the threat of future conflict resulting from climate change. As described above, this report is based on a broad definition of policy which includes regulations but also other types of steering mechanisms such as strategies, action plans, advisory bodies, initiatives as well as certain specific actors' responses to resource scarcity via infrastructure projects. Very few of the policies presented as potentially interesting for further study during the screening process for this review focused on the inter-linkages of the three aspects of interest, i.e. climate change, human security and conflict or cooperation. The following overview therefore presents mainly policies and other related activities that relate to one or more of the following aspects: climate change adaptation, human security and conflict or cooperation (always in the context of specific water resource management issues).

4.1.1 National policies (in alphabetical order of country)

Cyprus

Borehole Subsidy for Saving Potable Water

In Cyprus, the Water Development Department (which is the sole responsible authority for the issuing, monitoring and control of boreholes) offers a subsidy of €700 for the construction of boreholes for the irrigation of private household gardens. The aim of this policy is to reduce potable water consumption from the distribution networks. In this way, it provides an option for increasing the sustainability of water use in the region, critical in areas of water scarcity which will experience increased levels of drought due to climate change.[38] This subsidy began in the

[37] For example, a 2007 study looking at more than a 100 adaptation projects came to the conclusion that many projects in developing countries that are relevant to adaptation are not primarily targeted at adaptation; hence, a good adaptation project may in many cases just be the same as a good development project, see McGray/Hammill/Bradley (2007): Weathering the Storm: Options for Framing Adaptation and Development.

[38] Main authors's note: This policy, however, whilst encouraging reductions in water use from distribution networks may produce unintended side effects. The lack of restrictions for using the water from the borehole means that it may lead to a net increase in water use.

1990s. For the period of 1996-2010, an average of 568 subsidies has been granted annually. As of today, the measure still encourages people to install a borehole on their property and use it to irrigate their garden and/or connect it with their toilets for flushing instead of using potable water to do so.

The Nicosia Joint Sewerage Management Initiative

During much of the 1960s and 1970s, a plan was devised to provide the city of Nicosia with an improved sewerage system. After the division of the city between the Greek Cypriot and Turkish Cypriot communities in 1974, the cooperative policy stagnated with deterioration in the city's ability to manage sewage. After much negotiation, the leaders of both communities were able to put political differences aside and agree on building and managing the sewerage system together. The sewerage system started operating in 1980. This is an example of an initiative which shows how water management can provide increased cooperation and can have a positive effect on human security. A major factor making this initiative possible was the co-operation between the two community leaders, who joined together to devise a solution that would benefit both communities.

Egypt

Water Users Associations

The Irrigation Improvement Programme for water management in Egypt started in 1995 with a grant from the US Agency for International Development (USAID). A key aspect of the programme was the creation of Water Users' Associations (WUA) to take up a key role in decision-making and the operation and maintenance of pumps and irrigation ditches. A WUA is a group of farmers, all served by a common source of water, who join together to allocate, distribute, and manage water. A key function of the programme relevant for this study is the use of WUAs to address conflicts caused by irrigation in farmer communities. The aim of establishing a WUA is to develop a participatory irrigation management structure for increasing water use efficiency. This is done through the involvement of all stakeholders (to the extent possible) in the various management activities. WUAs are empowered to act on behalf of their members in their relations with water management districts and local administrative entities, to solve problems of water supply, to conclude contracts for construction, repair, and maintain the irrigation schemes and facilities, as well as other contracts and transactions allowed by the existing legislations. A WUA also acts as a liaison between regulatory authorities and users. There are currently more than 7,000 WUAs in Egypt and the model is spreading throughout the country.

Early Warning System for Flash Floods

In Egypt, flash floods have led to a number of damages that have had severe effects on the Sinai region and with particular impact on the Bedouin community. However, government attempts to relocate the Bedouin and manage water use have been met with dissatisfaction and have led to conflicts between the two parties. The Water Resources Research Institute (WRRI) has developed an early warning system to forecast the timing and intensity of flash floods. This instrument aims to make best use of the water from the flash floods which should increase water security and avoid general impacts on the well-being and human security of the Bedouin people.

Israel/Jordan

Coastal Desalination – Adapting to water scarcity

Droughts in the 1990s, increased stress on aquifer resources and an increase in urban water use prompted Israel to begin large scale desalination. A Desalination Master Plan was completed in 1997. Israel now operates three (of five proposed) large-scale desalination plants along the coast of the Mediterranean. It plans to produce 750 MCM/year of desalinated water by 2020 in order to deal with its decreasing water resources. Desalination plans are still in the process of being implemented, but are a policy-attempt to adapt to water scarcity in the region which could reduce water and therefore human insecurity.

Red Sea Dead Sea Water Conveyance

The Red Sea Dead Sea Water Conveyance proposal in the Jordan Basin has been presented as a way to both mitigate the water scarcity crisis in the region and rehabilitate the dwindling state of the Dead Sea. The multi-lateral project consists of building a 180 km pipeline that would transport 1.8 billion cubic meters of water from the Red Sea to the Dead Sea. The freshwater obtained from the desalination plant would be used to augment the water supplies of Jordan, Israel and the Palestinian Territories. The project would provide a source of freshwater, hydroelectricity, restore the level of the Dead Sea, and provide the opportunity for joint management in a region with a long history of political strife. The project, however, is still undergoing feasibility studies, most of which will be completed in 2011. It is expected that construction would take 10 years. This project presents an initiative that may have joint benefits for both water security and human security through cooperative management.

Italy

National Civil Protection System

The Italian National Civil Protection System (NCPS) was created in 1992; volunteers are an important part of this system which has the Department of Civil Protection is its core. As part of the NCPS regular awareness-building, campaigns on disaster risks are carried out. The Rivers Operation (RO) campaign, which started in 2003, is an information campaign travelling to municipalities characterised by high levels of risks of floods and landslides. Citizens learn about best practices in securing rivers and about their town's security policies. This policy provides an example of how citizens can increase their human security and ability to adapt to risk through greater awareness of hydrological impacts on their lives. Another component of RO is the dossier "Ecosystem at Risk." This dossier monitors the environmental condition of all Italian municipalities. Risk mitigation practices against landslides and floods are also assessed and communicated to authorities. This initiative tries to lead municipalities to take up measures that increase the security of the population, such as relocating assets exposed to risk and increasing the capacity of drainage systems. The "Ecosystem at Risk" surveys are also used as a tool to spread examples of good practice among municipalities. This initiative addresses the need for municipal-level understanding of hydrological risk and the implications for human populations.

GELSO Database Initiative

GELSO (Local Management for Sustainability) is an initiative led by the Institute for Environmental Protection and Research aiming to build a database on policies and initiatives taking place at local level to increase environmental sustainability. These best practices are made available to public administrators, environmental groups, technicians, environmental consultants and citizens. Its primary objective is to create an active network of information exchange among local governments. In 2010 GELSO also began to collect climate change adaptation initiatives as well. This initiative therefore provides an example of how local actors can learn about good practice for adapting to climate change. For the purposes of cataloguing and the subsequent inclusion in the database, projects require prior approval by a group of

specialists in different areas of sustainable development. The specialists analyse, evaluate and select those practices to be included in the GELSO database. In order to be included in the database, the practice must meet some quality requirements. Currently, drought and desertification issues are less than 1% of the database and most are from the last 5 years.

Morocco

Water law

Since its approval in 1995, the Water Law has introduced new regulations for water management at the national, regional and local levels. This law is the comprehensive legal framework of any national and regional Moroccan water resource management decree in Morocco and is the reference for water security issues of major importance for the country. It provides the necessary regulatory, legal and institutional framework to support sustainable water management. Its overarching goal is to use an integrated water resource management approach (IWRM) to integrate and coordinate the allocation and management of all water sources and users. In this way, this policy aims to help Morocco to adapt its management of scarce water resources, particularly important in the face of climate change. It includes several articles related to the protection and preservation of water resources, wastewater discharge, and the reuse of treated wastewater.

The Green Morocco Plan (Plan Maroc Vert)

The Green Morocco Plan or Plan Maroc Vert (PMV) was adopted in 2008 by the Ministry of Agriculture and Maritime Fishery (MAPM) and the agricultural development agency to make agriculture a national growth engine in Morocco. The PMV aims to reinforce the agriculture sector and sets strategies for a more sustainable use of natural resources (mainly water) for irrigation in the coming 15 to 20 years. The policy is of relevance as it aims to improve water management as well as the welfare of its citizens which could improve human security in the region. It sets forth agricultural reform measures to be fully implemented by 2020 based on two pillars: firstly, the acceleration of high value added agriculture, through an investment of 10 billion USD in 600 – 700 national projects; and secondly combating rural poverty (2 billion USD social investments).

National Plan for the Fight against Climate Change (Plan National de lutte contre le réchauffement climatique)

Approved in 2009, the *National Plan for the Fight against Climate Change* or *Plan National de lutte contre le réchauffement climatique* (PNRC) is aimed at reinforcing government action to deal with the effects of climate change. It is focused on strengthening inter-ministerial efforts, visibility and communication on inter-governmental actions, and establishing and optimising inter-departmental management in these areas. In this strategy, the Ministry of Environment coordinates all sectors affected by climate change and includes any necessary interdepartmental coordination. At the operational level, the strategy involves the creation of a yearly record on greenhouse effects, technological networks to measure climatic indicators, as well as increasing the capacities of people involved in climate change studies in addition to increasing public awareness of the impacts of climate change. In this way, the PNRC provides an example of how the effectiveness of climate change adaptation can be improved in key sectors of the domestic economy - water resources and agriculture.

Niger

Code Rural - Water and Pastoral Codes

The Code Rural was adopted on March 2, 1993 with the aim of establishing a juridical framework for agricultural, silvicultural and pastoral activities in the perspective of territorial management, environmental protection, and support of inhabitants. It assures the security of rural producers through the recognition of their rights to land tenure and water and pasture access. The Rural Code created the so-called Land Commissions: authorities which deal with the implementation of the national policy in terms of income from land. These constitute a consultative framework for reflection and decision making in terms of natural resources management and conflict prevention.
The Water Code was established in 1993 with the adoption of the Rural Code and in 2010, individuals from various organisations such as the Rural Code and the Ministry of Water, Environment, and the Fight Against Desertification formalised a national Water Code. Overall, the Water Code provides a unique legal framework that enables the usage and preservation of water.

The 2010 Pastoral Code completes, defines and specifies the fundamental principles and rules which make up pastoralism in Niger which were previously set out by the Code Rural. Among its main points, it recognizes mobility as a fundamental right of herders, pastors, nomads and transhumant; deals with the prohibition of the seizure for private purposes of pastoral spaces which pertain to the public domain of the State and collectivities; underlines that the property of pumping stations remains to the State of Niger, the region or "department" (district); defines access paths of livestock to surface waters; sets out a system for closing and for freeing the fields in the agricultural zones at the end of the harvest, in order to allow animals safe passage into the fallow fields; and seeks to solve the problems related to the base areas of pastoralists. Its main goal is to reduce conflict among groups. Both the Pastoral Code and the Water Code represent local level sustainable natural resource management in the fight against desertification which is likely to increase with climate change. They also provide examples of how natural resource use can lead to conflict or cooperation depending on the policies used to manage the resources at hand.

National Action Program for Combating Desertification and for Natural Resources Management (PAN- LCD/GRN)

The PAN-LCD/GRN was adopted in December 2000. It is one of the six priority programmes of the National Environmental Plan for a Sustainable Development (PNEDD). This policy is of relevance as it covers concrete adaptation measures for dealing with desertification and drought, likely to increase with the onset of climate change. Its main objectives are i) to identify factors which contribute to desertification and concrete measures to be taken to combat it and alleviate drought effects; and ii) create favourable conditions to the improvement of food security, the solution to the domestic energy crisis, the economic development of the population, and their empowerment in the management of natural resources.

Palestine

National Strategy for Water Sector Reform

The Palestinian Water Authority's reform plan was adopted by the Council of Ministers by means of Legislation No. 13/13/04 in December 2009 and will be implemented between 2011 and 2013. The reform plan seeks to accomplish better management of the water sector by concentrating on the development of institutions that can run with optimal efficiency under the status quo and contribute to the establishment of a Palestinian state. The proposed strategy and reform plan will serve the entire water sector, the four major pillars of the plan are: water security, social security, transboundary

cooperation, and institutional and legal arrangements. This is the first comprehensive, participatory water plan since the establishment of the Palestinian Water Authority.

National Climate Change Adaptation Strategy

The *Climate Change Adaptation Strategy in Palestine* resulted from a work program for the Palestinian Environmental Quality Authority (EQA) funded by the United Nations Development Program/ Program of Assistance to the Palestinian People (UNDP/PAPP). Its overriding goal is to identify the most effective means by which the Palestinian National Authority can enhance the capacity of the Palestinians to cope with current and future climatic hazards. Some of its main components are: current vulnerability assessments, future climate change risk assessments, proposed adaptation measures and information networks. This policy is relevant to this study because it represents the first decision taken by Palestinians to treat climate change and its effects on human security as a policy concern.

Spain

The National Climate Change Adaptation Plan (PNACC)

The National Climate Change Adaptation Plan was implemented in 2006. The plan's general objective is to evaluate the vulnerability of different socio-economic sectors and environmental systems that are sensitive to climate change, and to study the adaptation options for these sectors and systems. It is of relevance as it has a focus on water as a priority area as well as the implicit recognition of water as a cross-cutting issue in climate change adaptation policies in Spain. It is also of particular relevance as it explicitly addresses the human security dimension of climate change. It aims to generate an information base to promote a coordinated approach to climate change adaptation across all sectors and administrative levels. It provides a general framework for all activities among the different public administrations related to the evaluation of climate change impacts, vulnerability and adaptation options.

The AGUA Programme

The AGUA programme was introduced in 2004. Its main objectives are to improve water management, availability and quality in Spain, especially in the Mediterranean basins, to increase knowledge and awareness related to water, overcoming opposition to European policy objectives and to spread efficient and environmentally friendly technologies. The AGUA programme is of significance as it explicitly highlights climate change and its impacts on water resources in Spain as well as noting that actions are required to adapt to these changes. The main impact of the AGUA programme has been the increased desalination capacity of Spain, which reached 2.745.341m^3 per day in 2009.

Drought management plans (DMP)

In 2007, Spain adopted drought management plans. Their specific objectives are to guarantee the availability of water that is required to "sustain population life and health". Through the prioritisation of uses established by water policies and river basin management plans it aims to avoid or minimise negative drought effects on the ecological status of water bodies and to minimise the negative effects on public water supply and on economic activities. The drought management plans are of relevance as they establish rules for water restrictions in emergency situations and can play a role in avoiding or alleviating conflicts between water users during an alert situation. Public participation also provides citizens with the opportunity to be forewarned

about decision-making that may take place in drought situations, again reducing the potential for conflict.

Turkey

Law on Agricultural Insurance

This law was passed in 2005 with a decree on implementation signed in 2009. It establishes an insurance pool to handle risks associated with hydro-climatic shocks to agriculture. This agricultural insurance policy is cost-effective as it provides a burden-sharing mechanism through state subsidies. It provides a significant State-supported economic back-up plan in the case that more frequently occurring hydro-climatic hazards present risks to the income and thus well-being of rural livelihoods. However, one of the biggest hydro-climatic threats, droughts, is yet to be included in the scheme. Nevertheless, this policy is still of relevance in relation to concerns about adaptation to climate change, distributive justice and burden sharing. These latter issues can be an important factor in preventing conflict over scarce resources.

Turkish National Strategy and Action Plan on Combating Agricultural Drought (NSAPCAD)

The National Strategy and Action Plan on Combating Agricultural Drought (NSAPCD) was passed in 2008. It is relevant for the purposes of adaptation to climate change as Turkey's First National Communication and IPCC's 4th Assessment Report clearly state that droughts will be more frequent in this part of the Mediterranean. It focuses on agricultural drought with considerations of future climate change, inefficient use of water resources and faulty agricultural practices. The main objective of NSAPCAD is to provide a comprehensive and inclusive policy that takes into consideration demand and supply management as well as the views of all relevant stakeholders. This represents a shift from crisis management to long-term strategy for coping with droughts that will minimise the socio-economic impacts.

4.1.2 International policies

Environment and Security Initiative (ENVSEC)

ENVSEC is a joint initiative developed in 2003 by OSCE, UNDP and UNEP. The initiative is relevant to this report because its main objective is to contribute to the reduction of environment and human security risks and to strengthened cooperation among and within countries. Among the environmental factors ENVSEC identifies as potential sources of conflict are: inequitable access to natural resources, transboundary movement of hazardous materials and pollution, and large deposits of obsolete pesticides, to name just a few. Although not explicitly addressed, climate change is seen as a threat multiplier that will worsen access to natural resources and make their management more challenging.

European Security Strategy (ESS)

The ESS was issued in 2003 by the European Union partly in response to the growing divide among its members over the Iraq war. Among the "key threats" that the ESS identifies are terrorism, the proliferation of weapons of mass destruction, regional conflicts, state failure, and organized crime. Moreover, the ESS also conceptualizes security in broad terms, mentioning both national as well as human security; climate change, while not addressed in the strategy directly, has been brought up as an issue during its implementation. Subsequently, there have been a number of high-level discussions and position papers focused on integrating climate change into security policy at EU level. Furthermore, the EU's strategy specifies the following goals as appropriate measures to counter climate change related threats to international

security: a) enhanced bi- and multilateral dialogues with governments and organisations in regions that are especially vulnerable to security-related implications of climate change; b) increased cooperation with international organisations and large powers; and c) an improved early warning system that includes variables for the consequences of climate change.

Long Term Strategy for Water in the Mediterranean

The long term Strategy for Water in the Mediterranean was elaborated in 2008 at the Euro-Mediterranean Ministerial Conference on Water (22 December 2008, Dead Sea, Jordan) to address the significant pressures on water resources in Southern and South-Eastern Europe. The two main goals of the Strategy are: (1) the conservation of water quality including the prevention of further deterioration of water resources and (2) achieving a balance between the quantity of water used and quantity of water available including mitigation and preventing the consequences of droughts and water scarcity. To achieve these goals, the ministers agreed to focus on four main themes: water governance; water and climate change adaptation; water demand management including non-conventional water resources; and water financing. The Strategy for Water in the Mediterranean has not been approved yet, and the implementation of projects has been delayed. Nonetheless, a preliminary list of projects to achieve its objectives focus on (1) Adaptation to Climate Change, (2) Balance between supply and demand, (3) Conservation and rehabilitation of natural environments, (4) Depollution of the Mediterranean and (5) Technologies and efficient use of water. The policy was chosen for this study because once implemented, it should enhance the human security of the region by improving long term water management while taking into account climate change effects.

The United Nations Peacebuilding Commission (PBC)

The PBC is an intergovernmental advisory body consisting of 31 Member States, created in 2005 upon the recommendation of the UN Secretary General's High-Level panel on Threats, Challenges and Change through joint resolutions of the UN Security Council and General Assembly. The PBCs key role is to (1) bring together all of the relevant actors, including international donors, the international financial institutions, national governments, troop contributing countries; (2) marshal resources and (3) advise on and proposing integrated strategies for post-conflict peacebuilding and recovery and where appropriate, highlight any gaps that threaten to undermine peace. A case study of the PBC is relevant to this report because the organisation addresses post-conflict strategies and longer-term development. While the PBC has not tied climate change considerations into peacebuilding strategies yet, there are initiatives beginning internally to incorporate environmental concerns into the PBCs programmes of action.

UN Funding mechanisms

The following funding mechanisms were chosen for this analysis because they support either climate change adaptation and/or water resource management. Although human security is not explicitly mentioned in the guidelines for most of these funding mechanisms, the initiatives promoted could increase human security in developing countries by fostering climate change adaptation. The **UNFCCC Adaptation Fund** was established by the Parties to the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC) in 2001 to finance concrete adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol. The Fund is financed with 2% of the Certified Emission Reductions (CERs) issued for projects of the Clean Development Mechanism (CDM) and other sources of funding (donors and investing undisbursed funds). The **Global Environment Facility (GEF) Strategic Priority on Adaptation Fund (SPA)** was a pilot project mandated by the UNFCCC in order for the GEF to demonstrate how adaptation funding programmes can successfully "translate" into projects. In

order to be approved for funding, SPA projects not only had to address climate adaptation, but also provide global environmental benefits (e.g. biodiversity, land degradation, international waters). All funds were distributed by 2009 and it is now closed. The **GEF Least Developed Countries Fund (LDCF)** was created in 2001 to support the needs of the 48 Least Developed Countries (LDCs), which are especially vulnerable to the adverse impacts of climate. This includes preparing and implementing National Adaptation Programmes of Action (NAPAs) to identify urgent and immediate needs of LDCs to adapt to climate change. The LDCF's main objective is to integrate adaptation measures into the development activities of each LDC. The LDCF is also funding a number of adaptation projects in LDCs, with several of them addressing coastal areas, drought or other water related hazards. The **United Nations/GEF Special Climate Change Fund (SCCF)** was established under the UNFCCC in 2001, with the aim of financing activities, programmes and measures, relating to climate change, that are complementary to those funded by other funding mechanisms for the implementation of the Convention. It began funding projects in 2006, and has a focus on management, education, policy, and capacity building initiatives, as opposed to the Adaptation Fund and the LDCF which also contribute to infrastructural changes and other "hard" projects. Any funded projects must meet an "additionality" requirement such that project do not contribute solely to "development." The **GEF Focal Area on International Waters (GEF – IW)** has been a focal area of the GEF since its establishment in 1991. Its main objective is to fund initiatives that will improve management of and reduce stress on transboundary water systems, with the aim of preventing conflicts and supporting sustainable resource use. So far it has seen a huge number of projects, and a very significant amount of funding, supporting various aspects and stages in improved management of transboundary water resources. Its results include various international cooperation agreements for individual transboundary basins, and foundational, demonstration, or Strategic Action Programme implementation projects within particular basins. This initiative is particularly relevant to this report for its focus on shared water resources and conflict prevention.

4.1.3 Summary of current policies

As the above overview shows, there are very few policies that explicitly address the link between climate change, water, human security and conflict. Of the few policies that explicitly address the link, most are located at the international level and include the following:

- The **GEF Focal Area on International Waters** supports both adaptation and mitigation measures. One of its main objectives is to "catalyze multi-state cooperation to balance conflicting water uses in transboundary surface and groundwater basins while considering climatic variability and change."[39] It thus aims at reducing cross-border tensions over water allocation and quality issues by helping countries to manage transboundary waters together, in the context of climate change.[40]

- The **European Security Strategy (ESS)** of 2003, *A Secure Europe in a Better World,* conceptualizes security in broad terms, mentioning both national as well as human security.[41] The ESS itself does not refer to climate change. However, in the 2008 so-called "Solana Paper" drafted at the request of the EU Council and later endorsed by it, two high-ranking EU officials argue that: "Climate change is best viewed as a threat multiplier

[39] GEF (2011b) Results and Learning, SCCF. Available at: http://www.thegef.org/gef/SCCF_Results (accessed 10 February 2011)

[40] McGlynn/Vidaurre (2011)

[41] Stefes (2011)

which exacerbates existing trends, tensions and instability. The core challenge is that climate change threatens to overburden states and regions which are already fragile and conflict prone."[42]

- The 2008 Euro-Mediterranean Ministerial Conference on Water called for the elaboration of long-term **Strategy for Water in the Mediterranean**. One main topic that ministers agreed upon as being important is the issue of governance. One of the issues mentioned is promoting "collaboration at transboundary and sub-regional level, building upon and contributing to regional integration and cooperation, taking into account economic, social and environmental problems, as a means for avoiding conflict and promoting peaceful co-operation".[43] While a future strategy would thus appear to take into account the water – conflict nexus, so far the strategy has not been adopted.

- Another remarkable and somewhat more concrete initiative at the international level is the **Environment and Security Initiative (ENVSEC).** It is a partnership between the Organisation for Security and Co-operation in Europe (OSCE), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the North Atlantic Treaty Association (NATO), the Regional Environmental Center for Central and Eastern Europe (REC) and the United Nations Economic Commission for Europe (UNECE). The joint initiative developed out of a shared understanding between the founding partners that environmental degradation and natural resource scarcity could potentially lead to conflict and exacerbate human insecurity. Increased conflict itself can then lead to greater resource scarcity. Its objective is to reduce the likelihood that environmental changes will increase threats to human security. Building cooperation on water resource management between states is thus one of ENVSEC's main objectives. In the Southern Caucasus, for example, ENVSEC is operating by the Kura-Araks river basin, which is shared throughout a large part of the region, making cooperation essential to avoid conflict. Pollution from ageing industries and irrigation networks, as well as uncontrolled growth of capital cities also strain water resources and may exacerbate regional tensions. To ease these problems, ENVSEC is helping broker a water management agreement between the states that share water resources. In 2010, ENVSEC also successfully completed a two-year project "Sustainable management of shared water resources in the upper Pripyat basin." The result of the project was a historic agreement to "improve the sustainable allocation of water from the Pripyat River," a major freshwater resource shared by Belarus and Ukraine.[44] While ENVSEC does not have a direct focus on climate change, much of its practical work takes into account adaptation and mitigation concerns.[45] It is thus illustrative of how the climate change – water – human security – conflict link could be addressed politically at the international level.

At the national level, no similar targeted initiatives were identified. Only the Spanish Adaptation Strategy refers explicitly to human security and states that the evaluation of climate change impacts and vulnerability of different sectors and systems must also consider impacts of climate change on human security, including food security and related components such as poverty or social inequality– along with factors that determine adaptation options related to these

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[42] Climate Change and International Security, p. 2

[43] Union for the Mediterranean (2010). "Strategy for Water in the Mediterranean, Annex 1. of the Declaration of the IV Euro-Mediterranean Ministerial Conference on Water," Barcelona, p. 7

[44] ENVSEC (2010). ENVSEC helps broker water management agreement. Available at: www.envsec.org/docs/upper_pripyat_news.pdf

[45] Timeus (2011)

impacts.[46] However, adaptation policies and policies in various fields, including agriculture or water, do address risks for human security linked to water and climate change. Examples are an agricultural insurance scheme in Turkey, measures to improve water availability in Cyprus, Spain, Morocco and Israel/Palestine, improving disaster prevention in Italy and early-warning in Egypt or support for agriculture. The policies investigated for this report addressed risks to human security resulting from water shortage, a decrease in income in agriculture and risk associated with natural disasters, including land-slides or floods. In contrast, there seem to be fewer policies in place that are explicitly aimed at conflict prevention, with the formation of water user associations in Egypt and Niger being two exceptions. However, these policies, in turn, do not relate to climate change.

4.2 Conceptual lessons from case studies

4.2.1 Capacity of state actors

If policy interventions are to have a role in protecting human security against the negative effects of climate change, such as altered patterns of water availability, the first logical question is: which conditions are necessary for states to adopt and implement pertinent policies, especially policies beneficial to climate change adaptation? What constitutes the capacity of states and their institutions to implement the changes necessary to prevent, to the extent possible, and manage the negative impacts of climate change on human security?

State capacity is generally defined as the ability of the state to formulate and implement strategies to achieve economic and social goals in society.[47] Indeed, the case studies reveal certain factors that constitute and other factors that limit the capacity of states to formulate and implement policy responses. In this section and based on insights gained in the case studies, we discuss the following contextual conditions that can influence capacity: institutional coordination; financial resources, legal and political power; level of interest and motivation of individual actors; availability and dissemination of knowledge on increased risks from climate change impacts; and openness and responsiveness of policy actors to new problems.

Institutional coordination is a key element affecting the ability of states and international organisations to progress towards innovative interventions for addressing threats to human security in a changing climate and water environment. In Egypt, for instance, human security issues such as poverty, unemployment, health and their relation with environmental factors are still addressed independently with little consideration of the interrelationships between these issues and their causes and solutions. Further, the lack of ministerial cooperation has been a point of critique against the otherwise praised Water User Associations (WUAs) which were set up in the 1990s to play a major role in decision making, operation and maintenance of pumps and irrigation ditches and, as a result, reduce conflicts over access to water.[48] The Ministry of Water Resources and Irrigation is the only player in the WUA system, while the Ministry of Agriculture, a potential player in all agriculture activities, has almost no role. The resulting institutional gap affects the performance of WUAs.

On the UN level, the Peace Building Commission serves as a framework for different peace-building initiatives in the UN system and thus can also serve as an entry point for a stronger

[46] Schwörer (2011)

[47] Brautigam, Deborah (1996). "State Capacity and Effective Governance", in Benno Ndulu and Nicolas van de Walle (eds.), Agenda for Africa's Economic Renewal. Transaction Publishers

[48] Tawfic/Lotfy (2011)

integration of environmental concerns into peace-building.[49] In the EU, significant progress has been made towards achieving the goals set out in 2008 concerning measures to counter climate change related threats to international security.[50] How ambitious these goals were may be a different question. It could be argued that ambition was hampered by the differences between the institutions addressing the EU's Common Foreign and Security Policy and security on the one hand and climate change on the other. The same applies to competition for influence between actors and institutions within these respective policy areas, for instance different DGs claiming or having competence over issues such as water scarcity. However, it is difficult to assess whether such factors actually stifled ambition or progress. The EU as a governance structure is used to cross-cutting issues falling into more than one policy area and sphere of competence.[51]

Further, the overall **strength of public services and institutional settings** affects the ability of the state to prevent negative impacts of climate change on human security. Countries (especially developing ones) with weak public services and institutional settings are facing a challenge and will be even more challenged once climatic change effects become more obvious. As the example of Niger shows, existing customary rules may undermine a state's capacity to implement new formal policies. In Niger, legislation is often confronted with the reality of the terrain where customary rules and practice often take over, negatively affecting adaptation strategies for the pastoralist populations formulated by states entities. While the Pastoral Code provides a written guide for the pastoral population, traditional practices and rules often dominate in practice.[52]

The adaptive capacity of states depends also on the level of **knowledge** on the risks that the state and other organisations are expected to react to, as well as the efficiency of its **dissemination**. In Niger, the National Action Program for Combating Desertification and for Natural Resources Management (PAN-LCD/GRN) incorporates building knowledge about what causes desertification as well how to prevent it. It is reported that the capacity of the state to ensure food security for its citizens and improve the state of ecosystems is enhanced through research and dissemination of information about technical solutions such as natural regeneration, trenches, biological erosion barriers, and rock walls. The Spanish National Climate Change Adaptation Plan is also a very solid example of national endeavours that aim to collect and generate reliable knowledge for actors. One of the aims of the plan is to continuously provide assistance to all interested administrations and organizations, in evaluating the impacts of climate change in their respective sector, facilitating evaluation knowledge, tools and methods on adaptation activities in all sectors.[53] In Italy, on the one hand, the civil protection system set up to deal with hydro-geological risks promotes knowledge on risks through specific studies and information collection at the local level via questionnaires (so-called Ecosystem at Risk Survey). On the other hand, this survey does not cover climate change as an extra thematic area yet; it is argued that if climate were added as an extra area, it would raise insights on the perceptions of climate change in several municipalities.[54]

[49] See McGlade (2011)

[50] Goals were set in the: *Climate Change and Security: Recommendations of the High Representative on follow-up to the High Representative and Commission report on Climate Change and International Security* (S412/08), 18 December 2008. The paper was preceded by a more general *Report on the Implementation of the European Security Strategy - Providing Security in a Changing World - (S407/08)*, 11 December 2008.

[51] Stefes (2011)

[52] Snorek/Rosenfeld/Wirkus/Renaud (2011)

[53] Schwörer (2011)

[54] D'Alisa (2011)

In other instances, however, a lack of knowledge or knowledge dissemination is still a limiting factor for the implementation of policy responses beneficial to human security and natural resource management. For example, there is a low level of information regarding conflicts in the pastoral zone in Niger, since there is no systematic record keeping. For rural people, there is also little opportunity to learn about the laws that govern their system, especially due to the lack of capacity of relevant government bodies to disseminate information. Information and financial requirements overlap in this case as stronger research and dissemination requires a larger budget for education and outreach currently lacking in the present system.[55]

Closely related to knowledge on risks is also the actual **recognition of a specific issue** on the policy level and taking the decision to act. In Italy and Turkey, policy instruments have been developed to react to natural hazards in different contexts (civil protection system on hydrogeological risks in Italy and agricultural insurance law in Turkey). These have increased state capacity to react and provide assistance in the case of natural hazards including floods, although not necessarily increasing work on preventive measures. There are however several instances where the lack of recognition of an issue may prevent the state to develop its further capacity to implement change when it comes to human security threats from climate change. For instance, in some countries (e.g. Italy and Egypt), there is still no appropriate national climate change adaptation strategy, which can be viewed as lack of state response and action to handle climate change.

Budgetary aspects also play an important role in forming state capacity to address hydro-conflicts under a changing climate in several of the CLICO case studies. In Italy, institutional capacity to prepare and implement best practice projects on desertification and droughts is influenced by budgetary (next to institutional) issues. Italian institutions at different scales are not autonomously developing relevant projects to achieve their own objectives on drought and desertification issues, but strongly depend on EU funds.[56] In Niger, state capacity in policy implementation is limited partly due to budgetary limitations and large dependency on foreign aid. For instance, it is recommended that consistent funding coupled with a strategic plan would promote the sustainability of the National Action Program for Combating Desertification and for Natural Resource Management and the natural resources it is supposed to support.[57]

However, budgetary limitations in state capacity may be overcome by international funding, for example in the realisation of a joint sewage project in Cyprus and in planning the Red Sea Dead Sea Conveyance for Israel, Palestine and Jordan. More often than not, the countries that are most affected by climate change lack the resources to implement effective adaptation strategies. In this context, the UN has established multiple mechanisms for funding adaptation to climate change, particularly in developing countries (see relevant CLICO case study; McGlynn & Vidaurre (2011)).

In addition to their role in funding, **international organisations'** capacity to promote human security faced with climate change threats is determined by their degree of success in their role **as brokers** in transboundary settings, in particular in cases of existing conflicts. In Cyprus, one of the largest problems in the co-operation of the two sides on the joint sewage project was that of recognition, since the Republic of Cyprus did not wish to act in any way which implied the recognition of a legitimate state in the north and vice-versa. Four years of difficult negotiations took place (1974-1978) with the UN good services (next to the commitment of the

[55] Snorek/Rosenfeld/Wirkus/Renaud (2011)

[56] D'Alisa (2011)

[57] Snorek/Rosenfeld/Wirkus/Renaud (2011)

representatives of the two communities) needed in order to establish a working relationship to carry out the agreement.[58] In the case of the planned Red Sea Dead Sea Conveyance, the capacity of the neighbouring states (Israel, Palestine, Jordan) to enter into cooperation and joint planning of the project was positively influenced by the international support of the World Bank which secured funding and managed a feasibility study. Additionally in this case, previously existing treaties fostered political negotiations on the common project. The 1993 Oslo Accords between Israel and the Palestinians and the 1994 Peace Treaty between Israel and Jordan opened the door for regional cooperation, stressing the importance of joint projects aimed at increasing water supply and a general understanding that shared projects will benefit all parties involved.[59]

The case studies also reveal that sometimes the level of **interest and motivation of individual policy actors** is decisive for states' capacity to prepare for and react to threats to human security stemming from changes in the availability of water resources (now and in the future due to climate change). In Cyprus, the personal motivation and willingness of the representatives of the Greek Cypriot and the Turkish communities to enter into agreement under informal conditions at a time where political communication was lacking was a decisive factor in progressing with their joint sewage project and the ensuing increase in communication between the communities.[60]

Last but not least, the **power** (legal and political) of the actors involved cannot be overlooked as a factor of capacity of the state and other organisations to deal with water and conflict challenges. Although having legal and political power is crucial in formulating and ensuring the implementation of policy, the case studies show also some instances where the way power is exercised may lead to criticism or present a barrier in a process. In Italy's civil protection system for hydro-geological risks, there is a discussion around abuse of the declaration of the "State of Emergency" by official orders, which give Special Commissioners, or directly the Head of Department of Civil Protection, enormous power to intervene with disregard to the clauses of several laws. Critics highlight that part of civil society is worried about the increasing power of the Department of Civil Protection whose extended command can be considered a threat for democracy once the real emergency is passed.[61]

4.2.2 Policy responses – lessons learned

In addition to state capacity to adopt and implement relevant policies, if policies are to make a difference, they also need to be effective in attaining their aims and should not create new conflicts. The case studies have described a variety of policies, showing strengths and weaknesses of different approaches. The advantages and disadvantages of each policy are usually very much case- specific, but some more general lessons are described in this section. Due to the focus of this review on national and international level policies, most of the case studies provide insights on top-down approaches.

Some of the case studies indicate a value in the state having empowered end-users and having promoted direct societal and stakeholder **participation** in the management of limited water resources. In Egypt, the WUAs are reported to have reduced conflicts over access to water

[58] Charalambous/ Bruggeman/ Lange (2011)

[59] Katz-Mink, 2010

[60] Charalambous/ Bruggeman/ Lange (2011)

[61] D'Alisa (2011)

between head and tail–enders .[62] In Italy, systematic **awareness-raising** on hydro-geological risks and the participation of society in the civil protection system against such risks through a well-established volunteer system are seen as positive developments, increasing the legitimacy of state action in this field.[63]

In addition, **decentralisation** processes can lead to improved policies through greater understanding of local needs and issues. The decentralisation brought about by financial crisis in Niger for example, led to the strengthening of local water policies, presumably due to the fact that local governments were better equipped to understand the requirements of their constituencies than the national government. Also, a result of the decentralisation process of the new Codes in the rural environment in Niger, the so-called Land Commissions (COFOs) have been empowered by certain ordinances in their role to resolve conflict respecting the intricate cultural needs of pastoral groups.[64]

Several policies also focus on **improving coordination** (where this is previously missing) among a range of different actors and bodies. In Morocco, the designation of River Basin Authorities has led to increased interagency cooperation with responsibilities being more defined and consolidated.[65] In Italy, the use of a common database on local management for sustainability (GELSO) allows local municipalities to see what others are doing and for NGOs to put pressure on parties who take less action.[66] However, in many cases, there is no improvement in terms of coordination (yet). In Niger, the case study showed there to be a **lack of follow up and joined-up thinking** between post-drought crisis programmes such as Food for Work programmes and longer term development and sustainability activities to address the underlying causes of food insecurity.[67] In Morocco, different sectors have been assigned with the task of addressing climate change and the associated budget has been divided between different administrative bodies. This has meant that problems are not dealt with from a holistic perspective with a lack of cross-sectoral solutions being put forward.[68]

In the case of Spain, top-down policy has been used to carry out the **large-scale action** necessary to avoid interregional conflict over hydrological resources. In specific, national action was needed to cancel the large scale programme of water transfer from the lower Ebro river, which was the object of interregional conflict between water-rich regions sharing the Ebro basin and water-poor regions along the Mediterranean coast of Spain.[69] On the other hand, top down approaches, although well-meaning, may also exacerbate conflict. Where laws are passed at a higher level, there may be a lack of understanding of the policy at a local or rural level and thus be largely ignored, as was shown to be the case with the Nigerien National Action Program for Combating Desertification.[70]

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[62] Loutfy/Tawfic (2011)

[63] D'Alisa (2011)

[64] Snorek/Rosenfeld/Wirkus/Renaud (2011)

[65] Abdul Malak/Fons Esteve (2011)

[66] D'Alisa (2011)

[67] Snorek/Rosenfeld/Wirkus/Renaud (2011)

[68] Abdul Malak/Fons Esteve (2011)

[69] Schwörer (2011)

[70] Snorek/Rosenfeld/Wirkus/Renaud (2011)

Such difficulties are likely to be avoided through bottom-up policies, which also have some other advantages. In Niger for example, Farmer Managed Natural Regeneration programmes involve planting trees as a **grass-root activity**. [71] They require no development of new technology and are a farmer-led process in response to farmers' decision to improve soil fertility and to reduce the impacts of desertification experienced. This type of approaches is characterized by ownership of local actors over the adaptation process and has low governance and financial needs. The lack of government involvement may have actually resulted in increased success. However, bottom-up policies may also suffer from some difficulties of their own, such as insecure funding. For example, the Farmer Managed Natural Regeneration scheme in Niger has been reliant on NGOs and other sources of support. The lack of government involvement, whilst a benefit to the process itself, has meant that it has been slow to spread its message.

4.2.3 Cooperation and conflict

Another important aspect of CLICO and hence of this report is whether hydro-climatic changes lead to conflict or cooperation, and, in particular what role policies play in this regard. The case studies provide no conclusive answers, but instead help to map several links between policies, changes in environmental conditions and conflict/cooperation.

First of all, some case studies show how cooperation evolves in reaction to the need to solve urgent water-related environmental problems. One example is the shared sewerage system in the divided city of Nicosia/Cyprus.[72] It was created despite a political conflict (the division of Cyprus as a result of the Turkish military occupation), because it was badly needed. However, it was only with the help of international organizations that cooperation could be achieved. The UNDP helped with financial assistance, provided through the World Bank. The participation of these agencies opened the way for cooperation between both sides of the city. When the project became a humanitarian assistance project under the United Nations High Commissioner for Refugees (UNHCR) and was recognized as a bi-communal peace building strategy, more bi-communal development projects developed, leading to greater cooperation. As the authors of the case study point out, however, the successful operation of sewage treatment could not have been achieved without international support.

Another example of how an environmental problem may lead to cooperation, is the Red Sea Dead Sea Water Conveyance (RSDSC).[73] It has not been formally initiated yet, but as a future project to involve Israel, Jordan, and the Palestinian Authority, it is an example of how states may cooperate when resources, in this case, water become scarce. This multi-lateral project seeks to connect a 180 km long pipeline from the Red Sea to the Dead Sea to transport 1.8 billion cubic meters of water from the former to the latter. The pipeline would create a new source of freshwater to the water scarce region and also help stabilize the water level of the deteriorating Dead Sea. The project is still undergoing feasibility studies, but is projected to relieve some of the water pressure facing the region.

The Red Sea Dead Sea Water Conveyance Proposal was an opportunity for joint management of this region's water resources. Although Israel and Jordan had previously attempted to implement similar solutions, the economic costs were so high that cooperation was the only

[71] Snorek/Rosenfeld/Wirkus/Renaud (2011)

[72] Charalambous/ Bruggeman/ Lange (2011)

[73] Fiedler (2011)

economically sensible way forward. In light of the financial restraints of partner countries involved, the World Bank became one of the main players in facilitating the joint project. The Bank conducted some feasibility studies and in 2002 established a Steering Committee to guide the project's design and implementation.[74] Currently the World Bank is coordinating research to determine the viability of the project, and an environmental and social assessment.[75] If the canal is constructed, the World Bank will seek financing for the project with help from international donors. This would be the first project that Israel, the Palestinian Authority and Jordan undertake jointly. An expected positive consequence is that as each side becomes more dependent on the project, interdependence and peaceful cooperation between these states will follow. As the World Bank maintains, peace is more likely to develop as a result of cooperation on individual, tangible projects than in abstract terms. In fact, this project is often referred to as the "Peace Conduit" that will lead to amicable relations between the three states.[76]

A second link between hydro-climate changes, conflict/cooperation and policies reflected in the case studies is that policies that seek to mitigate risks or prevent future conflicts, may also create new conflicts, at the individual, group or state level. This effect was shown in several case studies: In the case of desalination in Israel, the Palestinian side is not happy about the Israeli plans for more desalination, and further tensions may result.[77] In Cyprus, borehole subsidies could lead to a situation where tensions increase between borehole owners which may have more water at their disposal and other people, who do not.[78] In Italy, adaptation measures were not addressed at all communities at risk to an equal degree.[79] These cases are obviously all very different. One lesson that could still be drawn is that equality appears to be a particularly important matter in adaptation; where adaptation measures increase or prolong existing inequalities, they are likely to give rise to tensions or even conflict.

5 Conclusions

This concluding section re-visits key findings of the paper on the main research questions asked and makes closing observations on the present analysis.

Research question 1: *What types of policy interventions exist to reduce risks from climate and water-related stressors and (directly or indirectly) improve human security? Are there any specific policies that address climate change, water management and / or security (simultaneously)?*

The research strategy for this paper has been a case study approach focusing on few selected policies and instruments from the national level in the MMES region and relevant developments on the EU and UN level. This approach allowed for a more in-depth insight on "how" certain policies and instruments may affect human security and reduce risks from climate and water-related stressors. On the other hand, this approach does not allow a straightforward and

[74] World Bank. (2010). Red Sea Dead Sea Water Conveyance Study Program Background Note. Retrieved from http://siteresources.worldbank.org/INTREDSEADEADSEA/Resources/Background_Note_October_2010.pdf

[75] Fischhendler, I., Wolf, A. T. & Eckstein, G. (n.d.). The role of creative language in addressing political realities: Middle-Eastern water agreements.

[76] Katz-Mink, E. (2010). Cooperative management structure for the proposed Red Sea-Dead Sea conduit. (MA Thesis). Ben-Gurion University of the Negev, Be'er Sheva.

[77] See Fiedler (2011)

[78] Charalambous/ Bruggeman/ Lange (2011)

[79] D'Alisa (2011)

generalised answer on the types of policies present or under development, since not all policies in existence are checked. Thus, the overview statements made are intended only as an initial insight into the current policy situation, into which more in-depth analysis is necessary. Also, due to the focus of this review on national and international level policies, most of the case studies provide insights on top-down approaches.

The analysis of selected policies and instruments showed that very few policies currently address explicitly the link between climate change, water, human security and conflict or cooperation. Of the few policies that explicitly address the link, most are located at the international level, such as the GEF Focal Area on International Waters, the European Security Strategy, the Strategy for Water in the Mediterranean and the Environment and Security Initiative (ENVSEC). Human security or conflicts are only in few cases explicitly mentioned in the formulation of concrete water and climate change policy instruments. Even UN and EU institutions that address security issues such as the ENVSEC initiative or the Peace Building Commission of the UN do not seem to have gone a long way towards integrating climate change specifically.

At the national level in the MMES region, no similar targeted initiatives were identified. Only the Spanish Climate Change Adaptation Strategy refers explicitly to human security and states that the evaluation of climate change impacts and vulnerability of different sectors and systems must also consider impacts of climate change on human security. Nevertheless, adaptation policies and resource management instruments in various fields, including agriculture or water, do address risks for human security linked to water and climate change. Some examples discussed in this paper (and analysed in the respective case studies) include an agricultural insurance scheme in Turkey, measures to improve water availability in Cyprus, Spain, Morocco and Israel/Palestine, improving disaster prevention in Italy and an early-warning system for flash floods in Egypt. Fewer policies in the sample of selected case studies are explicitly aimed at conflict prevention, with the formation of water user associations in Egypt and Niger being two exceptions. However, these policies, in turn, do not relate to climate change.

All in all, there is generally evidence that targeted policies are useful for protecting human security and there are examples of cooperation in the case of water scarcity. Due to the fact that policies on the climate change-human security-water resources nexus are only beginning to emerge, it is not yet possible to conclude whether new and additional policies are needed or whether the existing ones would be sufficient once properly implemented.

Research question 2: *What constitutes the capacity of states to implement the changes necessary for adapting to climate change and preventing, to the extent possible, negative effects of climate change on human security?*

In the case studies, certain factors stand out as influential of the capacity of states to formulate and implement policy responses beneficial to climate change adaptation and the enhancement of human security when faced with hydro-(climatic) hazards. The factors discussed in this paper included:

- Institutional coordination, relevant to different levels, such as coordination and integration of different policy fields as well as coordination of different institutional players.
  Overall, existing policies tend to show a need for greater coordination between civil protection systems, natural resource protection and climate change adaptation policies, between water/ agricultural policies and broader social and economic objectives (i.e. towards a more human-centered approach beyond the mere protection of natural resources) and between funding mechanisms and climate change adaptation strategies.

- Availability and dissemination of knowledge on increased risks from climate change impacts and natural resource degradation. This is relevant to knowledge creation and dissemination both for institutional actors and the resource users / public.
- Openness and responsiveness of policy actors to new problems, and in this specific case, actual recognition of specific hazards and climate change threats in general as an issue.
- Availability of financial resources to back-up policy implementation.
- Legal and political power of actors involved in policy formulation and implementation.
- Level of interest and motivation of individual actors to prepare for and react to threats to human security stemming from changes in the availability of water resources.

Research question 3: *Has water scarcity led to conflict or cooperation in the past? To what extent do existing policies exacerbate or mitigate water-related conflict? What determines their effectiveness, especially in terms of mitigating conflict and enhancing human security?*

The case studies carried out for the purpose of this review could provide no conclusive answers on this question, but instead helped to map several links between policies and other steering mechanisms, changes in environmental conditions and conflict/cooperation. Some case studies showed how cooperation evolves in reaction to the need to solve urgent water-related environmental problems (e.g. cooperation between the Turkish and Greek part of Cyprus over sewage treatment and potential future cooperation of Israel, Jordan, and Palestine over the Red Sea Dead Sea Water Conveyance). In the relevant examples, the assistance of international organisations in the development of cooperation was decisive.
Several other case studies showed how policies and other steering mechanisms that seek to mitigate risks or prevent future conflicts, may also create new conflicts, at the individual, group or state level, depending very much on the political and socio-economic context (e.g. as in the case of desalination of Israel, whereby the Palestinian side is not happy about Israeli plans for more desalination, and further tensions may result). In addition, equality appears to be a particularly important matter in adaptation; where adaptation measures increase or prolong existing inequalities, they are likely to give rise to tensions or even conflict.

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7 Annex I: Overview of policies screened

	Country/Name of policy	Current/future	Policy area	Chosen for case study?
	Niger			
1.	PAN-LCD/GRN (Consultation on Env and Fight against Desertification)	Current	Desertification	Yes
2.	Code Rural (with special focus on Water and Pastoral Codes)	Current	Water, agriculture	Yes
	Cyprus			
3.	Sharing of sewage water system and water supply in the divided town of Nicosia	Current	Water (sewage)	Yes
4.	Borehole Subsidies	Current	Water	Yes
5.	Progressive block tariffs for water supply	Future	Water pricing	No
6.	Educational campaign	Current	Water education	No
	Egypt			
7.	Activities of the Central Laboratory for Agricultural Climate	Current/future	Water (agriculture)	Yes
8.	Activities of the Water Resources Research Institute	Current/future	Water	Yes
9.	Activities of the Crisis and Disaster Management Sector	Future	Climate change adaptation	No
10.	Activities of the Nile Forecast Centre	Current	Water (rainfall)	No
	Italy			
11.	Activities of the National Service of Civil Protection, with focus on climate change	Current	Disaster prevention/relief	Yes
12.	Environmental Code: Soil legislation with possible focus on desertification	Current	Soil/desertification	Yes
13.	National Action Plan for the reduction of GHG emissions 2003-2010	Past/Current	Climate change Mitigation	No

14. Assessment and management of flood risk	Current	Water (floods)	No
15. National Strategic Plan for Rural Development [NSPRD]	Current	Rural development	No
Morocco			
16. Loi sur l'Eau, National Water Strategy (Stratégie Nationale de l'Eau),	Current	Water	Yes
17. Nouvelle Stratégie Agricole au Maroc (Plan Maroc Vert)	Current	Agriculture	Yes
18. Plan National de lutte contre le réchauffement climatique (PNRC)	Current	Climate change, institutional aspects	Yes
19. National Water Strategy (Stratégie Nationale de l'Eau)	Current/Future	Water	No
Israel/Palestine/Jordan			
20. Work of the Joint Water Commission	Current	Water	Yes
21. Multilaterals water work-group and climate change related sub-groups	Current	Water	Yes
22. Climate Change Adaptation Strategy for the Occupied Palestinian Territory	Future	Climate change adaptation general, water (wastewater re-use)	Yes
23. Strategic Water Sector Plan in Palestine 2011 - 2013	Current	Water	Yes
24. Palestinian Environmental Strategy 2011 – 2013	Current	Environmental policy	No
25. Desalination	Current/future	Water (new supply)	Yes
26. Red Sea - Dead Sea Canal	Future	Water (new supply)	Yes
Spain			
27. A.G.U.A Programme and its Urgent Actions in the Mediterranean Basins	Past (till 2008)	Water (waste water re-use, alternative water supply)	Yes
28. Special Drought Management Plans	Current	Water (drought)	Yes
29. National Climate Change Adaptation Plan	Current	Climate change adaptation general	Yes
30. Combined Agricultural Insurance System	Current	Agriculture, insurance	No

31. Andalusian Water Law (and the Andalusian Agreement on Water)	Current	Water	No
32. Catalonian Water Management Plan	Current	Water	No
Turkey			
33. Turkish National Strategy and Action Plan on Combating Agricultural Drought	Current	Agriculture, water (drought)	Yes
34. Law on Agricultural Insurance	Current	Agriculture, insurance	Yes
35. National Climate Change Strategy Document	Current	Climate change Adaptation	No
36. National Rural Development Strategy	Current	Rural development policy	No
EU			
37. European Security Strategy	Current	Security	Yes
38. Mediterranean Water Initiative	Current	Water	Yes
39. European Floods Directive	Current	Water	No
40. European Neighbourhood Policy	Current	Different policy fields, including environment	No
UN			
41. Peace Building Commission	Current/future	Peace building	Yes
42. Funding for adaptation	Current	Climate change Adaptation	Yes
43. ENVSEC Initiative	Current	Security	Yes
44. High-level discussions on climate change and security (e.g. at Security Council)	Current		No
45. UNEP disaster and conflicts programme	Current	Disaster relief, conflict prevention	No

8 Annex II: Case studies

Policies for improving water security, the case of Cyprus

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Work Package: WP4

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Dissemination level: Public

Abstract This report provides a brief overview of water management and climate adaptation policies and practices in Cyprus. Two policy measures that could contribute to providing water security and reducing hydro-conflicts in water scarce environments were identified for further review. The first policy is the sharing of sewage treatment and water supply in the divided city of Nicosia. Bi-communal use of a downstream sewage treatment plant has contributed to the cooperation between the Greek and Turkish Cypriot communities, while the provision of water by the Republic of Cyprus to the Turkish Cypriot community in the north may perhaps have extinguished a potential conflict source. The second policy aims to reduce potable water use by providing garden owners with a €700 subsidy for the installation of a borehole to irrigate their gardens. The policy was found to be effective in reducing potable water demand. However, surveyed garden owners with a borehole irrigated more frequently than those without borehole, indicating that the boreholes may also lead to less judicious water use. Half of the borehole owners identified water security as a motive for installing a borehole, to prevent their gardens from drying out during water supply cuts. Considering that groundwater leaching in urban areas tend to be high and that the water quality is not always suitable for potable water use, this policy could perhaps be specifically targeted to areas that suffer from high groundwater levels.

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1. Introduction

Cyprus, an island in the Eastern Mediterranean, relies on its highly variable precipitation for its natural renewable water resources. Average annual rainfall over the Republic of Cyprus is approximately 460 mm. As is typical for dry Mediterranean environments, the majority of this rainfall, about 86%, returns to the atmosphere as evapotranspiration (green water), while blue water forms a small remainder, with 7.1% for surface runoff and 6.7% for groundwater recharge, according to the 1971-2000 water balance.[1] This amounts to 370 Mm^3 renewable blue water per year, on average. Thus, with a population of 799,700[2], Cyprus' average annual renewable water resources are about 460 m^3 per capita, placing Cyprus among the top-twenty water scarcest countries of the world. Notwithstanding Cyprus' motivational water policy slogan "not a drop of water to the sea"[3], not all of the blue water can be economically abstracted, while, on the other hand, water's role in providing ecosystem services should also not be overlooked. Another important concern is the high variability within and between years. During the two driest years of the past four decades, the country received just 213 mm (1972/73) and 272 mm (2007/08).

Similar to a number of countries in the Sahel[4], Cyprus has already experienced a decrease in precipitation in the recent past. As part of a study on the reassessment of the water resources of Cyprus[5], a regional analysis of the changes in precipitation found a statistically significant step change in the 1916-2000 annual precipitation time series between the hydrologic years 1968/69 and 1971/72, with a 15-25% reduction in precipitation for the last 30 years of the 20th century.[6] The average annual precipitation over the government controlled area of Cyprus was 466 mm for the 1970/71-2009/10 period, as compared to 541 mm for 1901/02-1969/70.[7,8]

Climate change projections, based on a set of six regional climate models under the A1B scenario, indicate that Cyprus could possibly experience another 2-8% reduction in annual precipitation

[1] Water Development Department (WDD) (2002). Use and conservation of water in Cyprus. WDD, Ministry of Agriculture Natural Resources and Environment, Nicosia, Cyprus.
http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[2] Statistical Service (2010). Statistical abstract of 2009. General Statistics, Series I, Report no 55. Republic of Cyprus Printing Office, Nicosia, Cyprus.

[3] Water Development Department (WDD) (2003). Development of water resources in Cyprus, a historical review. WDD, Ministry of Agriculture Natural Resources and Environment, Nicosia, Cyprus.
http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[4] Kevane, M. and Gray, L. (2008). Darfur: rainfall and conflict. *Environ. Res. Lett*. 3, 034006.

[5] Klohn, W. (2002). *Re-Assessment of the water resources and demand of the island of Cyprus.* Synthesis Report. Water Development Department (WDD) and Food and Agriculture Organization of the United Nations (FAO), Ministry of Agriculture, Natural Resources and Environment, Nicosia, Cyprus.

[6] Rossel, F. (2001). Changes in recorded precipitation, in *Re-Assessment of the water resources and demand of the island of Cyprus.* 2002. Water Development Department (WDD) and Food and Agriculture Organization of the United Nations (FAO), Ministry of Agriculture, Natural Resources and Environment, Nicosia, Cyprus.

[7] Cyprus Meteorological Service (2010). Cyprus average annual precipitation 1901-2008.
http://www.moa.gov.cy/moa/MS/MS.nsf/DMLclimet_reports_en/DMLclimet_reports_en?opendocument

[8] Cyprus Meteorological Service (2011). Monthly rainfall in Cyprus during the hydrometeorological year 2008-2009 and 2009-2010.
http://www.moa.gov.cy/moa/MS/MS.nsf/DMLmeteo_reports_en/DMLmeteo_reports_en?opendocument

between 1976-2000 and 2026-2050.[9] While the outputs of 16 global models for the B1, A1B, A2 scenarios[10] projected reductions in annual precipitation ranging between 0 and 28% for 2040-2069, relative to 1961-1990.[11] The medians of this global model ensemble showed reductions between 10 and 19% for the three scenarios.

Water demand, on the other hand, keeps on increasing. The total annual water demand for the Republic of Cyprus has been estimated as 252 Mm^3 for the year 2011.[12] This demand is divided over the different sectors and uses as follows: 60% for irrigation, 3% for livestock, 26% for domestic use, 4% for tourism, 3% for industries and 4% for landscape irrigation. Environmental flows were not included in these demand computations, but minimum flow thresholds and maximum extraction rates were defined for the January-April winter months for a number of streams. In addition, a minimum amount to maintain the ecosystem of the dam water body was included in the proposals for the management of the abstractions from dams.[13] The computed 152 Mm^3 water demand for agricultural irrigation may have been underestimated. An independent study computed irrigation water demand to range between 195 and 250 Mm^3 per year, based on detailed land use, soil and climate data.[14] Part of this demand is met outside the government irrigation schemes through diversions from springs and streams or pumping for groundwater, while part of the demand, especially during drought years, is not met.

Climate change has been recognized as an important security challenge, contributing to increased migration, border tensions, spread of diseases and conflicts over food and water.[15,16] Freedom from hazard impacts such as floods and droughts has been identified as a fourth human security pillar, following freedom from fear, freedom from want and freedom to live in dignity.[17,18]

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[9] Hadjinicolaou, P., Giannakopoulos, C., Zerefos, C., Lange, M.A., Pashiardis, S. and Lelieveld, J. (2010). Mid-21st century climate and weather extremes in Cyprus as projected by six regional climate models. *Reg. Env. Change*. DOI 10.1007/s10113-010-0153-1.

[10] Meehl, G. A., Covey, C. Delworth, T., Latif, M., McAvaney, B., Mitchell, J. F. B., Stouffer, R. J. and Taylor, K. E. (2007). The WCRP CMIP3 multi-model dataset: A new era in climate change research, Bulletin of the American Meteorological Society, (88): 1383-1394.

[11] Climate Wizard. (2009). www.climatewizard.org

[12] Karavokyris, G. and Partners Consulting Engineers and Kamaiki, P. S. (2010). Final report on water policy, Report 7, Provision of consultancy services for the implementation of Articles 11, 13 and 15 of the WFD 2000/60/EC in Cyprus. Water Development Department, Nicosia, Cyprus. (In Greek with English Summary).

[13] Karavokyris, G. and Partners Consulting Engineers and Kamaiki, P. S. (2010). Final report on water policy, Report 7, Provision of consultancy services for the implementation of Articles 11, 13 and 15 of the WFD 2000/60/EC in Cyprus. Water Development Department, Nicosia, Cyprus. (In Greek with English Summary).

[14] Zoumides, C. and Bruggeman, A. (2010). Temporal and spatial analysis of blue and green water demand for crop production in Cyprus. http://www.cyi.ac.cy/node/698

[15] Barnett, J. (2003). Security and climate change. *Global Environmental Change,* (13): 7-17.

[16] Scheffran, J., Battaglini, A. (2011). Climate and conflicts: the security risks of global warming. *Reg Environ Change*, (11): 27-39.

[17] Brauch, H.G. (2008). Conceptualising the environmental dimension of human security in the UN. *International Social Science Journal*, 59(s1): 19-48.

[18] Brauch, H. G. (2009). Human security concepts in policy and science, Chapter 74, in Brauch, H.G., Beherea, N.C., Kameri-Mbote, P., Grin, J., Oswald Spring, U., Chourou, B., Mesjasz, C. Krummenacher, H. (eds.), Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts, Vol 4, pp. 966-989.

This report aims to review water policies, regulations, strategies, actions, and informal or traditional arrangements, concerning the relationship between potential climate change impacts, human security and conflicts in Cyprus. The island of Cyprus covers 9251 km^2, but the northern part (36.2%) of the island has been occupied by Turkish forces since 1974.[19] The water sector in the occupied part is currently in a state of flux. With support of the European Community, water supply, wastewater collection and treatment are being improved and water management structures are being reformed, in preparation for implementation of the *acquis communautaire*.[20] Therefore, this report focuses on climate and water management policies and measures in the government controlled part of Cyprus, hereinafter referred to as Cyprus or the Republic of Cyprus. The country has not yet developed any specific policies or guidelines for the adaptation of water management systems to climate change. However, being a water scarce country, over the years Cyprus has developed and implemented various measures that focussed on harnessing water resources and increasing water supply, as well as on water conservation and reduction of water demand.

The following chapter provides a brief overview of Cyprus' water supply, demand and climate change adaptation policies and measures and their relevance for human security. Two policies, namely the sharing sewage and water distribution networks between the Greek and Turkish Cypriot communities in Nicosia, and the borehole subsidy for saving potable water, are reviewed in more detail, using the OECD criteria for evaluating development assistance[21] in chapter 3 and 4, respectively. Finally, a general conclusion is provided in chapter 5.

[19] Press and Information Office (PIO) (2010). Republic of Cyprus from 1960 to the present day. PIO, Nicosia, Cyprus. www.moi.gov.cy/pio

[20] Commission of the European Communities (EC) (2007). Addressing the challenge of water scarcity and droughts Communication from the Commission to the European Parliament and the Council. COM(2007) 414. Brussel.

[21] Organisation for Economic Co-operation and Development (OECD) (2010). DAC Criteria for Evaluating Development Assistance
http://www.oecd.org/document/22/0,2340,en_2649_34435_2086550_1_1_1_1,00.html

2. Overview of Water Policies and Measures

2.1 Managing water supply

The annual reports of the Water Development Department (WDD)[22] explain the country's water policy to encompass "the production of desalinized sea water, the use of non-conventional sources such as the use of recycled water, the efficient use of available water including the better use of pricing and water conservation measures, the protection, preservation and improvement of the water quality, the introduction of new effective management procedures through the establishment of a Water Entity and the development of the remaining existing water resources with the construction of dams until 2015." Sustainability did not enter the Department's annual reports until 2008. [23] The 2009 report stated that the Government's water policy focuses on providing effective protection, rational development and sustainable management of water resources in Cyprus to address water scarcity and droughts and uncontrolled exploitation.[24] The promotion of nonconventional water resources "such as recycled water, desalination of seawater and brackish groundwater, as well as rainwater utilisation" now moved to second place.

The needs for revising the water legislation and for the establishment of an Integrated Water Entity were identified in the early years of the Republic of Cyprus, but it took until November 2010 for a new Integrated Water Management Law 79(I)/2010 to come into force.[25] The new law assigns the integrated management of water to the WDD, gathering all responsibility around water from other authorities and departments, such as the issue of permits to drill and abstract groundwater, which was previously in the hands of the District Officers.[26]

During the first half of the 20th century, groundwater was the main source of water supply in Cyprus. But due to extensive pumping for irrigation, groundwater resources were already over-exploited in the 1950s, with sea water intrusion occurring in coastal aquifers. Since its independence in 1960, the Government of Cyprus, supported by various international organizations and consultants, has focused on the development of its water resources, including an ambitious dam development program. One of the objectives of the dam development program was to increase the expansion of irrigation to increase farmers' income and thereby improve the national economy.[27]

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[22] Water Development Department (WDD) (2003-2009). Annual report (English Summary). http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[23] Water Development Department (WDD) (2003-2009). Annual report (English Summary). http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[24] Water Development Department (WDD) (2003-2009). Annual report (English Summary). http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[25] Water Development Department (WDD) (2011a). History. http://www.moa.gov.cy/moa/wdd/Wdd.nsf/history_en/history_en?OpenDocument

[26] Kotsila, P. 2010. The socio-environmental history of water development and management in the Republic of Cyprus. MSc Thesis, Universitat Autònoma de Barcelona. http://www.cyi.ac.cy/node/698

[27] Konteatis, C.A.C. (1974). Dams of Cyprus. Water Development Department, Ministry of Agriculture, Natural Resources and Environment, Nicosia, Cyprus.

Currently, there are 51 large and more than 30 small dams and off-stream reservoirs in the Republic of Cyprus with a combined storage capacity exceeding 300 Mm^3.[28] Even though these dams have been crucial for the water supply of the country, they have also reduced and sometimes almost completely cut off flows that supported ecosystems and recharged aquifers downstream. Inflow to the dams depends on the highly variable Mediterranean climate; during the 2007/08 drought year inflow to the main dams was just 19 Mm^3.[29]

The WDD has also provided tertiary treated sewage water for both landscape and agricultural irrigation, used supplies have ranged between 1-6 Mm^3/yr over the past 12 years.[30] Strict guidelines and controls on levels of biological contamination, gene toxity and concentrations of metals have been established.[31] Treated sewage has also been used for aquifer recharge.[32]

Desalination development started in Cyprus in the late 1990s. Desalination plants in Dhekelia (1997) and Larnaca (2001) have a current combined capacity of 40 Mm^3/yr.[33] A temporary, mobile desalination plant in Moni went into operation at the end 2008 and construction of three more plants, in Paphos, Limassol and Vasilikos, is currently underway.[34] By the end of 2012, Cyprus' total desalination capacity is expected to exceed 80 Mm^3/yr. This amount is sufficient to cover the country's full domestic and tourist water demand.[35]

Due to the occurrence of a few, relatively wet years (2001/02-2003/04) and a new government that tried to save funds, the plans for additional desalination plants, agreed on during the 2000 drought year, were scrapped after the change of government in 2003[36], while part of the water reserves stored in the dams were provided to agriculture. Thus, as headlined in media outlets

[28] Water Development Department (WDD) (2009a). Dams of Cyprus. (Republication). WDD, Ministry of Agriculture Natural Resources and Environment, Nicosia, Cyprus. http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[29] Water Development Department (WDD) (2011b). Statistical information (leaflets). Supply of water from the government water works, Inflow of water to the dams, Government water works - irrigation supply sources. http://www.moa.gov.cy/moa/wdd/wdd.nsf/statistics_en/statistics_en?OpenDocument

[30] Water Development Department (WDD) (2011b). Statistical information (leaflets). Supply of water from the government water works, Inflow of water to the dams, Government water works - irrigation supply sources. http://www.moa.gov.cy/moa/wdd/wdd.nsf/statistics_en/statistics_en?OpenDocument

[31] Fatta, D. Anayiotou, S. (2007). MEDAWARE project for wastewater reuse in the Mediterranean countries: An innovative compact biological wastewater treatment system for promoting wastewater reclamation in Cyprus. *Desalination*, (211): 34-47

[32] Christodoulou, G.I. Sander, G.C. Wheatley, A.D. (2007). Characterisation of the Ezousas aquifer of SW Cyprus for storage-recovery purposes using treated sewage effluent. *Quarterly Journal of Engineering Geology and Hydrogeology*, (40): 229-240.

[33] Manoli, A. (2010). Desalination in Cyprus. Presentation given at Spanish Cypriot partnering event, March 2010, Nicosia, Cyprus. http://www.moa.gov.cy/moa/wdd/wdd.nsf/All/24B06DE543FBD990C22576EB002E2633?OpenDocument

[34] Water Development Department (WDD) (2003-2009). Annual report (English Summary). http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[35] Karavokyris, G. Partners Consulting Engineers and Kamaiki, P. S. (2010). Final report on water policy, Report 7, Provision of consultancy services for the implementation of Articles 11, 13 and 15 of the WFD 2000/60/EC in Cyprus. Water Development Department, Nicosia, Cyprus. (In Greek with English Summary).

[36] Cyprus Mail (2008). Shocking apathy on water shortage. Editorial, January 27, 2008.

worldwide, Cyprus ran embarrassingly out of water in the summer of 2008 and ended up spending about €50 million to transfer water by boat from Greece.[37] The national Agricultural Insurance Organization paid €19.3 million as drought compensation to farmers,[38] while the Cyprus Agricultural Payment Organization provided farmers with €2.4 million emergency state aid.[39]

The Orthodox Church of Cyprus has also tried to contribute to the country's water supply by urging priests to pray for rain. ''We are certain that by praying together with the warmest of spirit and deepest of faith it is possible that Almighty God will hear our prayers and grant our request,'' according to the statement from archbishop Chrysostomos II on 26 November 2007.[40] The archbishop recognized that the continuous drought spell could result in terrible consequences for farming, livestock and crops. Prayers for rain were also held when droughts struck the island in 1998.[41]

2.2 Managing water demand

The Government of Cyprus has invested heavily in the improvement of water use efficiency in irrigated agriculture, which is the country's main water user (chapter 1). Irrigation water from the Government dams and groundwater networks is conveyed through closed pipes and at sufficient pressure (3 bar) for the farmer to connect water-use-efficient micro-sprinkler and drip systems.[42] A Water Use Improvement Project has been run by the Department of Agriculture since 1965. Under this project the government provided the farmers with technical and financial assistance to convert from traditional surface irrigation methods to modern irrigation methods. Phoicades (2002) reported that nearly 95% of the irrigated area in Cyprus uses low-medium pressure improved irrigation systems, mostly micro-irrigation, with levels of water use efficiency in excess of 80% percent. However, the data of the 2003 agricultural census [43] indicated that modern irrigation methods were used in 86% of the irrigated areas, while 14% was under surface irrigation. The Agricultural Research Institute has also contributed to water use efficiency in agriculture, through studies on the water requirements of different crops, irrigation systems, fertilization and fertigation practices, use of treated sewage water and greenhouse management.[44,45]

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[37] Christofias, D. (2009). Opening Statement by the President of the Republic, Mr. Demetris Christofias, at the Press Conference on the completion of the first year of administration. 7 March 2009.

[38] Auditor General of the Republic (2009). Annual report 2008. Audit Office, Republic of Cyprus.
[39] Cyprus Agricultural Payment Organization (CAPO). (2008). Annual report 2008.
http://www.capo.gov.cy/Capo/CAPO.nsf/All/AF120F331A3112E7C2257601003A7BA5?OpenDocument

[40] British Broadcasting Corporation (BBC) (2007). Cyprus churches to pray for rain. 27 December 2007.
http://news.bbc.co.uk/2/hi/europe/7114722.stm

[41] British Broadcasting Corporation (BBC) (2007). Cyprus churches to pray for rain. 27 December 2007.
http://news.bbc.co.uk/2/hi/europe/7114722.stm

[42] Phoicades, A. (2002). Irrigation Advisory Services in Cyprus, in *Proceedings of a workshop on irrigation advisory and training services in the Near East.* FAO Regional Office for the Near East, Cairo, Egypt, pp.12-25.

[43] Statistical Service (2006). Census of agriculture 2003. Agricultural Statistics, Series I, Report 7. Republic of Cyprus Printing Office, Nicosia.
http://www.mof.gov.cy/mof/cystat/statistics.nsf/publications_en/publications_en?OpenForm&OpenView&SrcTp=1&Category=0&Subject=0&SubSubject=0&

[44] Agricultural Research Institute (ARI). (2002). Soils, water use and environment, in *Review for 2000-2001.* Agricultural Research Institute, Ministry of Agriculture, Natural Resources and Environment, Nicosia, Cyprus, pp. 90-100.

[45] Metochis, C. and G. Eliades. (2002). Irrigation systems in Cyprus, in *Review for 2000-2001*. Agricultural Research Institute, Ministry of Agriculture, Natural Resources and Environment, Nicosia, Cyprus, pp. 90-100.

Irrigation water remains heavily subsidized, in 2010 farmers paid 0.17€/m^3 plus a fixed charge of 1.71€/dec. But extra charges are levied for the use of water above the crop-specific allocated amounts. For the proposed new water pricing policy, which is supposed to bring Cyprus in line with the cost recovery requirements of the EU Water Framework Directive (WFD), the WDD took the social importance and financial viability of the agricultural sector into consideration.[46] The price for government supplied irrigation water has been proposed to increase to 0.24 €/m^3 with a fixed charge of 6.61 €/dec, resulting in 54% cost recovery. A resource and environmental cost of 0.11 €/m^3 was proposed for individual irrigation water extraction from streams or groundwater.

To reduce domestic water demand, while still providing households with affordable water, a progressive block tariff system has been used by a number of suppliers of domestic water in Cyprus (Water Boards, municipalities, communities). For example, in 2010, Nicosia households paid €0.79 per m^3 for the first 10-m^3, €0.91 per m^3 for the second 10-m^3, and €1.13 per m^3 for the third 10-m^3, per two month period. In Limassol, households paid €0.48 per m^3 for the first 40-m^3, €0.77 per m^3 for the second 40-m^3, €1.37 per m^3 for the third 40-m^3, per four month period. A so-called shock tariff of €5.00 per m^3 is charged for the highest water use category. It should be noted that water prices vary substantially over the island, depending on the local suppliers and their access to water resources. All changes in water prices need to be approved by the Government, resulting sometimes in losses for local suppliers because the Government does not want to burden their electorate with having to pay for the actual cost of the water.

For the new water pricing policy, the WDD proposed the use of a fixed charge (€39 per household per year) and two or more progressive price scales for volumetric charges.[47] The WDD proposal also recommended uniform water prices for the whole island, but expects this to be non feasible and already offered alternatives. Not surprisingly, local stakeholder consultation meetings indicated also the unpopularity of common water prices for the whole island, especially among those that are currently paying less.

The WDD has been offering subsidies for four water-saving measures: the installation of a hot water recirculator (€ 220), the installation of a grey water recycling system (€ 3000), the development of a borehole for watering gardens (€ 700) and connection of the borehole with the toilet cisterns (€ 700).[48] In 2009, 1408 applications were approved, the majority (789) for garden boreholes.[49]

The WDD and some of the Water Boards provide also suggestions for household water savings on their website and through leaflets, posters and publications. Suggestions include repairing leaks,

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[46] Water Development Department (WDD) (2010a). Cost assessment & pricing of water services in Cyprus. Summary. March 2010.
http://www.moa.gov.cy/moa/wdd/Wdd.nsf/guide_en/guide_en?OpenDocument

[47] Water Development Department (WDD) (2010a). Cost assessment & pricing of water services in Cyprus. Summary. March 2010.
http://www.moa.gov.cy/moa/wdd/Wdd.nsf/guide_en/guide_en?OpenDocument

[48] Water Development Department (WDD) (2010c). Water saving measures. (In Greek)
http://www.moa.gov.cy/moa/wdd/wdd.nsf/measures_en/measures_en?OpenDocument

[49] Water Development Department (WDD) (2003-2009). Annual report (English Summary).
http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

checking meters and turning off the tap when brushing one's teeth, washing dishes, fruit and vegetables.[50] For people's awareness, information is also given on the quantities of water consumed if economical use of water is exercised, such as washing a car with a bucket and sponge (75 L) instead of with a hose (500 L) and turning off the shower while soaping (40 L) instead of letting the water run (120 L). [51]

Even though the country's has gone through a number of severe droughts with water cuts for all sectors, the older generation still seem to take water resources for granted. Therefore, the WDD has developed a special program to educate the younger generation (elementary, high school, technical school) about water resources and water conservation. This campaign has evolved over the past three years, from staff of the water education department going to schools, to training their own designated teachers and having an application form available on the WDD website for schools to specify their requests.[52,53]

Domestic water use in Cyprus' four main cities ranged between 121 and 166 L/d per capita in 2006.[54] This is similar to other cities in Mediterranean countries, such as in Spain (112-133 L/d) and Italy (148-222 L/d). It also compares favourably with more northern countries, such as Germany (133 L/d) and The Netherlands (128 L/d). However, tourists' water demand has been estimated at 465 L/d per capita.[55]

2.3 Adapting to climate change

According to Cyprus' responses to a European climate change and water adaptation survey[56], a variety of water resources adaptation initiatives and measures (flood, drought and coastal protection, and awareness raising) have been implemented in Cyprus. Technical flood protection and natural retention of flood water were identified as needed but were not yet planned.

Cyprus did feature in the Working Group 2 report of IPCC Fourth Assessment[57] as one of the many small island states with considerable experience in adapting to climate variability. Referring to

[50] Water Development Department (WDD) (2002). Use and conservation of water in Cyprus. WDD, Ministry of Agriculture Natural Resources and Environment, Nicosia, Cyprus.
http://www.moa.gov.cy/moa/wdd/wdd.nsf/booklets_en/booklets_en?OpenDocument

[51] Water Development Department (WDD) (2011d) Simple ways to save water (Leaflet). (In Greek.)

[52] Water Development Department (WDD) (2011c). The WDD working with schools. (In Greek.)
http://www.moa.gov.cy/moa/wdd/wdd.nsf/All/51AADEF2C71416A8C225771C00281C5F?OpenDocument

[53] Water Board of Limassol (2011). Educational matters. (In Greek.)
http://www.wbl.com.cy/greek/index.php?parent_id=17

[54] International Water Association (IWA) (2008). *International Statistics for Water Services - Information every water manager should know.* Vienna.
http://www.iwahq.org/MainWebSite/Resources/Document/IWA_international_statistics_2008.pdf

[55] Savvides, L, Dörflinger,G. and Alexandrou, K. (2001). The assessment of water demand of Cyprus, in *Re-Assessment of the water resources and demand of the island of Cyprus.* (2002). Water Development Department (WDD) and Food and Agriculture Organization of the United Nations (FAO), Ministry of Agriculture, Natural Resources and Environment, Nicosia, Cyprus.

[56] European Environmental Agency (EEA) 2007. Climate change and water adaptation issues. Technical Report No 2/2007. EEA, Copenhagen.

[57] Mimura, N., Nurse, L., McLean, R.F., Agard, J., Briguglio, L., Lefale, P., Payet, R and Sem, G. (2007). Small islands, in Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds.) Climate Change (2007): Impacts,

Tsiourtis (2002), the report acknowledges Cyprus' efforts and development strategies for alleviating the adverse effects arising from water scarcity, which is likely to be one of the important effects of climate change.

The only assessment of the potential effects of climate change on water resources in government reports was found in the reporting requirements for the Water Framework Directive.[58] A 1000-year synthetic time series with a Hurst coefficient was used to assess the effect of climate change on the inflows of the dams of the Southern Conveyor system. The minimum of the 40-year moving average of this series for the dams was found to be exactly half of that of the historical time series. Out of the twelve water management policies proposed in this report, three were considered to be correlated to adaptability to climate change. These were: (i) strategy for increased use of recycled water, (ii) strategy for increased use of recycled water in Southern Conveyor and (iii) periodical re-evaluation of water policy parameters.

Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, pp.687-716.

[58] Karavokyris, G. Partners Consulting Engineers and Kamaiki, P. S. (2010). Final report on water policy, Report 8, Provision of consultancy services for the implementation of Articles 11, 13 and 15 of the WFD 2000/60/EC in Cyprus. Water Development Department, Nicosia, Cyprus. (In Greek with English Summary).

3. Sharing Sewage and Water Distribution Networks in a Divided City

3.1 The situation prior to 1974

The independence of Cyprus in 1960 brought changes in the demography of the island as people arrived from the villages to settle in the main towns. Like the rest of the island, the city of Nicosia had septic systems or holding tanks and soakaways in buildings to discharge domestic sewage.[59] Due to the high clay content in the area of Nicosia, the soil was not capable of absorbing the seepage from the growing number of septic tanks and soak ways. This lead to increasing incidents of septic tanks over-flowing and untreated sewage spilling onto the streets and ending up into the moat. Septic tank systems were then temporarily connected to the storm water drains, causing risk of mosquito-transmitted epidemics.[60]

In 1965 the government of the Republic of Cyprus approached the World Health Organisation who prepared a feasibility study on a sewerage and drainage system for the whole of Nicosia. A full study was then undertaken in 1968 by a Canadian consultancy firm, McLaren International Limited, who prepared a fifty-year master plan for the creation of a sewerage system and storm water drainage system in the capital, proposing their development in stages.[61] The system was designed as a conventional gravity system and the treatment plant was to be located at Mia Milia, northeast of Nicosia city, which was the ideal site as it was down gradient. Works began in 1972 with Stage 1 due to be completed by the end 1974. This fell through due to the Turkish invasion in 1974.[62]

With regards to potable water supply on the island, until 1960 households were mainly provided water from private boreholes or springs. With the establishment of the Republic of Cyprus, construction of water supply systems began in the form of dams and reservoirs. The area of Nicosia was being supplied water from the Morphou aquifer (currently located in the Turkish occupied area) that fed three interconnected reservoirs. Increasing water demands, however, led to the over pumping of the aquifer and the intrusion of saline water. In order to resolve this, the Government set up the Morphou – Tilliria plan in the late 1960s, which entailed diversion of all water from the north side of the Troodos mountain to the Morphou aquifer. Due to the events of 1974 this also fell through.[63]

3.2 The situation after 1974

With the events of July 1974, Nicosia became a divided capital. Construction of Stage I of the sewerage system was just weeks away from completion and the treatment plant at Mia Milia was

[59] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[60] Office of the United Nations High Commissioner for Refugees (UNHCR) in Cyprus. (1996). *The Nicosia Sewerage Project: A plan for Nicosia, a strategy for the world*. UNHCR, Nicosia, Cyprus.

[61] Hocknell, P. (1998). Cooperation, coexistence or conflict?: Rethinking transboundary resource management in Nicosia. *Journal of Mediterranean Studies*, 8 (2): 223-251.

[62] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[63] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

now located 1.5 miles north of the Turkish Forces cease-fire line on the Turkish occupied side of the city.[64] The invasion caused a sudden influx of Greek Cypriots from the northern part of the island to the south of Nicosia and Turkish Cypriots from the southern part of the island to the north of Nicosia. The city had expanded in areas that had not been anticipated and with still no sewage treatment facilities in place the already bad situation got increasingly worse.[65]

Communication between the Greek Cypriot and Turkish Cypriot communities was virtually non-existent after 1974, but the sewage problem remained an urgent issue for both communities. In 1978, after recognising that the situation had to be brought under control, the representatives of the two communities at the time, Mr Lellos Demetriades and Mr Mustafa Akinci, met up and under informal conditions arranged to follow through with a joint sewerage system that would serve both communities.[66]

The Nicosia Sewerage Project came under the auspices of the United Nations High Commissioner for Refugees (UNHCR) as a humanitarian assistance aid project. Construction work for Phase I was completed in 1979, and on the 21st May 1980 the sewerage system began its operation which continues until this day.[67]

Even though the plant was expanded in 1995, there have been continuous issues in recent years with regards to the odour from the plant, which affects the people living near it and pollution of soil with contaminated water, while the quality of the treated water is not suitable for irrigation.[68] These issues resulted in another round of communication between the two sides in order to resolve the issue. In 2006 the decision was made that the plant was to be upgraded from treating 20,000 m^3 of sewage per day to treating 40,000 m^3 per day. It is estimated that 80% of the sewage sent to the plant will be from the Greek Cypriot side of Nicosia and 20% from the Turkish occupied area of Nicosia. The plant will be operated by the Turkish Cypriots.[69] Construction of a new treatment plant began in March 2010; the plant is expected to be operational by May 2012. Once completed, the plant will be the largest waste water treatment plant in Cyprus.[70]

Although efforts were made from both sides to keep a common water supply system, this was not achieved in the long-term. Contact and co-operation was maintained between the two sides immediately after the invasion with regards to water supply and even though emotions were high, the water supply for both sides was maintained. But within the first four years after the invasion

[64] Hocknell, P. (1998). Cooperation, coexistence or conflict?: Rethinking transboundary resource management in Nicosia. *Journal of Mediterranean Studies*, 8 (2): 223-251

[65] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[66] Office of the United Nations High Commissioner for Refugees (UNHCR) in Cyprus. (1996). *The Nicosia Sewerage Project: A plan for Nicosia, a strategy for the world*. UNHCR, Nicosia, Cyprus.

[67] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[68] Leonidou, L. (2006a). United by effluent. *Cyprus mail,* 22 July 2006. http://www.cyprus-mail.com/cyprus/united-effluent

[69] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[70] Water Technology (2010). Nicosia Bi-communal Wastewater Treatment Plant, Cyprus. http://www.water-technology.net/projects/nicosiawastewatertre/

the Turkish troops closed water supply valves. They stopped the water supply from one of the interconnected reservoirs that supplied Nicosia and reduced the water supply from the second reservoir from its usual supply of 10,000 m^3 per day to 2,000 m^3 per day, as both of these were on the northern side of the dividing line. The Greek Cypriots responded by reducing the amount of water they would normally send to the northern side.[71] Today both sides have their own supply, distribution and billing systems, although the Water Board of Nicosia sends around 1.5Mm^3 of water annually to the Turkish Occupied area.[72] The supply of water to the Turkish Cypriot citizens of Nicosia by the Water Board of Nicosia is paid by the Government of the Republic since 1982; previous amounts remain unpaid[73].

The water supply for cities in the Government Controlled Part of Cyprus comes mostly from desalination, whilst dam water and treated wastewater are mainly used for agriculture. In the Turkish Occupied part of Cyprus, overpumping of the Morphou area continues with supply being met with water that is transported from Turkey and some private developers having installed their own desalination plants. Studies are being carried out to look into the production of desalinated water using excess heat from power stations.[74] There are also plans to transfer water by pipeline from Turkey to the Turkish Occupied part of Cyprus. The 80 km under-sea pipeline would run from the Alakopru dam in Turkey to the Panagra/Getcitkoy dam in the north of Cyprus and it is to provide 75 Mm^3 of water annually to the Turkish occupied area.[75] The construction work for the Alakopru dam began early November 2010 and the construction of the Panagra dam is to commence six months after.[76] The project is due to be completed in November 2014.[77] When questioned on the sharing of this water, the Turkish Environment and Forestry Minister said that the water from this project could be used to cover the needs of the whole island if there was to be reconciliation with the Greek Cypriots.[78]

Water tariffs in the Turkish occupied area of Cyprus are not set at cost recovery levels, so they do not cover resource costs and operation and maintenance, or asset depreciation and investment financing charges. Although all water services are metered, there is no actual policy on periodic re-calibration of meters so they can be expected to under-record actual consumption over time. Aside

[71] Palantzis, C. (2010). Interview on the Nicosia Sewerage Project by first author, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[72] Water Official (2011). Telephone conversation on the exchange of potable water between the Republic of Cyprus and the Turkish Occupied part (Personal communication, 24 February 2011)

[73] Auditor General of the Republic (2001). Annual report 2000. Audit Office of the Republic, Nicosia, Cyprus.

[74] European Commission (EU) (2006). Instrument of financial support to encourage the economic development of the Turkish Cypriot community: Standard Summary Project Fiche 2006. CRIS Number: 2006/018-488.01.01 http://ec.europa.eu/enlargement/pdf/turkish_cypriot_community/objective_1_water_and_wastewater_en.pdf

[75] Famagusta Gazette (2010). Work on Turkey-Cyprus water pipeline starts. 1 November 2010 http://famagusta-gazette.com/work-on-turkey-cyprus-water-pipeline-starts-p10926-69.htm

[76] Republic of Cyprus Press and Information Office (2010a). *Turkish Cypriot and Turkish Media Review*. Works begin for the first leg of the pipeline project between Turkey and the occupied areas. 28-29 October 2010 http://www.moi.gov.cy/moi/pio/pio.nsf/a51d0d2b2ceb5e20c2257076004d03b5/5855c4c9227a71b6c22577cb003edb72?OpenDocument&print

[77] Republic of Cyprus Press and Information Office (2010b). *Turkish Cypriot and Turkish Media Review*. Water transfer to "TRNC" by 2014. 2 December 2010 http://www.cyprus.gov.cy/moi/pio/pio.nsf/All/0BE150F01603E366C22577ED00459993?OpenDocument

[78] Turkish Cypriot daily Havadis (2.12.2010)

from that, bill collection rates are very poor and the pricing policy for the drinking water service does not reflect the scarcity value of water. Tariff income goes to general central accounts and is not directly available to service the needs of the business.[79] On the Greek Cypriot side tariffs are set to take financial, resource and environmental costs into account, allowing for complete cost recovery as defined by the Water Framework Directive.[80]

Due to the fact that the sharing of potable water supply has diminished with time and today both sides have their own management system, this matter is not addressed further in this analysis.

3.3 Methods

The arrangements (policy) between two communities for sharing sewage and water distribution networks was evaluated for relevance, effectiveness, efficiency, impact and sustainability, in accordance with the OECD criteria for evaluating development assistance.[81] Information was collected through literature study and interviews with people in key positions with inside knowledge on the matter.

3.4 Results and Discussion

3.4.1 Relevance

The objective of the Nicosia sewerage project was to provide sewage disposal facilities for the Nicosia area. It still remains the main sewage collection and treatment facility for the main town of Nicosia. Even though there have been issues regarding the overflowing of the treatment plant and lack of maintenance, these have been dealt with over time.[82] The sewerage system has been upgraded to accept larger loads of waste and therefore provides for sanitary disposal for a larger area of Nicosia.

3.4.2 Effectiveness

The major factor that influenced the effectiveness of the Nicosia Sewerage Project was the co-operation between the two community leaders, Lellos Demetriades and Mustafa Akinci, who had set politics aside in order to come up with a solution that would benefit both of their communities.[83] The objective of the sewerage project has been more than achieved as the project

[79] European Commission (EU) (2006). Instrument of financial support to encourage the economic development of the Turkish Cypriot community: Standard Summary Project Fiche 2006. CRIS Number: 2006/018-488.01.01 http://ec.europa.eu/enlargement/pdf/turkish_cypriot_community/objective_1_water_and_wastewater_en.pdf

[80] Water Development Department (WDD) (2010a). Cost assessment & pricing of water services in Cyprus-Summary. March 2010. http://www.moa.gov.cy/moa/wdd/Wdd.nsf/guide_en/guide_en?OpenDocument

[81] Organization for Economic Cooperation and Development (OECD) (2010). Development Assistance Committee Criteria for Evaluating Development Assistance http://www.oecd.org/document/22/0,2340,en_2649_34435_2086550_1_1_1_1,00.html

[82] Leonidou, L. (2006a). United by effluent. *Cyprus mail,* 22 July 2006. http://www.cyprus-mail.com/cyprus/united-effluent

[83] Office of the United Nations High Commissioner for Refugees (UNHCR) in Cyprus (1996). *The Nicosia Sewerage Project: A plan for Nicosia, a strategy for the world*. UNHCR, Nicosia, Cyprus.

did not only provide the residents of both sides of Nicosia with a sanitary sewerage system but has also been an incentive for communication between the two communities. Thus, the cooperation on sewage water resources contributed to the overall improvement of human security in the divided city.

3.4.3 Efficiency

Efficiency was achieved when sewage water of the two communities started to flow downstream to the treatment plant. However, one of the largest problems throughout the co-operation between the two sides was that of recognition, since the Republic of Cyprus did not wish to act in any way which implies the recognition of a legitimate state in the north and vice-versa. Four years of difficult negotiations took place (1974-1978) with the UN good services and the representatives of the two communities in order to establish a working relationship to carry out the agreement.[84]

The recognition issue also created difficulties with the funding which was to come from international agencies, a problem that was in the end overcome. The project was originally under the umbrella of the United Nations Development Programme (UNDP) which was funded by the International Bank for Reconstruction and Development. But after the 1974 events, procedures regarding funding had to be done through third parties in order to avoid conflicts. The UNDP through the World Bank provided financial and technical advice. In 1986, the Nicosia Sewerage Project came under the United Nations High Commissioner for Refugees (UNHCR) as a humanitarian assistance project, which subsequently also became recognised as a bi-communal confidence and peace building strategy. This opened the way for other bi-communal building projects allowing for the development of co-operation between the two opposing sides.[85]

3.4.4 Impact

The Nicosia Sewerage Project, aside from providing sanitary disposal to the city of Nicosia, was also the foundation for establishing cooperation between Greek and Turkish Cypriot communities. A year after the operation of the sewerage system, encouraged by the first success, the formulation of what would be known as the Nicosia Master Plan took place. The Nicosia Master Plan is a live document which is continually revised and has been around since the late 1980s dealing mostly with urban planning issues and restoration of the town of Nicosia. A joint bi-communal team known as the 'Nicosia Master Plan Team' has been set up and is composed of architects, urban planners and sociologists from both communities. With regards to funding the same procedure used by the Sewerage System is being followed. The agreement includes the historical centre of Nicosia within the walls but also Greater Nicosia.[86]

Since the beginning of the Master Plan, a number of joint exhibitions have being organised with artists from both sides being involved and areas of the city have been restored. Examples include: the Famagusta gate, which has been renovated into a cultural centre, the creation of a park, and

[84] Palantzis, C. (2010). Interview by first author on the Nicosia Sewerage Project, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

[85] Office of the United Nations High Commissioner for Refugees (UNHCR) in Cyprus (1996). *The Nicosia Sewerage Project: A plan for Nicosia, a strategy for the world*. UNHCR, Nicosia.

[86] Demetriades, L. (1998). The Nicosia Master Plan. *Journal of Mediterranean Studies*, 8(2): 169-176.

pedestrianisation of streets along with other traffic arrangements. Houses in the Old Town have also been restored and leased to mainly young couples with children who have roots in the area.[87]

The treatment plant required upgrading due larger inflows of wastewater and outdated technology. The new treatment plant has been designed to treat double the amount of sewage compared to the old plant, its capacity increasing from 20,000 m^3 per day to approximately 40,000 m^3 per day in order to provide sanitary treatment for the whole community. Taking into consideration that 85% of potable water consumed per person ends up in the sewerage network[88] and that the average water consumption per Nicosia resident is 166 litres per day[89], it can be estimated that the new sewerage treatment could serve over 283, 000 people.

There are almost no other wastewater treatment plants in the Turkish occupied area with only certain areas of Nicosia, Kyrenia and Lapithos/Lapta benefiting from sewerage systems. Although there are private institutions that have their own treatment systems, 17 out of the 28 municipalities in the Turkish occupied area with populations in excess of 2000 rely only on septic tanks and dumping of sewage and industrial wastewater.[90]

3.4.5 Sustainability

After the initial establishment of the Nicosia Sewerage Project, problems did occur with the running of the plant as it had become overloaded. It had come to a stage of causing a nuisance and maybe even being a threat to the people it served due to its need for upgrading.[91] Nevertheless these required upgrades and extensions are now being carried out. The project is funded by both sides with the Turkish Cypriots using part of their 259 million euro budget granted to them by the European Union to improve, amongst others, their water and wastewater services. In the northern part of Nicosia wastewater charges are levied on a volumetric basis but are set at a level far below the cost of providing the service. However there are many cases where there are no formal charges for wastewater services in the Turkish occupied area.[92] The Greek Cypriots on the other hand pay through taxes for the loans made by the Sewerage Board of Nicosia for the treatment plant upgrade.[93]

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[87] Demetriades, L. (1998). The Nicosia Master Plan. *Journal of Mediterranean Studies*, 8(2): 169-176.

[88] Charalambous, K. (2010). *Urban water balance and management: A case study in Limassol, Cyprus.* MSc thesis. Queens University, Belfast. http://www.cyi.ac.cy/node/698

[89] International Water Association (IWA) (2008). *International Statistics for Water Services - Information every water manager should know.* Vienna, 2008
http://www.iwahq.org/MainWebSite/Resources/Document/IWA_international_statistics_2008.pdf

[90] European Commission (EU) (2006). Instrument of financial support to encourage the economic development of the Turkish Cypriot community: Standard Summary Project Fiche 2006. CRIS Number: 2006/018-488.01.01
http://ec.europa.eu/enlargement/pdf/turkish_cypriot_community/objective_1_water_and_wastewater_en.pdf

[91] Leonidou, L. (2006b). Deal signed for new bicommunal sewerage plant, Cyprus mail, 9 September 2006

[92] European Commission (EU). (2006). Instrument of financial support to encourage the economic development of the Turkish Cypriot community: Standard Summary Project Fiche 2006. CRIS Number: 2006/018-488.01.01
http://ec.europa.eu/enlargement/pdf/turkish_cypriot_community/objective_1_water_and_wastewater_en.pdf

[93] Palantzis, C. (2010). Interview by first author on the Nicosia Sewerage Project, Sewerage Board Nicosia. (Personal communication, 11 November 2010)

4. Borehole Subsidy for Saving Potable Water

Introduction

As explained in chapter 2, the Cyprus Government has four water saving subsidies in place: borehole installation, connection of borehole with lavatories, installation of a hot water recirculator and installation of a system for the recycling of grey water.[94,95] These subsidies are offered through the WDD, which is the sole responsible authority for the issuing, monitoring and control of boreholes, since the new water policy has come into effect in November 2010 (see chapter 2).

The WDD offers a subsidy of €700 for the construction of boreholes for the irrigation of private household gardens. The aim of this policy is to reduce potable water consumption from the distribution networks.[96] To be eligible for the subsidy, applicants' households should be within the jurisdiction of a water supply board, either a Water Board or a community board, and connected to the water supply system of a Water Board or of a municipality or community board of the Republic of Cyprus.[97]

The procedure of constructing a borehole on a private residential property until November 2010 was to first send an application to the local District Office requesting permission to drill the borehole on the property.[98] The application must be accompanied by site location plans, plot property titles, building permits or town planning permits.[99] The District Office then contacts the WDD to establish if a borehole can be drilled in the area where the household is located. The latter inspect and approve the planned borehole location and a permit for the borehole construction is issued by the District Office.[100] A borehole application could be rejected depending on the condition of the aquifer and where the borehole was to be located, for example if a borehole was to be close to rural areas where it could be used for agricultural purposes instead of domestic use or if it was to be located close to water authority supply boreholes.[101]

In order to obtain the grant, an application has to be submitted to the WDD within six months of the borehole installation. The application must include receipt of payment for the borehole drilling,

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[94] Kambanellas, C. (2010). Cyprobell systems for the recycling of grey water (In Greek). *Water and Waste.* 21: 8-9.

[95] Water Development Department (WDD) (2010c). Water saving measures. (In Greek) http://www.moa.gov.cy/moa/wdd/wdd.nsf/measures_en/measures_en?OpenDocument

[96] Neokleous, N. (2010a). Interview on the borehole subsidy application procedure by first author, Water Development Department, Limassol (Personal Communication, 4 November 2010)

[97] Water Development Department (WDD) (2010d). Application form for grant of the subsidy. (In Greek.) http://www.moa.gov.cy/moa/wdd/Wdd.nsf/All/E6F2DCE8A0D40735C22576C400403C6D/$file/Applic_Ann_Form_2.pdf

[98] Neokleous, N. (2010a). Interview on the borehole subsidy application procedure by first author, Water Development Department, Limassol (Personal Communication, 4 November 2010)

[99] Water Development Department (WDD) (2010e). Application form for borehole construction. (In Greek.) http://www.moa.gov.cy/moa/wdd/Wdd.nsf/all/0C38CE7720791FF2C225736B0024E023/$file/Applications.pdf?openelement

[100] Neokleous, N. (2010a). Interview on the borehole subsidy application procedure by first author, Water Development Department, Limassol (Personal Communication, 4 November 2010)

[101] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

receipt of purchase and installation of the pump, a copy of the permit from the District Office for the borehole construction and signed confirmation by the applicant that a meter has been installed.[102]

The two application forms for the borehole drilling permit and the subsidy grant are available from the website of the WDD. Under the new Unified Water Management Law[103], which has been in force since November 2010, both applications will need to be sent directly to the WDD.[104] The current subsidy period ends on the 6th of December 2010.

A communication of the EC[105] and a report of European Environment Agency[106] identify Cyprus to have been "encouraging re-use of grey water for watering gardens and flushing toilets, reducing per capita water consumption by up to 40%." This almost seems to imply that domestic water demand in Cyprus has been reduced by 40%, while this reduction would only apply to the households that have installed grey water use systems. No source for the data was cited. A graph from the WDD showed an average saving of 63% for two households during the June-July summer months (Appendix A). Estimates of the volume of potable water used for watering gardens in the greater area of Limassol, a town on the south coast of Cyprus, for the period 2003 to 2008, ranged between 29,400 m^3 to 42,100 m^3, which equated to 0.22 to 0.33% of the total potable water that was consumed in that area.[107]

4.1 Methods

The borehole subsidy policy was assessed for relevance, effectiveness, efficiency, impact and sustainability, in accordance with the OECD criteria for evaluating development assistance.[108] Water officials, water users and well drillers were interviewed using different questionnaires. The water officials were interviewed first in order to obtain a better understanding of the policy. A senior staff member from the head quarters of the WDD in Nicosia and two WDD officials in the coastal city of Limassol were interviewed using the questionnaire in Appendix B.

The borehole subsidy is relevant for water users with gardens. To obtain a representative sample of garden owners, the city of Limassol was divided in three development densities: high, medium and

[102] Water Development Department (WDD) 2010d. Application form for grant of the subsidy. (In Greek.) http://www.moa.gov.cy/moa/wdd/Wdd.nsf/All/E6F2DCE8A0D40735C22576C400403C6D/$file/Applic_Ann_Form_2.pdf

[103] Government of Cyprus. (2010). Unified Water Management Law (In Greek). Official Government Gazette, Nicosia, Cyprus. http://www.moa.gov.cy/moa/wdd/Wdd.nsf/legislation_gr/legislation_gr?OpenDocument

[104] Neokleous, N. (2010a). Interview on the borehole subsidy application procedure by first author, Water Development Department, Limassol (Personal Communication, 4 November 2010)

[105] Commission of the European Communities (EC). 2007. Addressing the challenge of water scarcity and droughts Communication from the Commission to the European Parliament and the Council. COM(2007) 414. Brussels.

[106] European Environmental Agency (EEA). 2009. Water resources across Europe - confronting water scarcity and drought. Report No 2/2009. EEA, Copenhagen.

[107] Charalambous, K. (2010). *Urban water balance and management: A case study in Limassol, Cyprus.* MSc thesis. Queens University, Belfast. http://www.cyi.ac.cy/node/698

[108] Organization for Economic Cooperation and Development (OECD). 2010. Development Assistance Committee Criteria for Evaluating Development Assistance http://www.oecd.org/document/22/0,2340,en_2649_34435_2086550_1_1_1_1,00.html

low. Garden owners in each of the three strata were randomly identified on Google Earth. However, it was almost impossible to find people willing to be interviewed when ringing at their door. On the other hand, from the telephone directory it cannot be known if people have a garden and a well. Therefore, we made use of a list provided by the WDD in Limassol with contact details of all people that were granted the "borehole subsidy" and the "borehole connection with toilets subsidy" in 2009. From the people on this list whose home fell in the research area, nine were willing to be interviewed. Secondly, additional garden owners with and without borehole in each of the three strata were contacted by picking phone numbers from the telephone book. The garden owners were interviewed using Appendix C.

To obtain an additional perspective on the subsidy, all well drillers in Limassol whose contact details were in the phonebook were contacted. From the 10 numbers available in the directory, only one driller dealt with borehole installation and was willing to answer the survey questions listed in Appendix D.

4.2 Results and Discussion

4.2.1 Relevance

The subsidy began in the 1990s and records of the numbers of boreholes have been kept from 1996 onwards. The government adopted the measure with the objective of reducing potable water use from the distribution network in households especially during drought periods. This is still applicable until today as the measure encourages people to install a borehole on their property and use it to irrigate their garden and/or connect it with their toilets for flushing instead of using potable water to do so.[109]

4.2.2 Effectiveness

Efforts to assess the effectiveness of the measure were made in 2004 under the initiative of Stephanos Papatryphonos, a Senior Hydrogeologist of the WDD. A study was carried out whereby the potable water consumption of 20-30 households was monitored in a suburb of Nicosia, 12 months before the installation of a borehole and 12 months after the installation of a borehole. Average savings of potable water consumption in the households were calculated to be around 27% when a borehole was installed.[110] This study was not carried out in other towns due to various reasons including the fact that other Water Boards were not willing to provide water consumption data for confidentiality reasons.

Although this study showed evidence of potable water reduction, Papatryphonos does not believe it is effective anymore as a measure, because people who own a borehole tend to waste water as they do not have to pay for it. Furthermore, the conditions for people applying are considered very

[109] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

[110] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

'loose' by some water officials, and it appears that everyone is eligible for a borehole.[111] A meter is installed at each borehole and there is a maximum withdrawal of 250 m^3 of water per annum. Monitoring of these meters is rarely carried out due mostly to the lack of personnel and the press of more important matters such as the illegal abstraction from boreholes for agricultural purposes. Therefore, people are freely withdrawing more than what they are allowed.[112] However, considering the size of planted garden areas (Table 1), irrigation of domestic gardens is generally not expected to require much more than 250 m^3, therefore large over-extractions of water from domestic households is not very likely.

An overview of the surveyed garden owners in Limassol is provided in Table 1. For the garden owners with a borehole, three were located in the high density area, two in the medium density area and six in the low density area. For the households without wells, there were four high density, one medium density and two low density. The number of surveyed people in each density stratum could be representative of their occurrence in each stratum, but it could also represent the unwillingness of people in the richer part of town (low density) to be interviewed. Five of the nine surveyed well owners from the list of people that had received a subsidy in 2009 lived in the low density area of town.

Garden owners with a borehole had larger gardens and irrigated more frequently than garden owners without a well. There was also a higher percentage irrigation systems (drip and sprinkler) among the garden owners with a borehole. Irrigation durations for both groups were surprisingly short, indicating that irrigation was not very efficient. Almost all well owners assumed or agreed that their water bills had decreased since the use of the borehole, although most were unsure by how much. One well owner thought the savings on his water bill did not amount to more than €1 or 2 per month. Three borehole owners reported water bill savings of 30%, 30-40%, 50%. However, saving money was not the only reason for installing a borehole, water security, that is continuous access to water was mentioned as often as a reason for installing a borehole as the financial aspect. Borehole owners said that having a borehole has allowed them to have gardens and not worry about irrigating these during water supply cuts that have been imposed during drought periods in Cyprus the last two decades.

There was in general a good awareness about the subsidies, with the borehole subsidy being the most well known. The well driller agreed that most people know, but he would also tell people to apply for a subsidy if they hadn't done so. Three of the garden owners without a well considered to install a borehole and apply for the subsidy, one of them as a result of the interview. The water quality was generally considered good for irrigation, with salinity, calcium and acidity each mentioned once. Three well owners had conducted a water quality analysis. There were two swimming pool owners among the 18 surveyed people, but both filled their pool with potable water.

[111] Achilleos, A. (2010). Interview on the borehole subsidy by first author, Water Development Department, Limassol (Personal Communication, 16 December 2010)

[112] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

Table 1. Summary of the results of the Limassol garden owners' survey (note that for most of the bold questions more than one listed option could have been identified).

	Borehole		No borehole	
Sample size	11		7	
High density	3		4	
Medium density	2		1	
Low density	6		2	
	Mean	Range	Mean	Range
Borehole depth (m)	86	18-183		
Garden area (m^2)	350	156-520	178	70-360
Planted area (m^2)	200	100-420	123	58-260
Irrigation in summer (d/mo)	15	4-30	7	4-9
Irrigation duration (min/d)	31	10-90	44	10-75
	Nr	% of sample	Nr	% of sample
Irrigation methods				
Sprinkler irrigation	6	55	2	29
Drip irrigation	5	45	1	14
Watering can, bucket	0	0	2	29
Hose	9	82	5	71
Other borehole water uses				
Washing pavements	5	45		
Washing car	2	18		
Reason for borehole				
Save money	6	55		
Water security	6	55		
Awareness about subsidies				
Not aware	0	0	2	29
Aware of 1-2 subsidies	6	55	2	29
Aware of 3-4 subsidies	5	45	3	43
Source of info				
Family or friends	6	55	2	29
At work	3	27	4	57
WDD info	2	18	2	29
Well driller	1	9	0	0
Considering to install a borehole			3	43
Swimming pool owner	1	9	1	14

4.2.3 Efficiency

The measure appears to be costing time, money and man power as the process of granting the subsidy takes a certain amount of time, people might not meet the required criteria and can be pushy about being granted the subsidy requiring extended timeframes, re-applying after being declined, etc. A WDD technician is sent around three times to the same site where a borehole is installed, to inspect the area before it is installed, then ensure that a meter and a pump are installed and finally to make sure that water is in fact being pumped to the surface.[113]

[113] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

It is the opinion of some professionals that for the measure to be efficient the installation of domestic boreholes could continue in areas where it is appropriate and the aquifers have no problems with overexploitation, but money should not be granted to people as they are already benefiting from acquiring an additional "free" water supply.[114] Another opinion is that a new subsidy should be created combining the already existing borehole subsidy with the borehole connection with toilets subsidy, while the two individual subsidies should be abolished.[115]

4.2.4 Impact

For the period of 1996-2010, 4430 subsidies have been granted for the district of Nicosia, 1369 for Limassol, 1157 for Larnaca and 1002 for Pafos. That is a total of 7958 subsidies or on average 568 subsidies per year. According to the WDD's annual report for 2009 a total of 789 borehole subsidies were granted for 2009 with €549,900 spent on this subsidy alone by the Government.[116]

The surveyed well owners paid between €1100 and €4700 for the installation of their borehole, but some included the cost for installing a storage tank and the connections to the toilet. On average, one would expect the €700 subsidy to cover approximately half of the cost of the installation of the well and a pump. The well driller suggested to increase the subsidy to at least €1000, and to make the actual amount depended on the cost of the well installation.

The subsidy has in some way allowed the government to have an idea of the number of domestic boreholes as it acts as an incentive for people to follow the procedure of applying and registering their borehole. Groundwater level and geology were not considered at the beginning of the policy but are more recently increasingly considered after evaluation of aquifers that were carried out showed that they are of poor water quality and quantity in most areas. This is taken into consideration during the application of a borehole installation and can be one of the grounds for declining an application.[117]

4.2.5 Sustainability

The main issue regarding the sustainability of domestic boreholes is that people may feel free to pump as much water from the borehole as they please. Due to the fact that monitoring of the water meters by the WDD is virtually non-existent there is no restricting the amounts of water that is pumped. Therefore savings of potable water are made but there is also a large waste of water as people do not have a sense of restraint in using the water since they are not paying for it.[118] This

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[114] Neokleous, N. (2010b). Interview on the borehole subsidy by first author, Water Development Department, Limassol (Personal Communication, 16 December 2010)

[115] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

[116] Water Development Department (WDD) 2009b. Water Development Department Annual Report 2009. http://www.cyprus.gov.cy/moa/wdd/wdd.nsf/annualrpt_en/annualrpt_en?OpenDocument

[117] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

[118] Papatryphonos, S. 2010. Interview on the borehole subsidy by first author, Water Development Department, Nicosia (Personal communication 29 November 2010)

waste is exacerbated by the number of un-licensed boreholes that exist on the island. The lack of monitoring and disciplining people who over pump their boreholes or have un-licensed boreholes is aggravating the already poor situation of groundwater quality and quantity.

The subsidy policy may also create uncertainties and inequalities. In times of droughts (like summers 2007 and 2008), water supply is cut regularly; and while some people are suffering from water shortages, others may still be watering their gardens or filling their swimming pools. Furthermore, someone that is seen washing down the sidewalks in front of their house cannot be confronted about wasting potable water, because they may be using poor quality water from their subsidized borehole.

On the other hand there are opinions from professionals that 250 m^3 of water per year from a number of domestic boreholes does not have a significant impact on the groundwater and it could continue effectively.[119] Groundwater recharge in the larger area of Limassol town for the period 2003-2008 has been calculated to be between 1 to 8 Mm^3 per year, while abstractions from boreholes for garden irrigation was between 0.03 to 0.04 Mm^3 per year.[120] These values show that indeed domestic boreholes could be environmentally sustainable, since abstraction from the boreholes is minimal compared to the recharge and since the groundwater is often of poor quality within the town it has limited use unless it goes through extensive treatment.[121] However, it should be noted that due to severe water constraints the aquifer in Limassol is also used for potable water supply by the water authorities.

Groundwater recharge in urban areas has been widely recognised to be as high as or higher than in equivalent rural areas.[122] The main source of the additional recharge is the imported water supply, through leaking water mains and septic tanks, and storm water is often partly diverted to groundwater, whether intentionally or otherwise.[123] These sources of recharge cause the groundwater quality beneath cities to be of very poor quality [124] and leads to a decrease in urban abstraction due to pollution problems.[125] Urban groundwater however, can be used for other purposes other than potable supply. In any case it is believed that borehole positioning is critical as it will invariably influence the water quality. Therefore benefit may be gained by abstracting water for different uses from different areas of the city.[126]

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[119] Neokleous, N. (2010b). Interview on the borehole subsidy by first author, Water Development Department, Limassol (Personal Communication, 16 December 2010)

[120] Charalambous, K. (2010). *Urban water balance and management: A case study in Limassol, Cyprus,* thesis (MSc), Queens University Belfast. http://www.cyi.ac.cy/node/698

[121] Konstantinou. (2010). Telephone interview with well driller on the borehole subsidy by first author (Personal Communication, 4 January 2011)

[122] Lerner, D. N. & Barret, M.H. (1996). Urban groundwater issues in the United Kingdom. *Hydrogeology Journal.* 4(1): 80-89.

[123] Lerner, D. N. (1990). Groundwater recharge in urban areas. *Atmospheric Environment.* 24B(1): 29-33.

[124] Lerner, D. N. (1990). Groundwater recharge in urban areas. *Atmospheric Environment,* 24B(1): 29-33.

[125] Yang, Y. Lerner, D.N. Barrett, M.H. Tellam, J.H. (1999). Quantification of groundwater recharge in the city of Nottingham, UK. *Environmental Geology,* 38 (3): 183-198.

[126] Davison, R.M., Prabnarong, P. Whittaker, J.J. and Lerner, D.N. (2002). A probabilistic management system to optimize the use of urban groundwater. Geological Society, London, Special Publications, 193: 265-276.

In Limassol town, recharge to groundwater was estimated to be 4.8 Mm^3/yr (69 mm) between the years 2003-2008, with 50.4% of this figure being water leaching from soils due to rainfall or garden irrigation, 41.4% leakage from the potable supply network, 8.2% from the sewerage network and 0.04% from the recycled water network.[127] Examples of high water tables in urban environments include Liverpool, UK, where leakages are calculated to cause recharge of 180 mm per year.[128] In Wolverhampton, UK, it is reported that urbanisation has led to an additional recharge of 100-150 mm per year.[129] In the city of Amman, Jordan 8 Mm^3 per year of aquifer recharge is believed to be coming from cesspool leakages.[130] Thus, there seems to be a potential to extract groundwater in urban environments for low quality uses such as irrigation of gardens. However, contamination of water by human or animal waste (coliforms) may need to be assessed.

[127] Charalambous, K. (2010). *Urban water balance and management: A case study in Limassol, Cyprus,* thesis (MSc), Queens University Belfast. http://www.cyi.ac.cy/node/698

[128] Wakida, F. and Lerner, D.N. (2005). Non-agricultural sources of groundwater nitrate: a review and case study. *Water Research,* (39), pp. 3-16.

[129] Lerner, D.N. (2002). Identifying and quantifying urban recharge: a review. *Hydrogeology Journal,* 10: 143-152.

[130] Wakida, F. and Lerner, D.N. (2005). Non-agricultural sources of groundwater nitrate: a review and case study. *Water Research,* 39: 3-16.

5. Conclusion

The Republic of Cyprus has put substantial efforts and funds in to the development of water supply, but also in water use efficiency and conservation. However, during the past decades water demands have exceeded the natural supply from rainfall, resulting in rationing and cuts in water supply for the agricultural sector as well as for domestic use, especially during drought years. Desalination of seawater has been seen as the main solution for domestic use and tourism, such that water supply will no longer rely on the vagaries of the weather. However, desalination also comes at important environmental and financial cost. Therefore, two policies that contribute to inter-communal cooperation and household water security were selected for review.

For the policy on the sharing of sewage water systems and domestic water supply among two hostile communities (Greek Cypriot and Turkish Cypriot), it appears that the laws of nature helped to improve human security in the divided city. However, the operation of a bi-communal sewage treatment plant could not have been achieved without international support. And even though the flow of waste water has found its way downstream, the water supply of Nicosia city did not reach its most efficient hydrologic engineering solution. While originally, an important part of Nicosia's water supply originated from the northern slopes of the Troodos mountains, and plans for the construction of a Northern water conveyer existed[131], after the events of 1974, water from the Southern Conveyer is being pumped up to Nicosia. On the other hand, the provision of water by the Republic of Cyprus to the Turkish Cypriot community has perhaps prevented potential conflicts.

For the evaluation of the borehole subsidy for saving potable water, there was a general agreement among the stakeholders that the use of private boreholes reduces the potable water use. Even though the boreholes are metered and the owners are not allowed to pump more than 250 m^3 per year, the borehole meters are not checked. The water officials indicated that the unlimited access and the low cost of pumping water from a private borehole caused the people to waste more water. The survey results indicated that garden owners with boreholes irrigated their gardens more frequently than garden owners without boreholes. However, the survey could not indicate if these people would have irrigated as much if they had to pay the full price for this water. Among the well owners, uninterrupted access to water (water security) was mentioned as frequently as a reason for installing a borehole, as financial savings.

In addition to the subsidy, the WDD incurs substantial costs for the checking of the location, establishment and functioning of the borehole (three trips). Considering that the borehole owners receive water at the cost of pumping it to the surface, it may not be needed to provide them with an additional financial bonus. On the other hand, it will take some time before the cost of the borehole installation is recovered and the well subsidy also provides an incentive for people to register and license their borehole.

It is not clear if under the cost recovery principle of the Water Framework Directive, the subsidies, provided by the government to encourage the reduction of potable water demand, would need to be included in the domestic water supply budget. This would imply that all water users would be obliged to contribute for the pleasure of seeing home gardens in the cities.

There still seems to be little knowledge about the impact of garden wells on groundwater levels. The WDD could perhaps make more efficient use of their geo-referenced databases with boreholes,

[131] Water Development Department (WDD) (2010b). Cyprus Preliminary river basin management plan. May 2010. http://www.moa.gov.cy/moa/wdd/Wdd.nsf/guide_en/guide_en?OpenDocument

groundwater levels and quality data and use the establishment of newly licensed boreholes to obtain a better understanding of the hydrogeology, groundwater flows and water quality. This could, in turn, reduce the number of field checks and could open the door for targeting subsidies to selected areas with high groundwater levels. This could also support the identification of areas where the abstractions of garden wells would need to be monitored and perhaps restricted.

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Appendix A. Comparison of potable water consumption for households without and with borehole connection with toilets.

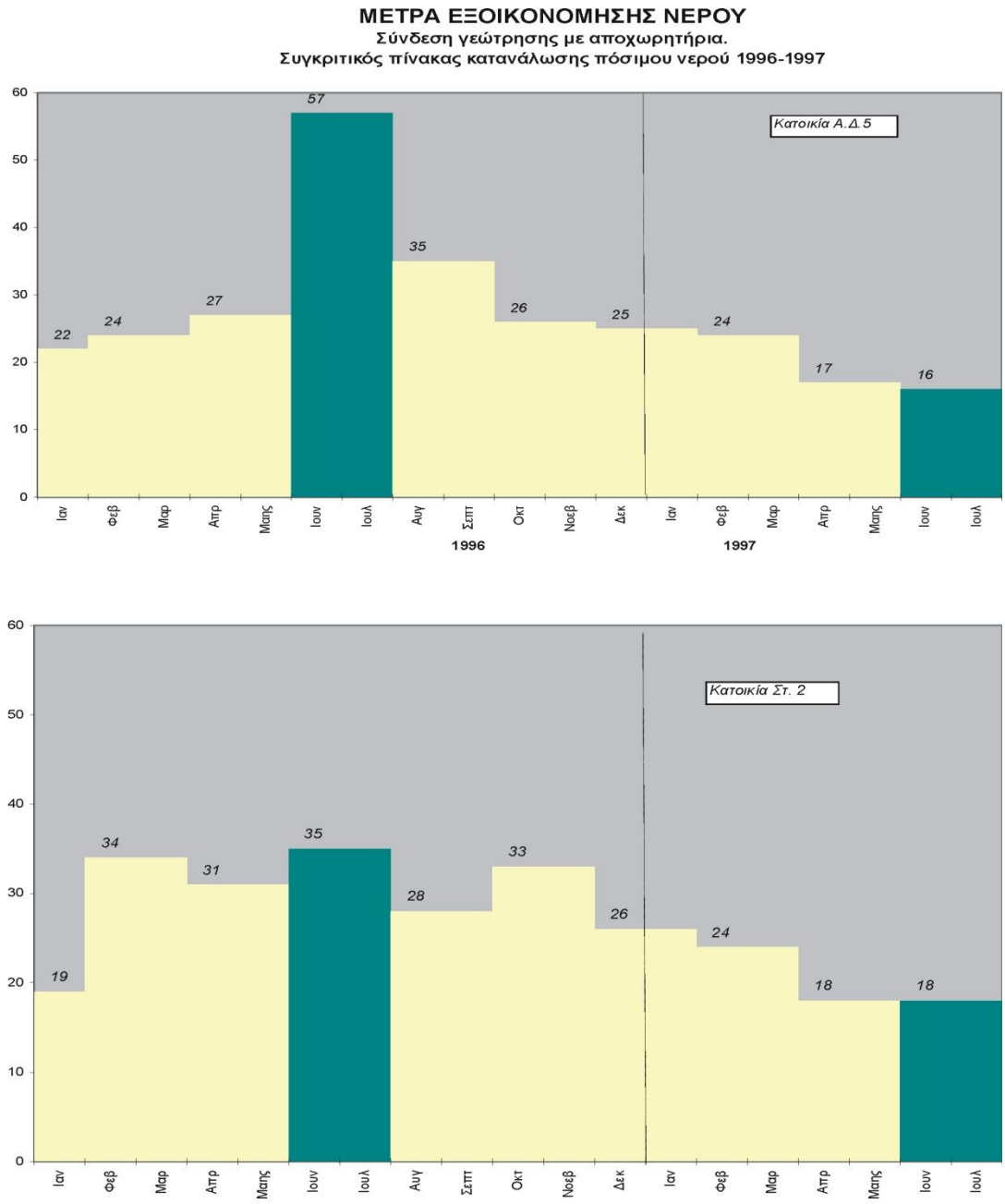

Figure A1. Bimonthly water consumption (m^3) of two households before and after installation of borehole. The green bars for June-July 1996 and June-July 1997 show a 72% reduction (top) and 49% (bottom) for the two households (Kambanellas, 1998).

Appendix B. Questionnaire for water officials (Water Development Department)

A. Motivation/Reason

1. What is the motivation for the subsidy measure?
2. Where did the idea for the subsidy measure come from?
3. Where issues such as the geology and the groundwater table considered?
4. Has the subsidy been effective?
5. How is this effectiveness measured?
6. Were there any targets to be met?
7. How is the subsidy being advertised?

B. Budget

1. Where does the money for the subsidy come from?
2. How many subsidies have been granted so far?
3. How many subsidies have been granted per year since the beginning of the policy?
4. Is there a maximum number that will be granted?
5. How many subsidies have been given for boreholes connected with toilets?
6. Can the two subsidies both be granted to one household?
7. Is there any record/research carried out on how much water and money have been/are being saved by applying this subsidy?

C. Timeframe

1. When did the subsidy begin?
2. Why is the subsidy ending in 2010?
3. Will this date be extended?

D. Eligibility

1. Who is eligible for the borehole subsidy?
2. Where should an applicant's house be located in order for him to be eligible?
3. What is the situation when a person applying lives on the edge of a town and owns adjacent agricultural land?
4. Is there a set minimum distance between neighbouring boreholes?
5. Are there any other grounds on which an application for a subsidy can be rejected?

E. Conditions and measures

1. What is the maximum water withdrawal per year from a borehole?
2. What is this figure based on?
3. Are the borehole meters monitored?
4. If yes, how often?
5. What is the penalty if the extraction is above the maximum permitted?
6. What measures/approaches are taken towards un-licensed boreholes?

Appendix C. Questionnaire for water users

Establishing existence of borehole on premises

1. Do you have a borehole? **YES / NO**

If no, answer* Group A *questions
If yes, answer* Group B *questions

Garden area ***(Group A & B)***

2. What size is the area (m^2) of the garden?
3. How much of this is impermeable?
4. What is planted in the garden area?
5. How was this decided on?

Garden irrigation
(Group A & B)

6. What irrigation system is there in place?

(Group B)

7. Is there a hose connected to the borehole? **YES / NO**
8. What do you use the hose for? (E.g. watering the garden, washing down pavements, washing the car)
9. How many times a month do you use the borehole during the summer (April-October)?
10. How long do you use it for each time?
11. How many times do you use the borehole during the winter (November-March)?
12. How long do you use it for each time?

Water bills and technical issues ***(Group B)***

13. How long have you had the borehole?
14. How deep is the borehole?
15. What do you think of the quality of water from the borehole?
16. How much did you pay for the installation?
17. Have your water bills decreased since you started using the borehole?
18. By how much have they decreased?

Borehole subsidy & licence
(Group A & B)

19. Are you aware that the Government of Cyprus has four water saving subsidies in place?
20. If yes, how did you find out about these subsidy measures?
21. If yes, have you applied for any of these subsidies?
22. Are you aware that you can get a €700 subsidy for installing a borehole?

(Group A)

23. Have you considered installing a borehole? **YES / NO**
24. If yes, have you applied for a borehole construction permit?

(Group B)

25. Have you applied for a borehole subsidy? **YES / NO**
26. Did you receive the subsidy? **YES / NO**
27. What was the reason you installed a borehole? (money saving, constant water supply)
28. Is your borehole connected with the toilets? **YES / NO**
29. Had you applied for a borehole construction permit? **YES / NO**
30. Did you receive it? **YES / NO**
31. Could I possibly see your water meter?

Any neighbours? *(Group A & B)*

32. Are you aware if any of your neighbours have a borehole?

Water saving practices *(Group A & B)*

33. Tick boxes Y if you carry out the listed activities with correct water use methods or N with water wasting methods.

Water activity																			
1						2		3		4		5		6		7		8	
Y	N	B	No.			Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
			W	M	YR														

B= Use of bath; No. = number of times used per year; W=week, M=month, Y=year

Swimming pool *(Group A & B)*

34. Do you own a swimming pool? **YES / NO**
35. What size is the swimming pool (Length, Width, Depth)?
36. What water do you use to fill it? (potable/groundwater, borehole/hose/imported)
37. How often do you empty the pool?
38. Where do you empty the pool water?
39. Do you use a pool cover? **YES / NO**
40. If yes, for what periods of time do you keep the pool covered? (all year round, winter time)

Appendix D. Questionnaire for well drillers

1. What are the geological formations in Limassol? Does this vary much between different areas?
2. What are the water table depths? Does this vary much between different areas?
3. What is the water quality in Limassol? Does this vary much between different areas?
4. Has this varied much over time (with regards to salinity and pollutants)?
5. How many boreholes do you drill per year?
6. Have there been variations between the numbers of boreholes drilled through the years and is there a reason for this variation?
7. What depths have you drilled to in Limassol?
8. Are all of the boreholes fully caged? Are screens used and at what depths are these installed?
9. What are the costs of installing a borehole?
10. Do you think the Water Development Department's borehole subsidy is a good idea?
11. Do you think it should be continued/ discontinued? Or should the grant increase/ decrease?
12. Do you inform people of the subsidy?
13. Do you find there are many people that are not aware of the subsidy?
14. Do you encourage them to apply?
15. Are you licensed from the WDD?
16. Do you drill boreholes without a drilling permit from the District Office?
17. Do you ask if people they have a licence?

[Report title] Policy Response to Climate Change, Egypt

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Abstract

Egypt is one of the most vulnerable countries to the impact of climate change. Shortage of freshwater caused by climate change could have significant drawbacks, with unfavorable repercussions on Egyptians wellbeing. Water shortage may also provoke tension and conflicts, at both, national and international levels. With such emerging threat, Egypt has embarked on a national policy that would enable various sectors to adapt to climate change. With water resources occupying a major priority in Egypt's agenda, changes in water resources are considered as central issues to Egypt's adaptation policy to climate change. The evolution of policies to protect the environment of Egypt began in the 1960s. The need to achieve economic growth while closing the gap between social classes during the 1960s and 1970s, in order to meet the basic needs of a rapidly growing population has exerted great pressures on the natural resource base, leading to environmental deterioration.

In the present study, adaptive policies, taken up to manage possible water - caused conflicts are looked at and analyzed. In one case study, the policies adopt to cope with water shortage and to minimize conflicts between users was looked at. In this study, Water Users Associations, one of the soft interventions for adaptation are presented as a sound tool to maximize the use of water, minimize losses, besides being a helpful mechanism to reduce tension and conflicts between farmers over water irrigation issues. In the other case study, the Water Resources Research Institute's policy of integrated water management of flashfloods is investigated. It was selected as one of the effective policies to manage flashfloods and take advantage of its water. Flashfloods, one of the extreme events caused by climate change is a destructive natural disaster affecting various regions in Egypt, specially Sinai. One of the focal issues of that policy is to devise an effective system of early warning to provide decision makers with early information about flashflood to allow taking necessary measures. The newly introduced policy was studied, its role in adapting to climate change caused conflicts and tension was also considered.

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1-Introduction

The population of Egypt, according to the 2011 Central Agency for Public Mobilization and Statistics census figures, (including those living abroad), is estimated to have reached 82.08 million at a growth rate of 1.96[1]. Population in urban areas increased by 40 % and is now at nearly 31 million people, and rural populations grew by 64% to roughly 41.6 million people.

Economic conditions in Egypt have improved considerably over the years. In 1990-/91, real Gross Domestic Product GDP growth rate was 3.7%. In first quarter of Fiscal Year (FY) 2007/2008, Egypt's economy achieved a growth rate of 7.1% which is the highest growth rate since ten years where (GDP) with production factors cost increased to reach LE 684.4 billion. However, despite these achievements, the failure to raise living standards for the average Egyptian has led to continued government subsidies for basic necessities and, consequently, sizeable budget deficit - roughly 7% of GDP in 2007/08 - a significant drain on the economy.

The Nile Delta is the most important agricultural region of Egypt and is also one of the most densely populated places on earth, with 50 million people and a density of 1 545 inhabitants per square kilometer. The delta's 270 km-long coastline lies only 0 to 1 m above sea level in places and is lined with lagoons and sand belts. The 1 to 10 km-wide coastal sand belts, shaped by discharge of the Rosetta and Damietta branches of the Nile, are eroding and will be further compromised by sea level rise (SLR). These belts provide essential protection of lagoons and low-lying reclaimed lands. Rising sea level will inundate large areas of valuable agricultural lands in the delta. Important industry and shipping facilities in the delta will also be threatened. Sea level rise will also impact water quality and affect fisheries in the lagoons, which comprise one-third of Egypt's fish catches. Groundwater salinity and impacts on recreational tourism along Egypt's coasts are also expected[2].

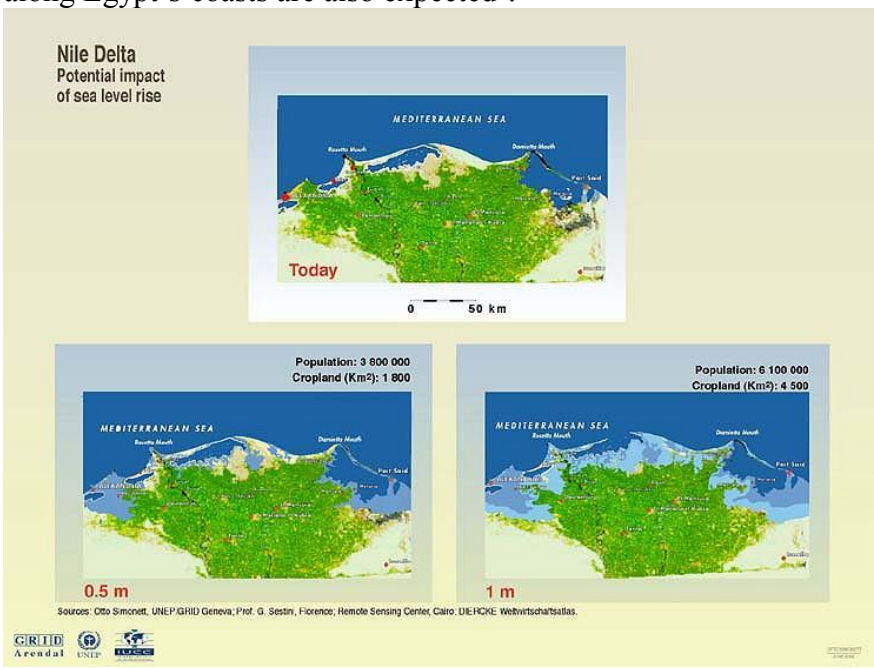

Figure 1, Nile Delta Potential Impact of Sea Level Rise
Source, UNEP
http://maps.grida.no/go/graphic/nile_delta_potential_impact_of_sea_level_rise

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1-http://www.indexmundi.com/egypt/demographics_profile.html
2- UNDP, Adaptation to Climate Change in the Nile Delta through Integrated Coastal Zone Management
http://www.gefonline.org/ProjectDocs/Climate%20Change/Egypt%20-%20Adaptation/3748%20Egypt%20SCCF%20revised%20PIF%20(2-Jul-08).doc

A United Nations report indicated that the potential impacts of sea level rise on the Nile Delta are also expected to include a decline of water quality, flooding of agricultural land and damage to infrastructure[2] Egypt's population would be most severely impacted by SLR. With a 1m SLR, approximately 10% of Egypt's population would be impacted. Most of this impact takes place in the Nile Delta; it reaches 20% with a 5m SLR. Egypt's GDP would also be significantly impacted by SLR. This is partly explained by the impact of SLR on Egypt's agricultural extent[3].

1.1 Environmental Policies in Egypt

The evolution of policies to protect the environment of Egypt began in the 1960s. The need to achieve economic growth while closing the gap between social classes during the 1960s and 1970s, in order to meet the basic needs of a rapidly growing population has exerted great pressures on the natural resource, leading to environmental deterioration. With the Government as the major player in the development process, civic society organizations including the private sector remained mostly weak with little capacity to participate in the development process. Accordingly, the institutional framework for effective compliance and enforcement remained largely undeveloped. The 1990s marked a turning point toward more effective environmental management as Egypt started its Economic Reform and Structural Adjustment Programme (ERSAP), and expressed its commitment to pursing the goal of sustainable development. Currently, the principles of sustainable development and UN conventions, such as Agenda 21 and WSSD Johannesburg Action Plan, are the basis of environmental policy making in Egypt[4]. The strategic objective of the environmental activities in Egypt is to mainstream, introduce and integrate environmental concerns relevant to protecting human health and managing natural resources into all national policies, plans, programme and projects. The medium-term objective is to preserve natural resources and biodiversity and national heritage within a context of sustainable development. The short-term objective is to reduce current pollution levels and minimize health hazards to improve the quality of life in Egypt. Policy making in Egypt is largely based on a sectoral approach. This has resulted in fragmented economic, social and environmental policies. Issues, such as poverty, unemployment, health and environment, are addressed independently with little consideration to the interrelationships between these issues and their causes and solutions[4].

The development of environmental regulation in Egypt has followed the traditional regulatory approach, which focuses on end-of-pipe controls implemented, through Command-And-Control regulations. Legislation in Egypt is, to a large extent, reactive to emerging environmental problems and enforcement oriented, i.e., emphasis is on output rather than outcome, i.e. end of pipe rather than innovative clean technology. The substance of Egyptian environmental regulations appears to be single based emission-limits, with little consideration to variations among point sources, or to ambient carrying capacity, and with weak links to any land use planning regulations. Egypt's Environmental Protection law, Law 4/1994 concentrates on informing the polluter of a violation. However, in the law there are little provisions for phasing in compliance measures after the violation has been announced. This is most likely a result of the fact that it was suggested to set the law in gradual steps and this is, probably, why industries have been given an extended grace period.

Formally the Egyptian Environmental Affairs Agency (EEAA) sets environmental policies. These policies are the product of consultation with legislative, political and public representatives. The Board of Directors of EEAA includes representatives from the private sector, research community and environmental NGOs. Compliance with Law 4/1994 is weak because enforcement is still not efficient enough. There is a need to strengthen the institutional mechanisms necessary for effective environmental management[4].

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*3-The Impact of Sea Level Rise on Developing Countries:A Comparative Analysis By Susmita Dasgupta*Benoit Laplante**Craig Meisner*David Wheeler***and Jianping Yan**World Bank Policy Research Working Paper 4136, February 2007 WPS4136*

4-Egyptian Environmental Affairs Agency, Capacity 21 Unit, UNDP, National Environmental Action Plan 2002-2017, Cairo, 2001, http://www.eeaa.gov.eg/english/main/policies3.asp (accessed April 4, 2007)

At least 17 ministries are involved in administrating about 81 laws and numerous decrees with environmental components. The main ministries that are involved in implementing environmental policy are the Ministry of Health and Population (MOHP), Ministry of Water Resources and Irrigation (MWRI), Ministry of Housing, Utilities and Urban Communities (MHUUC), Ministry of Agriculture and Land Reclamation (MALR), etc. Many ministries undertake works that have very strong environmental implications like land zoning, tourism development, water issues and infrastructure projects. Many government agencies control the granting of various licenses and approvals necessary for constructing and performing various types of economic activities, which need environmental review for their impact. Monitoring is also the responsibility of various governmental agencies as mandated by the law to inspect existing facilities and to check whether the facility complies with regulations and conditions set in the licenses. Finally, other governmental agencies carry out enforcement.

The EEAA was first established in 1982 as the highest authority in Egypt responsible for promoting and protecting the environment and coordinating adequate responses to these issues. The agency was re-established in 1994 in accordance to Law 4/1994 for environmental protection. The EEAA has to prepare general policy and plans for protecting the environment, monitor the state of the environment, set procedures for licensing, monitor and inspect establishments, enforce the law and follow-up on plans. In addition, the EEAA has to prepare and implement campaigns for education, public awareness and information dissemination.

1.2 Climate Change and National Policy Framework

In 1992, Egypt established a climate change unit in the EEAA, representing the focal point of the United Nations Framework Convention of Climate Change, UNFCCC and Kyoto Protocol, aiming at coordinating and integrating all national and international activities relevant to climate change.

In 1999 Egypt produced its "Initial National Communication", in accordance with UNFCCC guidelines following a number of relevant documents in this regard, such as the National Environmental Action Plan (NEAP), the Support for National Action Plan (SNAP). The report pays extensive attention to the risks facing the country due to climate change and sea level rise, mainly in relation to agriculture, water resources, human health, and the coastal zone (particularly the Nile Delta). It also includes economic loss estimates for sea level rise in several coastal cities.

Currently, Egypt has produced the "Second National Communication" (SNC) to the UNFCCC. The report highlights among other things measures to mitigate climate change including strategies containing measures for mitigating emissions in energy, industrial, transport, agriculture and waste sectors. The report is also highlighting vulnerability and adaptation to climate change in water resources, agriculture, coastal zones, tourism, housing, roads and health sectors.

1.3-Egyptian Environmental Affairs Agency EEAA

EEAA has the responsibility of implementing national environmental policies and of setting up environmental standards for cases of conflicting interests. In this respect, the Agency established inter-ministerial committees on each of the major relevant crosscutting environmental issues, such as water, energy, and climate change. These are chaired by the Minister of State for Environmental Affairs, and coordinate between multiple competent authorities for the different specific environmental processes of concern. The Prime Minister renewed the mandate of the national committee for climate change that had first been established in 1997 by his Decree No. 272 in 2007. The Minister of Environment heads the inter-Ministerial National Committee for Climate Change. The members represent a wide range of governmental, experts and non-governmental stakeholders. Recently, the Ministry of State for Environmental Affairs scaled up Climate Change Unit, (CCU) to be a Central Department in EEAA in 2009, in order to strengthen the climate change institutional framework on the national level. . Meanwhile, on the sectoral level attempts to strengthen the institutional framework led to the establishment of two committees in the Ministry of Agriculture and Land Reclamation and the Ministry of Water Resources and Irrigation, in addition to establishing a climate change information centre for the Agriculture Sector, and conducting an adaptation programme as part of Agriculture Sustainable Development Strategy up to 2030.

On the other hand, Egypt ratified the Kyoto protocol on 12/1/2005 followed by establishing the Egyptian Designated National Authority for the Clean Development Mechanism. Investment costs of initially approved 55 projects in 2009 are 1243 million USD. These projects will reduce Green House Gases, GHG by almost 8.3 million ton CO_2 equivalent. They include reduction of nitrous oxide emission from the fertilizer industry, renewable energy, fuel switching, methane capture and flaring from waste and energy efficiency improvement.

The following additional adaptation policies and measures are being considered by national authorities in Egypt: building institutional capacities for integrated monitoring and geographic data collection and analysis; identifying indicators and carrying out a full assessment of vulnerable sectors, sites and stakeholders; enforcing environmental regulations; identifying and carrying out protection measures of vulnerable touristic and archeological sites and roads against extreme events (flash floods, dust storms and storm surges); building capacities on regional circulation models, proactive planning, integrated coastal zone management and risk reduction; upgrading resilience of stakeholders through increased awareness of energy and water conservation needs; improving health and socioeconomic infrastructure; establishing employment opportunities in safe areas; strengthening research institutions particularly in areas of renewable energy, such as solar energy, biofuel and wind farms. Moreover, efforts are exerted for the establishment of early warning systems, as well as improving the management of Red Sea diving sites.

1.4 Water Resources, A background

Water resources have always been a major source of concern in Egypt. Egypt receives more than 95% of its various fresh water resources from outside its international borders.

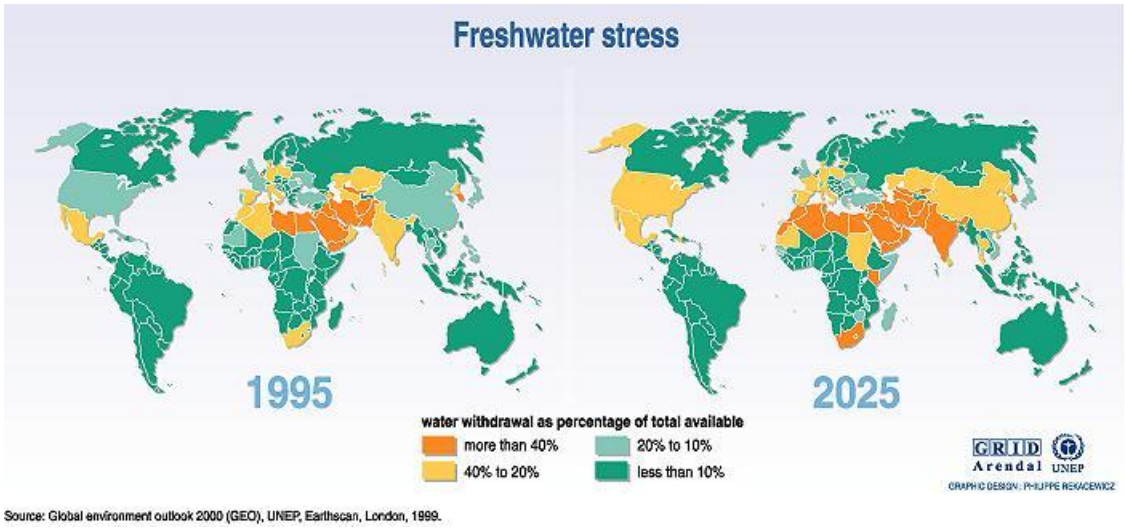

Figure 2 Freshwater Stress, A Global View Showing Egypt's Position
Source, UNEP, 1999

The average annual yield of Nile is estimated at 84 BCM at Aswan. This yield is subject to wide seasonal variation. Nevertheless, Egypt's annual share of the river water is determined by international agreements by 55.5 BCM. Groundwater is also an important source of fresh water in Egypt both within the Nile system and in the desert. Groundwater in the Nile aquifer cannot be considered an additional source of water as it get its water from percolation losses from irrigated lands and seepage losses from irrigation canals. Therefore, its yield must not be added to the country's water resources but rather be considered as a reservoir in the Nile River system with about 7.5 BCM per year of rechargeable live storage. Groundwater also exists in the non-renewable deep aquifers in the Western Desert region and Sinai with the current total abstraction estimated at only 0.9 BCM per year. On the other hand, most of the available groundwater in the desert is non-renewable and associated with a high development cost. Figure (2) shows the quantities of Egypt's water resources.

Reuse of drainage water in the Nile Delta has been adopted as an official policy since the late seventies. The policy calls for recycling agriculture drainage water by pumping it from main and branch drains and mixing it with fresh water in main and branch canals.

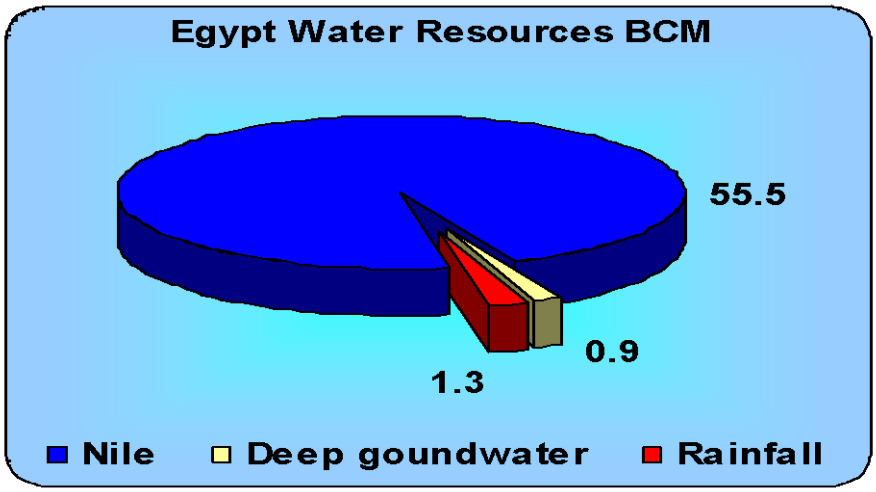

Figure 3. Egypt's Water Resources
Source: Ministry of Water Resources and Irrigation

1.4.1 Climate Change and Vulnerability to Water Resources

The first impact of climate change in Egypt is likely to be felt in the water supply. Water is already a limited resource, with per capita share just below 1000 m^3 per year, Figure 4, and is thus at the edge of the so-called poverty line[5]. Impacts of climate change on the supply side are likely to arise from possible changes of precipitation patterns. The Eastern Nile (Atbara and the Blue Nile) is extremely sensitive to the change in rainfall where an increase of 10% in rainfall results in a 36% increase in water flow at Khartoum, and a decrease of 10% in rainfall results in flow reduction of 31%.

On the other hand, Equatorial Nile flow has low sensitivity to the change in rainfall, with a 6% increase of flow for a 10% increase in rainfall and a decrease of 4% of flow reduce flow for a 10% decrease in rainfall. Bahr El Ghazal Basin (White Nile at Malakal) has moderate sensitivity, where an increase of 10% in rainfall increases water flow by 19% and a decrease of 10% in rainfall reduces water flow by 11%. The above results indicate that the Nile flows are extremely sensitive to any change in climate. With 4°C warming and 20% reduction in precipitation Nile flows may decrease by 98%, and with a 20% reduction in precipitation and 2°C warming the decrease may be 88%; and if no change in temperature took place the decrease may reach 63% for a 20% reduction in precipitation. For an increase of 20% in rainfall and increase of 4°C, 2°C and 0°C the flow may be reduced by 68% or increased by 1% and 71% respectively. The response of flows to precipitation change is not linear, but it is more or less symmetrical on both sides of increased or decreased precipitation (SNA).

In another climate and economic scenarios for Egypt, Strezpek et al. (Strezpek et al. 1996) developed ten different scenarios for Nile flows. Only one of the ten scenarios predict eventual increase in the far future, the other nine scenarios show long term reduction ranging between 10% and 90% by the year 2095. On the short term, all ten scenarios indicate a loss of 5% to 50% by the year 2020.

5-El-Quosy, D. (1999). Climate change and water resources in Egypt. Egypt -US Workshop on Global Climate Change, NARSS, EEAA and USEPA, Cairo, Egypt.

6-Strzepek, K.M., Yates, D.N. and El-Quosy, D.-E., 1996. Vulnerability assessment of water resources in Egypt to climatic change in the Nile Basin. Climate Research, 6: 88-95.

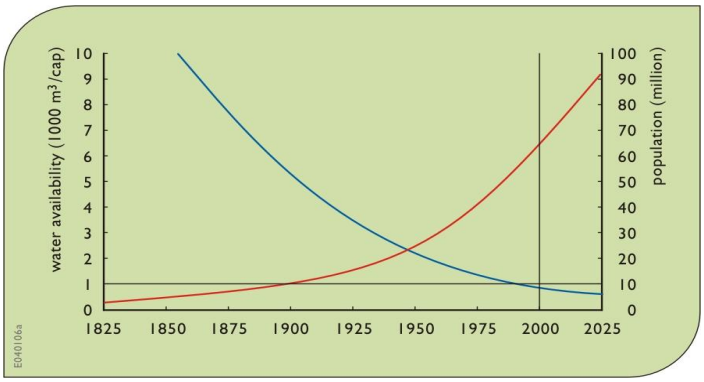

Figure 4 Egypt Population Growth vs Water Per Capita
Source, Ministry of Water Resources and Irrigation

1.4.2 Water related conflicts

Water related problems have been one of Egypt's major priorities for sometime. Reduction in the flow of the Nile could have a very serious impact on Egypt's well-being. While substantial uncertainties remain about how climate change might affect Nile flow itself through changes in rainfall upstream, there is much more certainty about temperature increases which are likely to enhance evaporative losses from the Nile, and at the same time increase irrigation and other demands for water.

At the national level, a number of problems have been surfacing very often not necessarily as a result of water shortage as a single factor but also as a result of mismanagement of Egypt limited share of water. On the other hand, there is a long record of conflicts at the local levels, between farmers over the rights to use irrigation water. Competition leading to violent conflicts at the local level mostly occurs between upstream and downstream users. This is probably the oldest and the most common type of conflicts, between upstream and downstream users sharing the same source of water. This type of conflicts is mainly associated with water conveyance and distribution systems where water flows from the upstream to the downstream end (e.g. rivers, canal, stream, etc.).

Typically, the upstream users are accused of over–using the water or taking more than their fair share.

The type of conflict is usually created by the following factors:

1-It is technically very difficult to prevent the upstream users from over using water. This can only be done through formal or informal water users organizations.

2-The price of land irrigated from upstream reaches of water sources is usually higher than the land irrigated from downstream reaches, hence upstream water users are richer and of higher social status than downstream users.

3-Because of better water availability in the upstream areas, farmers on those areas are able to grow more cash crops, hence reinforcing their financial status in the community, which in turn is helping them to use more water for better farming, and deprive others in the tail ends.

Another potential for societal tension arises from adaptation measures to manage decreasing water availability as a consequence of climate change. Adaptation should entail water saving measures, especially in the agricultural sector, beside intersectoral reallocations7. This leads to shifts in the labour force needed in large scale agriculture, with more agricultural workers laid off. Consequently, this would severely affect poor subsistence farmers who can neither compete for the scarce water nor are qualified enough to find work elsewhere.

7-Wichelns, D. (2002). Economic analysis of water allocation policies regarding Nile River water in Egypt. Agricultural Water Management 52(2): 155-175.

Distribution conflicts between the different sectors are also possible, particularly when a developing industrial sector demands more water or contributes significantly to water pollution, or if water for agriculture is cut since it can be used more efficiently elsewhere. Currently, prices for water in Egypt are heavily subsidized[8], and unrest could occur if a pricing policy is introduced as an incentive for saving water[9].

8-Abou-Ali, H. (2003). Water and Health in Egypt: An Empirical Analysis. Ph.D. thesis, Gteborg University, Sweden..
9-Mason, S.A. (2004). From conflict to cooperation in the Nile Basin. Interaction between water availability, water management in Egypt and Sudan, and international relations in the Eastern Nile Basin. Swiss Federal Institute of Technologie ETH Zurich.

II. Case Study 1

II.I ***Background***

At the national level, a number of water related problems have been emerging, not necessarily as a result of water shortage, but also as a result of mismanagement of the limited share of water. The expected changes in Egypt's water supply due to climate change may exacerbate the problem, causing some harsh repercussions. The possibility that climate may aggravate the current problems should reinforces the need for Egypt to develop its strategies for coping with water shortage.

Egypt's adaptation policy to climate change impacts on water resources comprises a number of scenarios. The most relevant scenario is that of inflow reduction which would affect the quantity of available water.

Even without the impact of climate change, Egypt expects to face water shortages because of the growing population, industrial and agricultural expansion, This in turn will reduce the per capita share of water to less than 500 cubic meters per year by the year 2050. Some of the measures that have to be taken according to the National Water Resources Plan[10] are:

1- Physical improvement of the irrigation system.
2- More efficient and reliable water delivery.
3- Better control on water.
4- Augmented farm productivity and raised farmers' income.
5- Empowerment and participation of stakeholders.
6- Quick resolution of conflicts between users.
7- Use of new technologies of weed control.
8- Redesign of canal cross sections to reduce evaporation losses.
9- Cost recovery systems.
10- Improvement of drainage.
11- Change of cropping pattern and on farm irrigation systems.

A reduction of the water budget can stir a long chain of drawbacks with unfavourable impacts. Farmers, the prime users of irrigation water, are among the most vulnerable groups, who might suffer the most if water budget becomes smaller. Egypt's adaptation policy to climate change in the water resources sector is putting special emphasis on sound participation of stakeholders, specially farmers. It also recognizes the frequently occurring bitter conflicts over the use of water between farmers.

Adaptation measures to manage water shortage and conflicts that follow are to address such basic facts, and should provide solutions to help managing available water resources, while minimizing frictions. In this respect, adaptation measures are putting special weight on soft policies that empower actual participation of stakeholders, and ensures the swift resolution of conflicts between them. Towards this end, adaptation policy envisages the need for addressing end users with a bottom up approach as a major priority.

Water Conflicts, How to Make Ends Meet

Water shortage based conflicts are most obvious during the periods of high water demand in the middle of the summer season. Moreover, restriction on water consuming crops such as rice and banana in the Delta and sugar cane in Upper Egypt was not heeded in many cases causing extra flaws in water budget. Farmers at the tail end of many canals were denied getting their right share of water, while upstream growers tended to take advantage of their position with a better share. In some cases farmers were

10- Ministry of Water Resources and Irrigation, Egypt (2005), National Water Resources Plan 2017.

using pumps for pumping water into their fields regardless of the needs of others downstream. Summer 2010, one of the hottest Egypt had for year, has witnessed a large numbers of crop failure, with considerable financial losses to growers of vegetable crops, specially in areas located downstream irrigation canals. Pollution problems, with many villagers dumping their solid waste in canals are another factor that seriously affects water flow and water quality in the canals. In addition, massive growth of aquatic weeds has been also a main cause for restricted water flow in a number of canals, causing water shortage incidents.

Different mechanisms are used to resolve water conflicts depending on their types, scale and parties involved. The most common of those mechanisms largely depends on the intervention of the local community leaders based on customary laws. Social aspects, such as kinship ties between the water users, play an important role not only in conflict resolution but in minimizing the conflicts at the first place.

● ***Water Users Association, Turing Water Conflicts into Social Accord***

In Egypt, one of the most influential polices for water management was The Irrigation Improvement Programme (IIP). The programme started in 1995 with a USAID grant. The programmeme is one of the large-scale projects to help Egypt in the 21st century sustaining its ambitious development plan and to manage water shortage problems.

The programme involves a combination of technical changes and infrastructure investment, together with institutional and organisational changes in the way irrigation water is managed. A key aspect of the programme was the creation of Water Users Associations (WUA). WUA plays a major role in decision making, the operation and maintenance of pumps and irrigation ditches. The fundamental change introduced by IIP is to replace individual farmer pumping at multiple points along the irrigation ditches by collective single point pumping that all farmers would agree upon.

●**Mechanisms**

A Water Users Association (WUA) is a group of farmers, all served by a common source of water, who join together to allocate, distribute, and manage water. A WUA allows farmers to perform activities that are more difficult or impossible to do individually. The aim of establishing a WUA is to develop a participatory irrigation management for increasing water use efficiency, through the involvement of all stakeholders, as much as possible in the various management activities. WUA are empowered to act on behalf of their members in their relations with water management districts and local administrative entities, to solve problems of water supply, to conclude contracts for construction, repair, and maintain the irrigation schemes and facilities, as well as other contracts and transactions allowed by the existing legislations.

A WUA is also acting as a liaison unit to ease communications and feedback between regulatory bodies, such as Ministry of Water Resources and Irrigation on one side and farmers on the other side. With WUA representing millions of end users, it would be easier to regulatory bodies to communicate with WUA instead of communicating with millions of growers individually, a matter of great difficulties and impracticalities. With such infrastructure in mind, regulatory measures taken to adapt for climate change impact on water resources could be easily communicated to WUA, and hence to the farmer communities at large. Egypt has already more than 7000 WUA spreading over many governorates, including Behira, Kafr El Shiekh, El Menya, Bani Souf, and Assiout. Plans are to spread the WUA to cover other parts of Egypt gradually.

The WUA is a voluntary organization, made up of representatives of the district, selected by all member of the community. The head of the Association is appointed by free election in which all members of the Association are involved. Central pumps, and other hard ware required to operate the system are purchased by the ministry of irrigation. Stakeholders would pay back the cost on installment extending to 20 years.

II.2. Evaluation of case study 1

Relevance, Effectiveness and Efficiency

Water User Associations has been used as one of the potentially relevant, effective and efficient tool to address conflicts caused by irrigation water in the farmers communities. Water conflicts have always been rampant and had assumed various forms, ranging from the exchange of harsh words, to fist fight, beating and injuring the other party, to killing in some occasional cases[11]. In case of conflicts other than killing, customary laws were the most common mode of conflict resolution. The village mayor, some elderly people and the village leaders were usually involved in settling the disputes where a sentence would be issued against the aggressor including a financial penalty. The picture was remarkably changed after the IIP. The consensus of the farmers is that there is no problem with water supply nowadays. Difference in access to water between head and tail–enders has diminished and are now negligible in terms of their impact on crop yield.

Accordingly, there are fewer disputes and fewer conflicts over water. Moreover, WUAs are also a prominent factor in saving irrigation water by up to 10 - 15 %[12] making a great significant difference in dealing with water shortage issues, whether caused by climate change or other factors. Nevertheless, experience with some of the existing WUAs has shown a number of drawbacks, mostly institutional, that limit to some extent their full fledged successful operations.

Impacts

On the other hand, WUAs have had a number of negative impacts that occassionaly led to serious drawback. One basic trait of WUAs is its community – based nature, in which every one in the community is acting for the interest of the whole community. But many observers tend to think that WUAs still lack the full swing of the social entity. Currently, WUAs tend to be a one man show in which the Ministry of Water Resources and Irrigation is the only player while the Ministry of Agriculture, a potential stakeholdeer in all agriculture activities, has almost no role in the system. The Ministry of Agriculture, already has its strong presence in the farmer communities, represented by the agricultural cooperative present in each village. The cooperative looks after the interest of farmers, supplying them with their needs, including pesticides, seeds, beside the extension service. Agriculture Cooperatives are not connected to the WUAs, hence depriving the Associations the wide experience of socio – rural and local knowledge issues creating a big gap that affects the performance of WUAs. A number of rural sociologists[13] have maintained a conservative view about WUAs in which the technical part represented by the Ministry of Irrigation has been the dominant side, at the expense of the social aspects, that the Ministry of Agriculture should fulfill. This claim is based on the fact that the role of rural sociologists in WUA dose not exist and the whole show is played by irrigation engineers. Their claims would even go further to blame the technocrats to ignore critical issues such as farmers' local knowledge, heritage and traditions as basic constituents of the social framework of the Associations.

As an NGO, water users associations are not always able to open a bank account unless they provide some legal documents that many cannot produce. As a result, WUAs very often cannot have the advantages of being a holder of a bank account, with the numerous facilities and credits a bank can provide.

11-Water Conflicts and Conflict Management Mechanism in the Middle East and North Africa Region, Centre Environment Development Arab Region and Europe, 2007

12- Personal communication Gamal Siam,Department of Agriculture Economics, Cairo University, 2011

13-Personal communication, Mohamed Nawar, Department of Rural Sociology, Cairo University, 2011

III. Case Study 2

III.1. Description

Flash floods are among the most destructive natural disasters and at the same time, an important source of water, especially in arid areas. A flash flood can be generated during or shortly following a rainfall event, especially when high-intensity rain falls on steep hill slopes with shallow, impermeable soils, exposed rocks and lack of vegetation[14] [15]..

In Sinai, heavy flashfloods ending up in the Red Sea are one of the prominent adaptive measures to manage shore erosion. The sediments that the flashflood brings help compensating the erosion damage caused by the sea. Sediment carried out by flashfloods ending up in the sea is a major source of aquatic life enrichment, providing valuable nutritional value for aquatic organisms, specially for coral reefs, a main source of tourists attraction in Sinai. Meanwhile, in terms of groundwater replenishment, moderate flashfloods are more useful because of their relatively slow dynamics over terrain, that give ample time for water infiltration to shallow underground level.

●***Conflicts and Security, Features of a Case Study, Sudr, South Sinai***

Flashfloods is one of the most valuable ecosystem services in arid areas such as Sinai, where Bedouin consider it a great blessing and virtue. Flashfloods cleanse their soil, ridding it from salinity, replenish their groundwater and supply their limited agriculture with water, and renew their land cover, allowing grazing activities.

Flashfloods is also a source of worries and anxiety, especially in recent years, because of the tremendous damage they cause. Many houses and utilities including wells, the main source of water in many areas, were destroyed in flashfloods. Massive damage to crops and orchards in the affected area, loss of sheep, and on top of that a number of fatalities were reported in many parts of Egypt.

The devastating damage caused by the flashfloods has also instigated a number of conflicts that involved the Bedouin community on one side, and many other bodies, including the government on the other side.

The massive flooding has caused a serious damage to a number of the pipes transporting oil from some of the oil fields in the areas, causing serious spill of oil. A massive area of arable land was contaminated with the spilled oil. Losses of crops, and land caused by oil pollution are quite substantial, with the farmland of more than 100 families ,hit hard by the oil pollution. Oil companies are trying to evade responsibility and in many occasions tried to remove apparent oil residues from the affected area, trying to deny any responsibility. Nevertheless, this was not a sufficient measure to remedy the long lasting impact of oil contamination on groundwater and soil. Bedouins in the affected areas are taking their case to court, filing a case against the oil company asking for a compensation for the damage they incurred. Recently, it was reported that oil companies have agreed to pay some financial compensation to affected families to settle the issue. Many of the Bedouin have their houses destroyed or even demolished, and some of them were given a temporary housing, far away for their original places and the government has promised to build them new houses. Bedouin are not happy about their new temporary residence, nor about the places where the government plan to build them new houses, and feel that the government is letting them down. Some of them have even left the temporary housing and gone back to their destroyed houses as they feel better off in these places. The flashfloods have destroyed many of the fields in the area, while their irrigation piping system was shattered. Many of the wells used for irrigation were also destroyed and covered with flood debris. Bedouin had to spend lot of money and time in order to clean these wells, to allow their use once again. Flashflood debris are also covering vast areas of arable lands in the area, rendering the fields unsuitable for agriculture. As a result prices of all agricultural commodities are soaring, specially olives, and palms, the major staple food for the Bedouin. According to local Bedouin, one kilogram of olives is currently costing 7 – 8 pounds while it used to cost 1 – 2 pounds in the past.

14-Lin, X. (1999). Flash floods in arid and semi-arid zones, 65 pp, UNESCO, Paris.

15-Weather, H.S. (2002). Hydrological processes in arid and semi-arid areas. In: Wheather, H.S., Al-Weshah, R.A. (Eds.) Hydrology of Wadi systems. UNESCO.

Sinai in general is one of the most arid places in Egypt. Lack of precipitation prevailing for the last few years is raising lot of concern about groundwater stocks and future use. Flashfloods and rainfall are the main sources to replenish groundwater, helping to balance up, groundwater consumption and rate of recharge. With the scarcity of rain witnessed the last few years groundwater balance between demand and replenishment is becoming very critical. In order to conserve groundwater stocks, in one of these measures, government official at Sudr have banned Bedouin to drill new wells unless they have a permit, a new legislation that Bedouin never had in the past. Moreover, government is considering to meter old wells in the area so they can find out how much water is consumed, and to introduce some charges for consumption. Bedouin are quite resentful of such new policy. Drilling wells is a costly business for Bedouin, and imposing charges for their water consumption from these wells is considered as an extra burden.

● ***Actors responsible***

,Water Resources Research Institute (WRRI) the policy maker

Egypt's strategy of adaptation to climate change, currently designed by the Crisis and Disaster Management Centre, has made very little reference to extreme events of climate change such as sand storms and flashfloods and how to adapt to such incidents. But, on the other hand, one of the main mandates of the Centre is to deal with flashfloods in an independent perspective as one of the natural disasters. With the increasing frequency of flashfloods affecting various parts of Egypt, interest in flashfloods as a major source of water and also as a major threat is being looked at as a matter of great priority.

WRRI is one of the main branches of National Water Research Centre, (NWRC), with a special mandate on flashfloods in Sinai and also in southern Egypt. WRRI is Egypt's competent authority to come up with a package of adaptive policies and measures that meant to take advantage of fashfloods in Sinai, to make full utilization of flashfloods, and to help Bedouins, the local inhabitants of Sinai coping with flashfloods, and overcoming the numerous difficulties and possible conflicts that flashfloods risks and hazards may bring about.

WRRI adaptation policy for integrated water management system of flashflood is a major policy aid that contributed to a great extent in managing flashflood, minimizing damage and introducing the concept of sustainable use of water into practice in some of the most arid parts of Egypt, namely Sinai. The policy is made of some main components. A major constituent is the establishment of an early warning system to forecast flashfloods timing and intensity. It also has a special emphasis on water harvesting through the constructing of dykes and dams, and other water storage facilities that help preserving flashflood water, allowing Bedouin to use it.

●**Mechanisms**

Early Warning System

One of the major adaptive policies to flashfloods that WRRI has developed is the establishment of an operative early warning system that alarms people in the vulnerable areas to flashflood incidents.

The chain of components for the early warning system is shown in Figure (4). The first and most essential component of the early warning system is rainfall forecasting. Firstly, an analysis has been done on the available in-situ rainfall measurements.

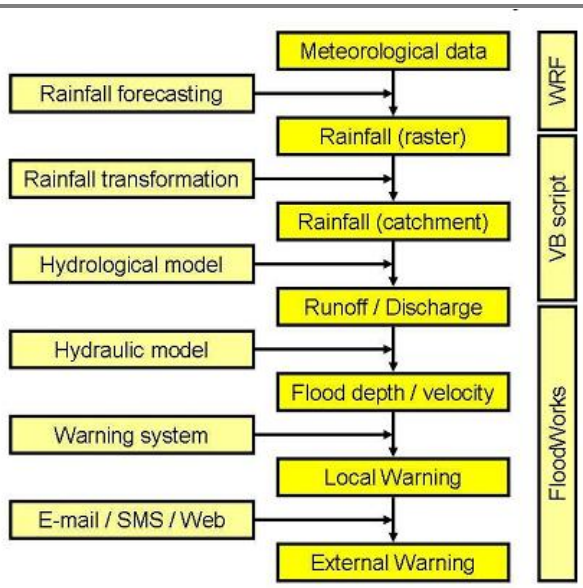

Figure 4. The Chain of Components that Forms the Early Warning System (WRRI)

The early warning, is currently operative, covering some parts of Sinai. It has resulted in extra time to take action and spread the news for the competent authorities. The system also allows to forecast the amount, timing and location of rainfall. Based on this simulation, the risk for flash floods is calculated and if needed, a warning is sent to the local competent Crisis and Disaster Management Centre in the affected area of Sinai. The Centre in turn would announce the news about the flashfloods through cars going around with microphones, going through the town.

III.2. Evaluation of case study 2

Relevance, Effectiveness, and Efficiency

The introduction of the early warning system to parts of Sinai is beyond doubt one of the most relevant and effective mechanisms that meet an urgent demand to forestall flashflood risks and to take advantage of its water. Advantages of the system would touch upon a wide range of stakeholders and beneficiaries that include but are not limited to the following:

- General Water resources management in South Sinai Governorate
- Crisis and disaster management in South Sinai Governorate
- Ministry of Transport
- Ministry of Tourism

*Bedouins communities in the study area

The project has been developed in close collaboration with the South Sinai Crisis and Disaster Management Centre and the municipality of Nuweiba City as a necessary measure to manage the frequent risks posed by flashfloods to the that part of South Sinai.

Impacts

The early warning system would provide, for the first time a very efficient mechanism that would buffer the area from the destructive impacts of flashfloods, while making the utmost use of its water, as a part of the integrated water management system of flashfloods. Al Ahram, the most influential newspaper in Egypt is already acknowledging the role this new system is playing, Figure 5.

At its early stages the system was covering the area of Wadi Water only. However, eventually, technocrats operating the system have developed the ability to cover further areas of South Sinai, including Sudr and other places.
Governorates of Sinai, North and South have been geared to deal with flashflood forecasting information, in line with WRRI guidelines. Information reaching liaison offices at governorates are basic requirements for implementing preparedness and readiness plans for water harvesting, an elemental component in meeting their growing demand for water. One of the major implications of the WRRI new policies was the emerging of a new realm of considering flashflood as a potential wealth that Bedouin ought to take advantage of. It also looks at such practices as an emerging sustainable use of flashfloods that should be fostered in all parts of Egypt. The system is providing substantial support to decision makers in alleviating the flood risk beside utilizing the flood more efficiently using the proper water harvesting techniques.

Newspaper: Al-Ahram
Date: Thursday 21-1-2010
Title: Ministry of Irrigation emphasizes that early warnings of heavy rains were sent to the affected governorates
Subject: The Ministry of Water Resources and Irrigation "The National Water Research center that has sent an early warning e-mails and phone calls to the crisis management centers in South Sinai" the message to inform them with the time of the rainfall storm, direction and its duration.

Figure 5 An Excerpt of Al Ahram Newspaper Showing Ministry of Water Resources and Irrigation Early Waring System

IV. Conclusion and Recommendation

There is no doubt that climate change is creating an atmosphere of apprehension in Egypt. Information gathered from various sources indicates a series of events that might cause considerable damage to Egypt, especially concerning its water resources.

The Ministry of water resources and irrigation has followed a sound set of policies and strategies not only to forestall any expected changes in Egypt share of Nile water, but also to manage the growing demand of the growing population and the fast development in communal, industrial, touristic sectors of Egypt.

Farmers, as end users, are a major player in the Ministry efforts to establish a sound communication mechanism that would ensure a mutual flow of information and feedback. Sustainable water use was the backbone of all policies that the Ministry has tried to promote, weather through soft interventions such as stakeholders participation, or hard interventions such as wastewater recycling, desalination and similar options.

Egypt has been strongly committed to international protocols dealing with climate change to a great extent. Egypt has also compiled its first (1999) and second (2010) national communications, under the United Nations framework convention on climate change.
But on the other hand, Egypt has no formal comprehensive and integrated adaptation strategy to climate change, except some measures for the most vulnerable sectors, including water resources, agriculture, coastal zones and some others embedded in the two national communications of Egypt.
The strategy has acknowledged the possibility of conflicts at national level between water users and possible problems this might took place. A bundle of measures and / or policies were introduced to minimize the causes of conflicts. Such measures would include the promotion of bottom up approach, and empowering end users. Moreover, it is rather imperative that stakeholders should assume direct involvement in running their water management affairs. Conflicts based on water rights have been one of the common causes of many communal disputes, with possible escalation that might have various manifestations and shapes.

Extreme events, as many would view them, are probably the most hazardous and influential manifestations of climate change in Egypt, with the highest impacts. Some information indicating that incidence of extreme events is increasing to a great extent. Heat waves have been recorded for 40 days / year in Alexandria in recent years in comparison to only 5 days / year as an average.
Frequent heat waves during 2010, have had some of the most destructive effects for years. Many crops, including tomatoes, wheat and others have been drastically affected, with big yield losses. Prices of some of these crops have been soaring to record prices, especially tomatoes, with a kilogram reaching 15 pounds when its usual price is less than one pound, causing a wide wave of discontent between consumers. Meanwhile, growers have incurred serious financial losses. The impact of heat waves was not restricted to agriculture and crops, people general health was badly affected, with many serious cases. Similarly, the strong flashfloods that hit parts of Sinai early 2010 have had a casualty record, and lot of destruction of various utilities including roads, buildings and others. It is well known that some parts of Egypt have always been of special vulnerability to flashfloods that tend to cause some substantial damage. But it is also safe to mention that recent flashfloods recorded early 2010 have been incomparable to previous onset of flashfloods, considering the magnitude, duration, and the damage it caused. The heat waves have also had its toll on life in the cities, and the extensive energy consumption. People have become heavily dependant on air conditioning units to overcome such unusual heats, creating an enormous over demand of available electricity supply. With most of the cities grids not able to cope with such unusual demand, power cuts were very frequent even in big cities such as Cairo, with lot of complaints and repercussions.

Water Resources Research Institute, with one of his mandate to manage flashflood, has applied a new policy of Integrated Water Management of Flashflood to manage flashfloods in Sinai and other parts of Egypt. In Southern Sinai, a newly installed system of early warning was established to help forecasting flashfloods to prevent damage and utilize water. The system operated by Water Resources Research Institute is a good step forward in the right direction. But there is a need to extend such service to other vulnerable parts of Egypt, including Upper Egypt. Equally important is to expand on the mandate of the WRRI, by constructing storage dams and dykes that would enable the full utilization of flood water, specially in such arid areas suffering tremendously from drought, beside protecting people and facilities.
The two case studies reported in this study have been evaluated using the recommended OECD guidelines.
Finally, as a final recommendation, the following points could concluded:

1- There is a need to increase and empower WUA, and to solve the logistic problems they have. WUA has the right infrastructure and conceptual framework to work out problematic issues related to climate change and water scarcity between growers and possibly other sectors as well. The logistics of these associations should also be improved, legalized. Specially designed

capacity building programmes for WUA members should be carried out, with reasonable covering of socio and rural issues.

2- Institutional integration of different stakeholders, and ministries, with special reference to ministries of irrigation and ministry of agricultures should be pursued for a good operation of WUA.

3- Extreme events are probably the most obvious manifestation of climate change at the present time Egypt is facing. Impacts of these events are increasing in frequency and intensity, with direct bearing on economics, human health, and lives. Some more assorted efforts to manage extreme events and to adapt it its numerous repercussions should be empowered.

The Jordan River Basin

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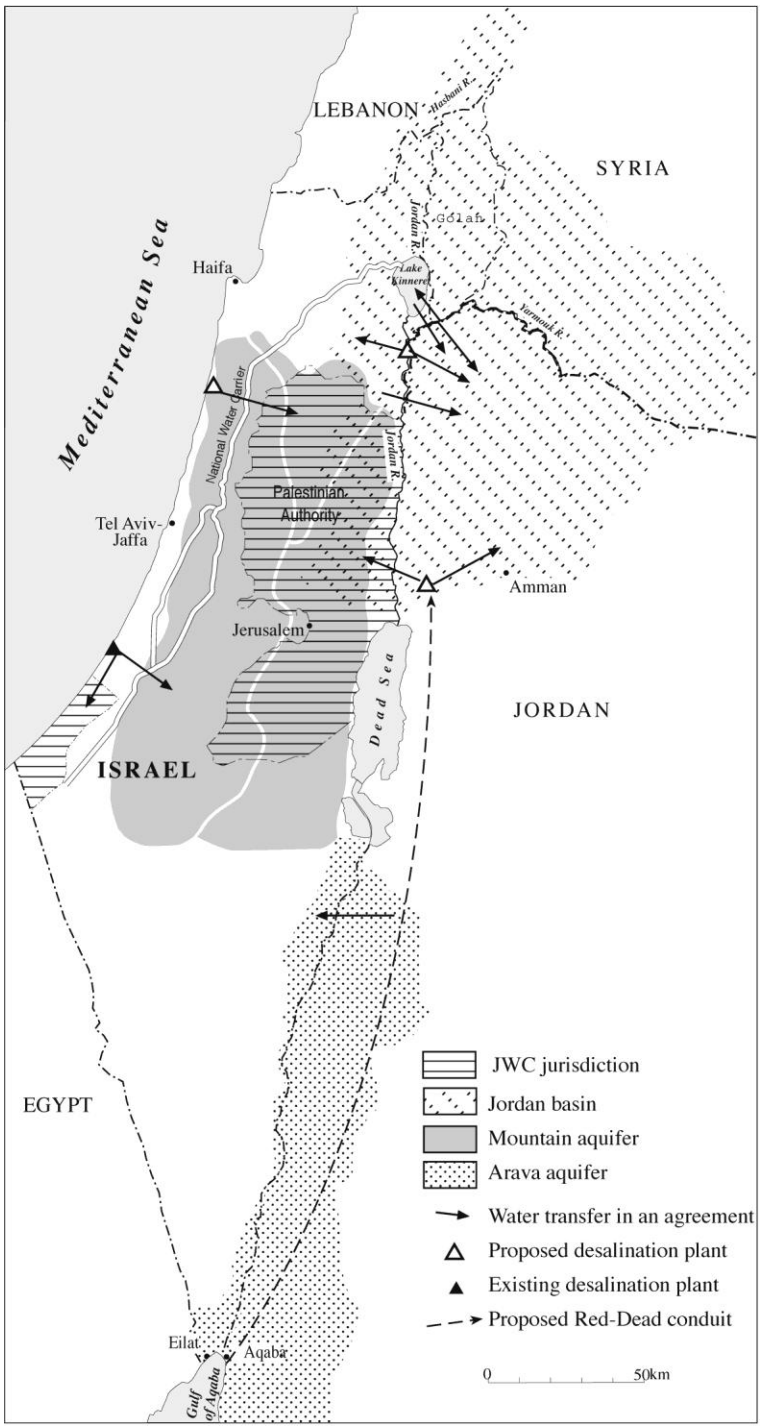
I. Introduction

Located in the Eastern Mediterranean, the Jordan Basin lies along the northern branch of the Great Rift Valley. Climatologically, the region is a convergence point for arid and sub-humid Mediterranean conditions, which make the Jordan Basin especially vulnerable to climatic shifts and land use changes (GLOWA Jordan River). Add to this an ever-increasing demand for water due to population growth and development in the region (GLOWA Jordan River) and the result is extreme water scarcity. This region is home to Israel, Syria, Lebanon, Jordan and the Palestinian Authority, which historically have had to share the scarce water supplies provided by the Basin. In the near future, these nations' growing populations will face the impending effects from climate change against a backdrop of a history of conflict over water resources. In order to ascertain its existence well into the future, Israel approaches this scenario with a variety of water management policies aimed at increasing the availability of water.



I. A. Geography of The Jordan Basin

Israel, Syria, Lebanon, Jordan and the Palestinian Authority are riparian nations of the Jordan Basin. As depicted in Figure 1, the basin is fed by three rivers that originate in Syria, Lebanon and northern Israel and converge before flowing into Lake Kinneret, also known as the Sea of Galilee or Lake Tiberias. From Lake Kinneret, the Jordan River meets up with the Yarmouk River flowing from Syria in the east. The Jordan River then snakes its way south to the Dead Sea as it forms the border between Israel, the Palestinian Authority, and Jordan (Fischhendler, 2008).

Figure 1: Map of the Jordan Basin depicting aquifers, desalination plants, and the proposed

alignment of the Red Sea Dead Sea Water Conveyance. Source: Feitelson & Fischhendler, 2009.

I. B. Socioeconomic and Political Context of the Jordan Basin

The Jordan Basin is a transboundary watershed, the rights to which are the subject of longstanding international debate (Tal, 2006). In order to understand possible barriers to regional cooperation and the political environment that must be seeded in order for partnership to be achieved, a brief background on the socioeconomic and political context of the regional actors is helpful. In the interest of remaining within the scope of this paper, only Israel, the Palestinian Authority and Jordan will be discussed in these terms.

According to *The World Factbook* prepared by the U.S. Central Intelligence Agency (2009), socioeconomic conditions vary widely across the Jordan Basin. In 2009 Israel's GDP per capita was $28,400 with 23.6% of the population living below the poverty line. In the West Bank (Palestinian Authority), per capita GDP was $2,900 in 2008. 46% were living below the poverty line in 2007 while 70% of the population of Gaza was living in poverty as of 2009. Across the river in Jordan, GDP per capita stood at $5,200 in 2009 with 14.2% of the 2002 population living below the poverty line (*World Factbook,* 2009).

The political context in the region and the relations between each of the actors are extremely sensitive. The volatility of the region is based on historical conflicts that date back to the early 1900's, if not earlier. Water has always played a crucial role in the political relations between Israel, Jordan and the Palestinians. Nowadays, current peace agreements between Israel and Jordan include provisions of water resources; Israel supplies a specified amount of water to Jordan from the Jordan Basin according to the 1994 peace treaty signed between the two countries. However, regional disagreements abound over rights to groundwater below Israel and Palestinian Authority-administered territory in the West Bank (Feitelson & Fischhendler, 2009). Both the Palestinian Authority and Jordan are or have been skeptical of cooperating with Israel over regional water projects for fear that agreement will come at the expense of their rights to a fair share of groundwater resources or access to water of the Jordan Basin.

Regional climate change mitigation efforts between Israel, Jordan and the Palestinian Authority, particularly with regard to water resource management, have the potential to bridge the gap between these nations. However, the volatile nature of political relations between the three players could also prove to be a barrier to large-scale projects, and disagreements could lead to skirmishes that could threaten human security in the region. There is also the question of whether water resource management in the region should be dependent on the state of political relations. A common notion is that peaceful relations are a prerequisite to transboundary water-related agreements. However, since the water scarcity crisis is a result of climatic conditions of the region and not a past war (Yakhin, 2006), these two domains can and should be treated independently from one another.

There are two other actors in the Jordan Basin that must not be overlooked. Syria and Lebanon are also riparian nations of the Jordan Basin and thus are affected by agreements over water resources between the other three actors. However, while regional cooperation

is ideal, the political environment at present does not allow coordination among all the actors. Instead, actions are taken unilaterally or between two or more Basin riparians.

I. C. The Jordan Basin and Israel

The Jordan Basin is one of Israel's main water resources, providing approximately 570 MCM/year (Lautze, Reeves, Vega & Kirshen, 2005), and draining approximately 18,000 km^2 of land (Fischhendler, 2008). Israel supplements this supply from a variety of sources. The Mountain and Coastal aquifers contribute a sizeable amount to Israel's water resources. The Mountain Aquifer lies south of the Jordan Basin and consists of the Western, Eastern and Northeastern Aquifers and provides approximately 640 MCM/year. The Coastal Aquifer is situated along the western coast of Israel from Haifa in the North to Gaza in the South, providing approximately 330 MCM/year. Additionally, desalination and recycled wastewater provide approximately 520 MCM/year (year 2000 estimate). Combined, these sources provide the 2,060 MCM/year (year 2000 estimate) of renewable water resources in Israel (Lautze et al., 2005). The map in Figure 1 shows the aquifers of the Jordan Basin, and two of Israel's three large-scale desalination plants at Ashkelon and Hadera along the Mediterranean Coast.

The region's varying climate causes an uneven distribution of precipitation. Israel exhibits a Mediterranean climate in the North and along the coast and an arid climate in the South (Thomas, 2004). As such, rainfall varies from 25 mm/year in the south to over 1400 mm/year in the north (Thomas, 2004). The transition between the two climatic zones carries implications for the annual flow of the Jordan River, which ranges from 200 MCM/year in dry years to 1,000 in rainy years (Fischhendler, 2008).

An additional implication of the seasonal variation in rainfall and transition of climatic zones from the north of Israel to the south is that large parts of Israel are left unsuitable for agriculture (Thomas, 2004). The uneven distribution of fertile land is especially problematic for a state founded on the ideology of "making the desert bloom," a mandate that holds intense religious and cultural value and to which significant political support has been lent (Thomas, 2004). On the basis of this notion, Israel constructed the National Water Carrier, which redirects 400 MCM of water annually from Lake Kinneret to the arid regions in the south of Israel (Lautze et al., 2005). While a necessary provision to population centers in the South, this out-of-basin transfer of water diminishes the resources of the Basin and reduces the flow of the Lower Jordan River (Lautze et al., 2005) and ultimately to the Dead Sea. The Dead Sea is proving to be severely impacted by this diversion, having dropped over 25 meters during the last century (Gavrieli, Bein & Oren, 2005), causing ecological, geomorphological and economical damage to the region.

I. C. 1. Sectoral Water Use within Israel

Water resources in Israel are divided among the domestic, agricultural, industrial, and environmental sectors (Koelsch & Twite, 2010; Lautze et al., 2005). Historically, the

agricultural sector has enjoyed the largest allocation of Israel's water resources. This is due to the deeply entrenched notion of Zionism's emphasis on tilling the land and the rural ideals on which the new state was founded. However, the share allocated to agriculture has dropped significantly (Feitelson, Fischhendler & Kay, 2007) and now Israeli water usage is dominated by the municipal sector.

Since the mid-60s, municipal water use had been increasing in tandem with a rise in population. Considering Israel's per capita water usage of 275 to 350 liters per day, impending fluctuations in water resources may be particularly consequential (Lautze et al., 2005).

In addition, some resources must be reserved for the natural environment. This sector requires water for landscaping, upkeep of public parks, leisure activities, maintenance of natural aquifer recharge (Koelsch & Twite, 2010) and overall support for aquatic ecosystems (Megdal, Feitelson, Varady & Fischhendler, 2007). Providing water for these uses is known as maintaining an environmental flow (Moore, 2004). The importance of ensuring water for the natural environment is underscored by the adoption of an amendment to the Israeli Water Law recognizing the environment as a sector worthy of allocation (Megdal et al., 2007). Despite adoption of the amendment, however, allocation is not required and allocation amounts are not specified (Megdal et al., 2007).

I. C. 2. Israeli Water Scarcity

The regional water scarcity in Israel appears dire considering the growing gap between supply and demand (Dreizin, Tenne & Hoffman, 2008). In 2005, total water demand from all sectors in Israel was estimated at 2,060 MCM/year (Dreizin et al., 2008). By the year 2020, the projected total demand is expected to rise to 2,805 MCM/year (Dreizin et al., 2008). Additionally, climate change is only expected to widen the gap between supply and demand (Pe'er & Safriel, 2000).

I. C. 3. Water Management within Israel

The establishment of the State of Israel brought about the realization of several Zionist ideologies, which became the basis for early water policy in the country. Among these tenets were the settling of the Negev desert, setting a uniform cost of water across the country, bolstering the agricultural sector through subsidies, and granting the state authority over water policy (Fischhendler & Heikkila, 2010).

In order to fulfill the Zionist ideology of cultivating the land, Israel's water resources were physically integrated upon the construction of the National Water Carrier in 1964. The water carrier linked Lake Kinneret (also known as the Sea of Galilee or Lake Tiberias) in the North and the country's aquifers to the Negev desert in the South (Fischhendler, 2008). While providing necessary resources to the arid desert, this diversion of water from the upper Jordan Basin has limited the flow to the Dead Sea.

In order to further centralize water management (Fischhendler, 2008), Israel adopted the Water Law in 1959. The Water Law contends that all water in Israel is public property, regardless of property lines, and furthermore, that anyone is entitled to partake in water resources as long as they do not deplete or harm the water stores (Water Law, 1959). Among other stipulations, the Water Law also prohibits pollution and outlines rules on water price and quality (Koelsch & Twite, 2010).

The Israeli Water Commission was established to carry out the stipulations of the Israeli Water Law. In keeping with national integration, the Water Commission had to coordinate among eight different ministries, all having influence over the water sector (Fischhendler et al., 2010). This resulted in a fragmented policy-making process. In addition, water planning remained within the realm of a government entity, while on-the-ground work was to be carried out by a public corporation (Fischhendler et al., 2010). Therefore, in 2006 the Water Authority was established to create an overarching entity and remove authority from the eight different ministries. Now under the Ministry of National Infrastructures, the Water Authority is also less agriculture-centric compared to the Water Commission, which was headed by the Ministry of Agriculture (Koelsch & Twite, 2010).

I. D. Implications of Climate Change

Bearing in mind the current water scarcity in the region, Israel's water resources will likely be adversely affected by climate change. Indeed, climate models predict that the Eastern Mediterranean will prove to be especially susceptible to changes in the climate (Alpert, Krichak, Dayan & Shafir, 2006). The Intergovernmental Panel on Climate Change has observed long-term trends of decreasing precipitation in areas such as the Sahel and Mediterranean from the years 1900 to 2005 (IPCC, 2007), and scientists predict with high confidence that semi-arid areas such as the Mediterranean will see a decrease in available water resources. Predictions point to surface runoff as a main negative hydrological effect of a changing climate within the Middle East, mainly caused by decreased precipitation and increased extreme rainy events, both leading to soil erosion, desertification, and decreased vegetation (Pe'er & Safriel, 2000). Surface water runoff may also increase the likelihood of flash floods, damaging crops and infrastructure (Pe'er & Safriel, 2000). Increased surface water runoff prevents aquifer recharge on which Israel relies heavily for potable water (Pe'er & Safriel, 2000). In addition, aquifers will become vulnerable to sedimentation and salinization, which will further decrease groundwater quality (Pe'er & Safriel, 2000). Sea level rise is also of concern in Israel, and likewise has the potential to harm the Coastal aquifer due to saltwater intrusion (Feitelson et al., 2007).

The condition of Israel's aquifers underscores the severity of impending climate change and also politicizes and securitizes the issue. This is so because Israeli water policies are geared towards increasing the water supply artificially, for example, via desalination, with the goal of reducing stress on aquifers. This strategy preserves the aquifers for storage capacity for use during dry years. As the Coastal aquifer becomes threatened by sea level rise, Israel's attention is turned towards preserving the Mountain Aquifer as

storage for future dry years (Feitelson et al., 2007). However, the issue becomes politicized and securitized because the Palestinian Authority argues for its right to extract from the Mountain Aquifer, which may further reduce the quality of the aquifer and threaten its storage capacity for both Israel and the Palestinian Authority (Feitelson et al., 2007). In addition, although not directly related to climate change, the quality of groundwater in the region is heavily influenced by disputes over water allocation to the different sectors in the Israeli water economy. As will be discussed in further detail in the desalination section, gridlock in the allocation process led to further depletion of the aquifers as Israeli decision makers bided time until issues over sectoral allocations were resolved. Thus the quality of the aquifers dwindles at the expense of political disagreements within Israel's different water sectors.

I. E. Adaptation Policies

I. E. 1. Scope of Study

It is essential to point out that while the focus of this case study is on the Jordan Basin, potential policies examined must extend beyond the borders of the watershed. This is due to the interconnectedness of the National Water Carrier. It serves to integrate Israel's water supply such that shortages in one area of the country can be offset by inputs elsewhere. The Water Carrier was built to transport water from the Jordan Basin to the rest of the country, ensuring equal access to water and effectively leveling the playing field between the dry South and the water-rich North. However, because Israel has exhausted the resources of the Jordan Basin, it must now turn to other inputs that will replace the Basin's contribution to the Water Carrier.

Policies to be examined are those whereby water can be produced and incorporated into the supply of the National Water Carrier, but that take place outside of the boundaries of the Jordan Basin. However, these policies are still relevant to a case study on the Jordan Basin because inputs from elsewhere within Israel will reduce Israel's reliance on the watershed. For example, desalination in Israel must take place along the coast of the Mediterranean, but the water produced from this process will be incorporated into the National Water Carrier, thereby easing stress on the Jordan Basin.

Table 1: Policies with the potential to affect water scarcity in Israel

Type of Policy	Policy				
Demand Side	Water Tariffs		Drought Tax		Drought Campaign
Supply Side	Coastal Desalination	Virtual Water	Red Sea Dead Sea Water Conveyance	Water Imports	Cloud Seeding

I. E. 2. Rationale for Policies Selected for Further Study

The policies noted in Table 1 present opportunities to augment Israel's water supply through demand side and supply side management. However, the policies of

desalination and the proposed Red Sea Dead Sea Water Conveyance are the only policies that fall within the boundaries of the scope of this study and therefore warrant further in-depth research. First, demand side policies such as water tariffs, a drought tax, and drought campaigns do not impact significantly enough on regional security issues to be a focus of this paper. In addition, virtual water, as it pertains to the Jordan Basin, is not widely discussed in the literature and would thus require intense analysis of primary sources. Next, talks of water imports, mainly from Turkey, are now stalled due to recent political disagreements and would be difficult anyway because the scheme would necessitate running pipelines through Syria, a politically contentious move. And finally, cloud seeding is not expected to bring significant results in terms of increasing rainfall.

Both coastal desalination and the proposed Red Sea Dead Sea Water Conveyance have the potential to increase Israel's water supply, are extensively discussed in the literature, and have security implications for the region. Coastal desalination, for example, would augment both the Israeli water supply and that of the Palestinian Authority, decreasing regional tension over scarce resources. In line with the Oslo accords, Israel is expected to supply the Palestinian Authority with water from its desalination plants. Whether or not the Palestinian Authority will accept the supply remains to be determined. Either way, there are serious implications for regional security surrounding the increased use of desalination within Israel. Likewise, the proposed Red Sea Dead Sea Water Conveyance can positively impact the security of the region. One benefit of the proposal, also called the Peace Conduit, is its potential to serve as a collaborative project in a region with a long history of conflict, helping Israel, Jordan and the Palestinian Authority work together to overcome the common challenge of water scarcity. However, if not implemented properly, the Red Sea Dead Sea Water Conveyance could pose a risk to the region. The political situation in the region is delicate and a botched scheme could damage moral and inhibit further peace efforts.

While these options present viable alternatives to the present state of water scarcity in the region, it should be noted that institutional capacity of each country to incorporate large-scale projects of this type varies greatly across the region. In Israel, large-scale desalination plants typically involve a high degree of private-sector participation. According to Deane, economic conditions within Israel are befitting private-sector participation due to the country's low credit risk, GDP and history of private-sector participation in other ventures (2002). Jordan may have a more difficult time gaining private-sector participation due to a below-investment grade country credit rating and a lower GDP, which would necessitate aid from lending agencies such as the World Bank (Deane, 2002). As GDP is an indicator of a country's ability to pay for water produced through large infrastructure projects and thus a driver or obstacle to private-sector participation (Deane, 2002), it can be deduced that the Palestinian Authority will find it even more challenging to encourage private-sector participation in large-scale water projects considering its low GDP relative to the other regional actors. These uneven conditions across the Jordan Basin will make it difficult for each player to benefit equally from any regional infrastructure project.

II. Case Study 1: Coastal Desalination

II. A. Description

II. A. 1. Background

The concept of desalination as an option to augment Israel's water supply has been discussed since the establishment of the State (Thomas, 2004). In a region where water scarcity has always served as a backdrop for water resources planning, desalination appears a promising solution by offering the opportunity to provide a stable water supply independently of climatic patterns (Garb, 2008). Desalination in its first form saved thirsty soldiers upon conquering Eilat in 1949, however rudimentary a process (Tal, 2002). Their technique was energy-intensive and expensive, costing US $240 per cubic meter (Tal, 2002). Well aware of the possibility of a water scarce future, Israel began investing in R&D of desalination technologies in the late 1950s (Dreizin et al., 2008). Then, with David Ben-Gurion as Prime Minister, desalination was given political support (Tal, 2002). The Prime Minister saw desalination as the hydrological solution to Israeli and the greater global water crises, and saw no reason why Israel could not establish itself as the world leader in this technology (Tal, 2002). Indeed, by the late 1950s, Israel began exporting desalination technologies (Garb, 2008). However, within Israel, the utilization of the technology was still in its nascent stages. In 1965, Tahal, Israel's water supply company, proposed a $100 million, 15-year desalination venture, which was adopted by the government (Tal, 2002). However, Ben-Gurion was no longer Prime Minister and so the funding never came through (Tal, 2002).

Israel operates several small-scale plants, which desalinate brackish groundwater (Thomas, 2004). A major plant in Eilat has been desalinating brackish water since 1978 and began desalinating seawater in 1997 (Adin, 2006). Other plants operate in the Arava region, but they do not supply the National Water Carrier (Garb, 2008). Israel has been able to delay the construction of large-scale desalination plants by capitalizing on the National Water Carrier and the aquifers that supply it, curtailing water use, and increasing water efficiency (Dreizin et al., 2008). Desalination was not going to be considered seriously until all other options to increase the water supply had been exhausted. In addition, the agricultural sector was heavily opposed to the new technology, the full cost of which they feared they would be forced to bear (Garb, 2008; Tal, 2002).

Soon, however, it became clear that Israel could no longer put off development of comprehensive desalination. Droughts in the 1990s, increased stress on aquifer resources (Dreizin et al., 2008) and an increase in urban water use (Garb, 2008) prompted the country to turn toward the option of desalination on a much larger scale. To that end, preparation of a Desalination Master Plan was initiated in 1996 and completed one year later (Dreizin et al., 2008). This plan estimated the desalinated water needs over a 20-year forecast, examined suitable sites for large plants, capacities of these plants, resultant water quality, and the costs and benefits of expanding the water supply and the assumed subsequent economic growth that would result both from increased water use and improved water quality (Dreizin et al., 2008).

Friction over sectoral water allocations were greatly intertwined with Israel's decision to move forward with desalination. Depletion of aquifer resources in order to satisfy the agricultural sector prompted the Israeli cabinet to approve a 50 MCM/year desalination plant in 1999 (Fischhendler, 2008). Shortly thereafter, in 2001, disagreements over sharing the burden of cutbacks between the agricultural and urban sectors caused a stalemate in the allocation process. Instead of reaching a decision, the aquifers were further depleted to cover the difference. This prompted an increase of the desalination scheme from 50 to 200 MCM/year (Fischhendler, 2008). Finally, on April 4, 2002, under Cabinet Decision 1682, the Israeli government adopted a timeline for the construction of four large-scale desalination plants totaling an output of 400 MCM/year (Garb, 2008). This number was later increased to five plants with a combined output of more than 500 MCM/year (Garb, 2008). Currently, Israel plans to augment its water supply by 750 MCM/year by the year 2020 (Israel Ministry of National Infrastructures, n.d.).

Israel now operates three large-scale desalination plants along the coast of the Mediterranean. The rise of this technology within Israel is ever more vital considering the changing climate. With the expected effects of climate change on the eastern Mediterranean, desalination will become increasingly valuable as a way to supplement Israel's water supply. Water will become increasingly scarce in Israel (Pe'er & Safriel, 2000). Climate change is expected to cause a decrease in precipitation and an increase in rain intensity, leading to increased water runoff, which, combined with limited rainfall, will diminish aquifer recharge (Pe'er & Safriel, 2000). Furthermore, sedimentation and salinization of aquifers will limit the amount of usable groundwater available (Pe'er & Safriel, 2000).

II. A. 2. Actors Responsible

The future of desalination in Israel hinges on the decisions of the ministers within the Cabinet of Israel, which approves the building of new plants. Israel's Ministry of National Infrastructures issued the plan to produce 750 MCM/year of desalinated water by 2020 in order to deal with Israel's water crisis (Waldoks, 2010). The Ministry of National Infrastructures also houses the Water Authority, which, along with the Ministry of Environmental Protection and Ministry of Finance invites local and foreign private sector companies to build the desalination plants (Waldoks, 2010). It is the responsibility of Mekorot, Israel's national water company, to incorporate supply from desalination plants into the country's National Water Carrier (Waldoks, 2010).

The chemical makeup of desalinated water is different from water derived from natural sources and as such has dietary implications (Garb, 2008). Thus Israel's Ministry of Health and the World Health Organization weigh in on the local and international drinking standards of desalinated water, respectively (Garb, 2008).

Likewise, the chemical makeup of desalinated water also holds implications for agricultural use (Garb, 2008). The agricultural community is therefore interested to ensure that the water is safe for crop use (Garb, 2008).

The energy sector will prove a major actor in Israel's desalination scheme because more power, supplied by the Israel Electric Company (Adin, 2006), is required to operate plants (Garb, 2008). In addition, the energy sector will be interested in situating power plants in close proximity to desalination plants because the two facilities can share resources (Adin, 2006).

Lastly, the private sector is a key actor when it comes to desalination in Israel. Desalination plants typically involve some degree of public-private partnership due to risk sharing capabilities (Garb, 2008). Table 2 lists the major actors involved with large-scale desalination within Israel.

Table 2: Major actors influencing desalination policy in Israel

Category	Actor Involved	Responsibilities/Interests
Government	Cabinet of Israel	Approves new plants
	Water Authority of Israel	Water policy and planning
	Ministry of National Infrastructures	Plans the State's water and energy projects
	Ministry of the Environment	Concerned with impacts on the environment and public health
	Ministry of Finance	Coordinates build-operate-transfer system of contracting plants
	Ministry of Health	Drinking water standards
	Mekorot	Supplies water to the National Water Carrier
International Community	World Health Organization	International drinking water standards
	Foreign Companies	Build and operate plants
Sectors	Agricultural Sector	Impact of desalinated water on crops, availability of water and water subsidies
	Energy Sector	Increased energy use to fuel new plants
	Private Sector	Building and operating plants

II. A. 3. Main Mechanisms

Desalination plants in Israel are contracted under the build-operate-transfer (BOT) method, whereby a foreign or Israeli company finances, designs, constructs, and maintains a facility and then sells it to the State after a specified amount of time (Shabtai,

n.d.). Usually, contract periods run for about 25 years (Dreizin et al., 2008). Increased water prices will help fund the costs to Mekorot of connecting the desalination plants to the National Water Carrier (Waldoks, 2010). This price increase also reflects Mekorot's challenge of converting the National Water Carrier from a north-south running system to one that will originate at the coast and span the length of the country (Waldoks, 2010). Through the construction of a relatively small amount of large-scale plants, Israel expects to provide 750 MCM/year of desalinated water by 2020 (Israel Ministry of National Infrastructures, n.d.).

One particular concern of the BOT method is the government's assurance that it will purchase water from the desalination plants at a fixed price even in the event of a wet year. In addition, desalination plants must operate year round, even during wet seasons. This has implications for human security from two standpoints. On the one hand, it presents the threat of conflict between consumers and the State while on the other hand stands to increase security in the region by offering a supply of water for nature. During a wet year or season, the government must purchase the desalinated water even though water is available from natural sources for a lesser price. This is translated into increased prices for consumers, who must purchase the desalinated water from the State. This creates conflicts between the State and consumers who may demand lower water prices. However, excess water that results from a wet year means more water is made available for the natural environment, such as aquifer recharge or stream restoration. This is noteworthy because aquatic ecosystems are recognized under Israeli Water Law as a sector warranting allocation of water resources. However, this particular sector was not recognized in the allocation process until relatively recently and, in addition, funding constraints have limited the actual amount of water allocated (Megdal et al., 2007). Recent research has examined potential sources of water for nature, such as treated effluent (Megdal et al., 2007). However, because desalination plants must operate even during a wet year, a potential source could be the surplus water from the plants (or the surplus resulting from natural rainfall during an unexpected wet year), which could be allocated to nature for the purposes of restoring aquatic ecosystems such as groundwater aquifers. This can help ameliorate the water scarcity crisis in the region by restoring aquifer quality and preserving the aquifers for storage, as noted in section *I. D. Implications of Climate Change*, which has positive implications for the human security of the region.

II. B. Evaluation

OECD's DAC Criteria for Evaluating Development Assistance will be used to evaluate Israel's desalination policies. The four criteria include relevance, effectiveness, efficiency and impact.

II. B. 1. Relevance

The current desalination policies at work within Israel are highly relevant. By addressing the country's water shortage, Israel's plan for large-scale desalination, by default, also addresses the security concerns of the region. This is in part due to the fact

that the region as a whole is experiencing a water shortage. According to Yakhin, the region (Israel, Palestinian Territories and Jordan) experiences an annual average water deficit of 70 – 120 MCM/year (2006). Israel expects to supplement its water supply with 750 MCM/year of desalinated water by the year 2020 (Israel Ministry of National Infrastructures, n.d.). Policies promoting desalination might ameliorate what can be termed 'hydro-hysteria': the concern over Israeli control of West Bank territory due to its hydrological importance as a contributor to the Israeli water supply (Garb, 2008). Capitalizing on desalination of Mediterranean seawater lessens Israeli reliance on water from Lake Kinneret, the Jordan River and underlying aquifers, making this water available to other regional users or reserving it for future dry years (Yakhin, 2006). In fact, experts contend that a focus on increasing Israel's water supply, or supply side management, will help reduce the stress on disputed natural water resources (Yakhin, 2006). It should follow that a country would applaud increased water infrastructure of its neighbour (Yakhin, 2006).

Desalination is relevant to local politics by way of water resource allocation amongst the different sectors within Israel, as mentioned briefly in *II. A. 1. Background*. Insecurity regarding the amount of water allocated to the agricultural sector has caused stalwarts in decision-making and ultimately led to overdrawing of aquifer resources. With desalination as a source of water, tensions between sectors can be eased, hopefully thereby improving water resource management and hastening the decision-making processes. This is especially critical during dry years when hasty decisions might be settled upon at the expense of better thought out alternatives.

With regard to climate, large-scale desalination negates Israel's need to rely on inconsistent wet years and fluctuating rainfall patterns characteristic of a varying climate (Garb, 2008). Climate change will only exacerbate Israel's already scarce supply of natural rainfall, thus making desalination even more important as a supplement to the Israeli water supply.

II. B. 2. Effectiveness

Currently, Israel produces around 300 MCM/year of desalinated water from three plants in operation, which is almost 40% of Israel's municipal water use (A. Tenne, personal communication, September 2, 2010). The Israeli cabinet recently approved the building of two additional plants, and one more is scheduled to come on line (Waldoks, 2010). Thus the country is well on its way to achieving its objective to provide 750 MCM/year by 2020.

The advancement of desalination in Israel makes it feasible for Israel to build plants to supplement the Palestinian Authority's water supply. In fact, a plant that would serve the Palestinian Authority was slated to open near the new Hadera facility (Kedmi, 2005). The proximity to the Hadera plant would result in decreased operating costs, which, combined with aid from the US, would result in reduced water costs (Kedmi, 2005). However, both political geography and long-held principles play an important role in whether or not the Palestinian Authority will agree to this offer. While the Palestinian Authority welcomes

regional initiatives that aim to relieve the water stress of the Jordan Basin, it worries that this cooperation will come at the expense of its rights to extract water from the Mountain Aquifer. The Mountain Aquifer is recharged by rainfall in the West Bank, but its direction of flow is toward Israel (Weinthal, Vengosh, Marei, Gutierrez, & Kloppmann, 2005; Isaac, 2000). The Palestinian Authority contests the cost of water produced through desalination and argues that it should not have to pay higher costs for desalinated water when it should be able to access the groundwater of the Mountain Aquifer, the rights to which it does not currently hold (Associated Press, 2010). Thus the Palestinian Authority has not yet agreed to incorporate the desalinated water from the Hadera plant into their supply ("Palestinian Water Authority," 2009). Therefore, the effectiveness of this arrangement is yet to be determined.

The main factors influencing achievement of desalination initiatives in Israel are likely the frequency of drought years and decreasing quality of groundwater aquifers due to over extraction, which prompted the government to move forward with measures to promote construction of desalination plants in order to supplement the existing water supply.

II. B. 3. Efficiency

The efficiency of Israel's plan for large-scale desalination is examined using a cost-benefit analysis prepared by Y. Dreizin (2006), which focuses on the Ashkelon desalination plant, and which is assumed to represent similar large-scale plants within Israel.

According to Dreizin (2006), benefits derived from a plant such as the one at Ashkelon include improved water supply quality and reliability and savings in energy required to pump water from the North. The total value of these benefits is estimated to be 15.2 US cents/m^3 (Dreizin, 2006).

The costs to the government of purchasing water from the Ashkelon desalination plant is estimated at 57.5 US cents/m^3 (Dreizin, 2006). Additional costs to the government include risks such as unforeseen events or plant idling time and are estimated to be 8.9 US cents/m^3, bringing total desalination water costs to 66.4 US cents/m^3 (Dreizin, 2006).

The net cost of desalinated water from the Ashkelon plant comes out to 51.2 US cents/m^3 (Dreizin, 2006). Dreizin (2006) compares this cost to the cost of supplying water to the Ashkelon area using natural sources. At the time of writing, this cost was estimated at 40 – 50 US cents/m^3 (Dreizin, 2006). Therefore, Dreizin (2006) estimates that desalination will cost an estimated 10.2 US cents/m^3 more than supplying the area with natural water sources. However, Dreizin (2006) argues that the Israeli economy requires, what is in his opinion, this higher quality water.

When comparing desalination to other water savings measures, such as wastewater effluent reuse and water saving campaigns, desalination costs the most but provides the greatest benefits in terms of million cubic meters of water supplied (Israel Water

Authority, 2010). According to the Israel Water Authority (2010), water saving campaigns cost US \$0.10/m^3, wastewater effluent reuse US \$2.98/m^3, and desalination US \$6.99/m^3. Figure 2 illustrates the cost benefit comparison between the three modes of water saving or production.

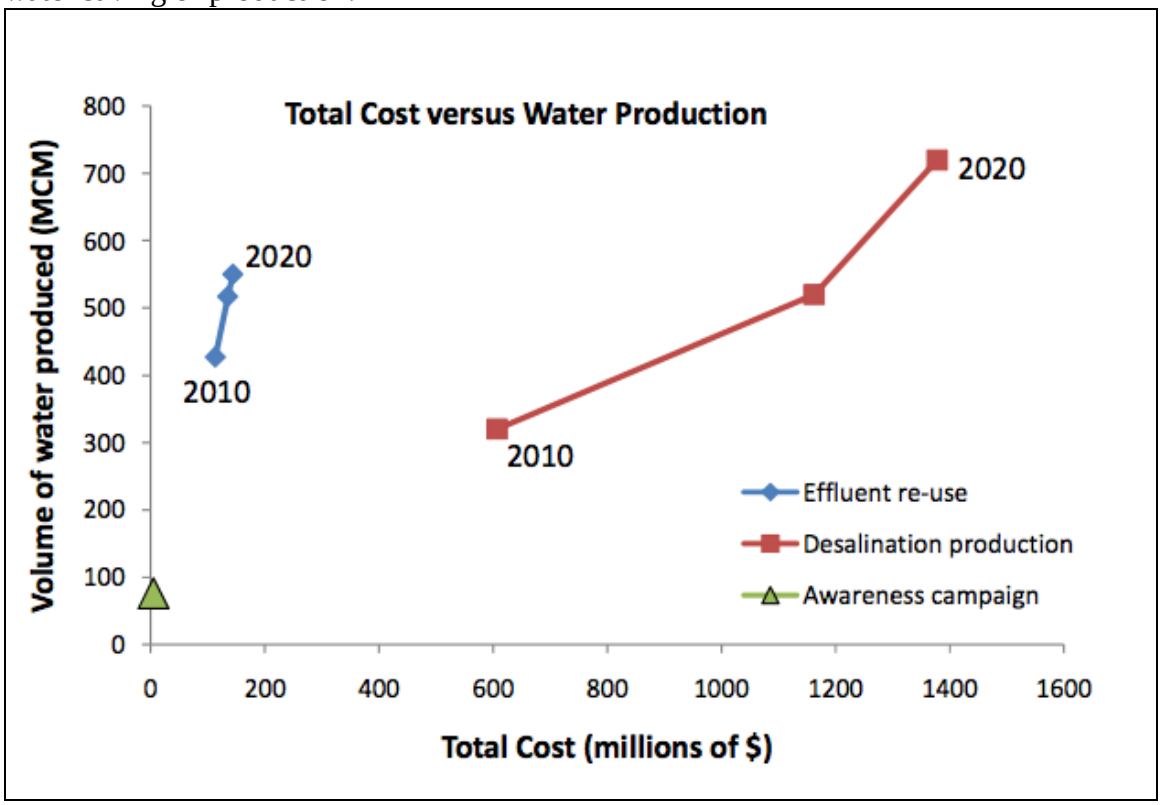


Figure 2: Comparison between the overall costs, in millions of US$, and benefits, in MCM, between wastewater effluent reuse, desalination and water savings ("awareness") campaigns. Awareness campaign-data are shown only for 2010. Effluent re-use and desalination are shown for 2010, 2015, and 2020 (chronologically from left to right, and connected by a line). Source: Israel Water Authority 2010.

II. B. 4. Impact

While desalination presents a likely choice through which Israel can supplement its water supply, the process is not without its drawbacks, particularly to the environment. Israeli environmental groups contend that several aspects of large-scale desalination have negative environmental implications. The Mediterranean Sea is known to be oligotrophic, or low in plant nutrients (Garb, 2008; Christaki, Wambeke & Bianchi 2003). This makes the sea more sensitive to discharge from industrial processes such as desalination. Discharge from the reverse osmosis process contains mainly ferric, or iron containing compounds, and polyphosphates used as an anti-scalant in the desalination process (Safrai & Zask, 2008). While the upmost care is taken to protect the membranes, or the equipment required in the reverse osmosis process, from damage, the effects of desalination on the Sea are not always considered in the equation. In fact, environmental protection groups in Israel have characterized the Mediterranean Sea as the "backyard" of the reverse osmosis desalination process (Safrai & Zask, 2008).

High volumes of ferric in the discharge brine create reddish plumes on the Sea's surface (Safrai & Zask, 2008). In total, 450 to 500 tons of iron are discharged to the Mediterranean Sea annually (Dreizin et al., 2008; Safrai & Zask, 2008). An argument surrounding the discussion on the impacts of desalination plants on the environment is whether this problem is one of mere aesthetics or an actual threat to the environment (Safrai & Zask, 2008). Regardless, large amounts of ferric have the potential to harm the marine environment in several ways. Increased suspended solids could cause decreased light penetration and thus decreased activity of primary producers, or accumulation could trigger an anoxic zone (Safrai & Zask, 2008). These effects could possibly impact the greater ecosystem, ultimately causing changes in the food chain (Safrai & Zask, 2008). However, it is perhaps still too early to know exactly how the Mediterranean Sea will be affected by increased desalination (Picow, 2010b).

In addition, the chemical makeup of desalinated water poses environmental concerns because it is different from water found in nature. Boron, which is found in small amounts in natural drinking water, is present to a greater degree in seawater (Garb, 2008). Certain crops are extremely sensitive to high boron concentrations (Garb, 2008). Thus Israel must employ boron removal processes and has therefore set stringent limits to boron concentration in desalinated water (Garb, 2008).

Desalination plants contribute to atmospheric pollution by burning nonrenewable resources (Garb, 2008). The contribution to greenhouse gas emissions juxtaposes the very problem that brought about the need for desalination – water scarcity – and is grounds for opposition to desalination plants by Israeli environmentalists.

Land use is another environmental impact of desalination. Facilities must be large in order to benefit from economies of scale (Garb, 2008), but this means more land set aside for industrial purposes as opposed to nature, recreation or tourism (Qutob, 2004). This is especially critical when the plants must be situated on Israel's limited coastline within close proximity to the sea.

Finally, there are concerns that the desalinated water will cause harm to the water conveyance system due to its chemical makeup. The water may be acidic enough to cause corrosion to pipes (Garb, 2008). While not only damaging the system, this process also causes other toxic metals to form in the water, though the problem can be corrected with post-treatment (Garb, 2008). Desalinated water is also found to be lower in ions, which are an important dietary supplement, and must be chemically added (Garb, 2008).

III. Case Study 2: Red Sea Dead Sea Water Conveyance (RSDSC)

III. A. Description

III. A. 1. Background

Given the consistent rise in demand for municipal water in Israel (Lautze, Reeves, Vega & Kirshen, 2005), it is likely that water will continue to be diverted from the Jordan

River and thus the Dead Sea (Gavrieli, Bein & Oren, 2005). Coupled with this trend are forecasts that climate change will cause a decrease in precipitation but an increase in rain intensity, leading to water runoff (Pe'er & Safriel, 2000), which will further strain the water resources of the country. As anticipated sea level rise threatens the viability of the Coastal aquifer (Feitelson et al., 2007), Israel is prompted to explore other methods of supplementing its water resources. Add to this a regional water scarcity felt not only by Israel and the Palestinian Authority but perhaps more strongly by neighboring Jordan.

Consider as well the deteriorating state of the Dead Sea, which is characterized by a negative water balance; evaporation from the lake is far greater than the amount of water it receives (Gavrieli et al., 2005). Mainly due to diversion of its receiving waters, the level of the Dead Sea has fallen by more than 25 meters since the early 1900s and now stands at -416 meters (Gavrieli et al., 2005). As such, a solution that provides an additional source of freshwater to the region, the prospect of a joint regional project with peaceful repercussions, and an opportunity to stabilize the water level of the Dead Sea is ideal.

While still undergoing feasibility studies, the proposed Red Sea Dead Sea Water Conveyance (RSDSC) would offer such a solution. The basic idea of the plan is to transport water from the Red Sea at the Gulf of Aqaba to the Dead Sea, utilizing the drop in elevation to create hydroelectricity to fuel a desalination plant (Katz-Mink, 2010). Brine discharge would be deposited into the Dead Sea to elevate its declining water level (Katz-Mink, 2010). In addition to these positive impacts, it is also hoped that the RSDSC will serve as a peace-building initiative among Israel, Jordan and the Palestinian Authority. In fact, the project has been coined the "Peace Conduit" as it is hoped that cooperation over the transboundary project will foster amicable relations between Israel, Jordan and the Palestinian Territories (Katz-Mink, 2010).

A water conveyance project of these proportions is not new. Plans originated in the mid-1800s when William Allen first proposed a network of canals connecting various water bodies in the Middle East as an alternative to the Suez Canal (Katz-Mink, 2010). Then, in the early 1900s, in his book *Altneuland*, Theodore Herzl expounded on the idea of a canal that might pipe water from the Mediterranean Sea to the Dead Sea in order to create hydropower (Gavrieli et al., 2005; Katz-Mink, 2010). Following the 1973 energy crisis, this idea resurfaced in the form of the Mediterranean Sea – Dead Sea Company, which examined the feasibility of such an endeavor, finally deeming it economically taxing (Gavrieli et al., 2005). Additionally, international opposition to the project halted progress on such a pipeline (Gavrieli et al., 2005). As of late, interest in a Mediterranean – Dead Sea pipeline has waned, while attention has turned towards the Red Sea Dead Sea Water Conveyance. The possibility of including a desalination plant to offset Jordan's water shortage has reestablished interest in the project and increased its relevance in the face of the current water crisis and the impending effects of climate change.

III. A. 2. Actors Responsible

The World Bank is one of the main players in the proposed Red Sea Dead Sea Water Conveyance. Its involvement began in 1998 with a pre-feasibility study financed by the Italian government. In 2002, the World Bank Technical Assistance Mission visited Jordan to judge support for the water conveyance (Fischhendler, Wolf & Eckstein, n.d.). Soon thereafter the Steering Committee was established, which includes Israel, Jordan and the World Bank. The Steering Committee formulated the Terms of Reference (ToR), a set of stipulations governing the Red Sea Dead Sea Water Conveyance (Fischhendler, Wolf & Eckstein, n.d.).

The ToR went through several iterations between 2002 and 2005 before acceptance by the participating parties. At first, the Palestinians were not included in the agreement. However, once it was decided to include the Palestinian Authority as a partner, and in order to satisfy all parties to the agreement, the language of the ToR had to be revised repeatedly. Specifically, the meaning of "parties" had to be carefully defined. In earlier versions of the ToR, Israel, Jordan and the Palestinian Authority were each named "riparian", a legal term that refers to the states that border a water body. Israel, however, felt that this definition allowed the Palestinian Authority precedent that could be used in negotiations with Israel over permanent status issues, meaning issues pertaining to Jerusalem, refugees, settlements, security, and borders (Israel Ministry of Foreign Affairs, n.d.). More precisely, by implying a shift in the balance of power away from Israel, the term "riparian" threatened the security of Israel's water resources in future peace negotiations with the Palestinian Authority (Fischhendler, et al., n.d.). However, the Palestinian Authority felt that a term was required that would express their equal involvement in the project (Fischhendler, et al., n.d.). The term "beneficiary parties" thus satisfied both Israel and the Palestinian Authority and was incorporated into the 2004 draft (Fischhendler, et al., n.d.).

On May 22, 2005, the beneficiary parties of Israel, Jordan and the Palestinian Authority agreed to commence studies into the feasibility of the RSDSC project (Fischhendler, et al., n.d.). The World Bank is coordinating the research required to determine the viability of the project, which includes a feasibility study assigned to the French Firm Coyne et Bellier, and an environmental and social assessment, headed by the British firm Environmental Resources Management (World Bank, 2010). In addition, a study of alternatives to the scheme, Red Sea modeling study, and Dead Sea modeling study are underway (World Bank, 2010). If the canal is constructed, the World Bank will seek financing for the project with help from international donors (World Bank, 2010). The World Health Organization is another international actor, stressing careful supervision of desalinated product water to ensure that proper minerals are supplied, such as calcium and magnesium (Caspi-Oron, 2010). Israel, Jordan and the Palestinian Authority, as beneficiary parties, will receive desalinated water produced as a result of the project (Environmental Resources Management, 2010b). As such, each country has its own set of entities responsible for overseeing the project and monitoring its influence within its borders. In Israel, Mekorot will be responsible for distributing water once the desalination plant is constructed (Environmental Resources Management, 2010b). Additionally, the Water Authority of Israel is a member of the Technical Steering Committee, the body that oversees the studies being led by the World Bank (Environmental Resources

Management, 2010b). Other entities of the Israeli Cabinet involved in the proposed Red Sea Dead Sea Water Conveyance include the Ministry of Environmental Protection, the Ministry of National Infrastructures, the Ministry of Interior, the Ministry of Health, and the Ministry of Industry, Trade and Labor (Environmental Resources Management, 2010b). Table 3 lists the major Israeli actors influencing the RSDSC.

From a regional standpoint it is important to consider other nations that may be impacted by the RSDSC. Egypt, while not a riparian to the agreement, is a riparian to the Red Sea and may be concerned about pumping large amounts of water from the Red Sea and the impacts this may have on the marine environment. From the little information available on Egypt's attitude toward the proposal, it appears as though Egyptian environmentalists were originally concerned with the plan but have since determined it important to alleviate Jordan's water crisis (Joshi, 2009). However, pending completion of the study program, it may be too early to say what, if any, negative impacts the proposal will have on the Red Sea (Hazaimeh, 2008).

Table 3: Major Israeli Actors Influencing the Proposed Red Sea-Dead Sea Canal in Israel

Category	Actor Involved	Responsibilities/Interests
Government	Cabinet of Israel	Approves projects
	Water Authority of Israel	Responsible for water policy and planning
	Israeli Ministry of National Infrastructures	Plans the State's water and energy projects
	Israeli Ministry of the Environment	Concerned with impacts on the environment and public health
	Israeli Ministry of Health	Sets drinking water standards
	Mekorot	Supplies water to the National Water Carrier
International Community	World Bank	Coordinates Study Program
	World Health Organization	Promotes international drinking water standards
	Consulting Firms	Conduct feasibility study and impact assessment
	Foreign Nations	Contribute monetary aid
Sectors	Energy Sector	Prepares for increased energy use to fuel new plants

III. A. 3. Main Mechanisms

The Red Sea Dead Sea Water Conveyance proposal presents an alternative to both mitigate the water scarcity crisis in the region and rehabilitate the dwindling state of the

Dead Sea. The project aims to accomplish several endeavors. It would provide a source of freshwater, hydroelectricity (Abitbol, 2009), restore the level of the Dead Sea, and provide the opportunity for joint management in a region with a long history of political strife. The multi-lateral project would feature a canal or pipeline that would span a distance of 180 km (Katz-Mink, 2010), transporting up to 1.8 billion cubic meters of water annually (Global Water Intelligence, 2002). As is depicted in Figure 1 (in section *I. A. Geography of the Jordan Basin*), water would be pumped from the Red Sea at the Gulf of Aqaba, transported 125 meters above sea level and then pumped towards the shores of the Dead Sea (Katz-Mink, 2010). Capitalizing on the elevation difference, water would then descend 400 meters in order to reach the Dead Sea, creating hydropower that would then be used to fuel a desalination plant (Gavrieli et al., 2005).

The Red Sea Dead Sea Water Conveyance would operate in two phases. The project would be composed of an early phase whereby seawater from the Red Sea would be pumped to the Dead Sea (Gavrieli et al., 2005). Once the level of the Dead Sea is stabilized, the second phase of the project would entail input of brine from the desalination process in order to maintain a specific lake level while at the same time providing a much-needed source of freshwater for the region (Gavrieli et al., 2005).

The freshwater obtained from the desalination plant would be used to augment the water supplies of Jordan, Israel and the Palestinian Territories (Coyne et Bellier, 2009). The plant's capacity is expected to reach approximately 800 MCM/year (Coyne et Bellier, 2009). Although specific allocations to each state have not yet been finalized, interim estimates predict that Israel will receive approximately 60 MCM/year of potable water by the year 2020 (Coyne et Bellier, 2009). Due to the project's low elevation, it would not be economically feasible to transport the water to higher regions within Israel. Therefore, water provisions would be limited to the vicinities of the Arava Valley, Dead Sea and other low-lying population centers (Coyne et Bellier, 2009).

Before the Red Sea Dead Sea Water Conveyance can be implemented, the project's impacts and possible alternatives must be thoroughly examined, hence the ongoing Feasibility Study and Environmental and Social Impact Assessment. The World Bank secures funding for and manages these tasks, known collectively as the Study Program (World Bank, 2010). To date, the World Bank has received commitments from France, Greece, Italy, Japan, South Korea, The Netherlands, Sweden and the United States to donate to a multi-donor trust fund amounting to US $16.7 million to finance the Study Program (World Bank, 2010). As part of the Feasibility Study, consultants will be responsible for identifying the various components of the project that could attract funding, and then seek funders willing to finance a given component (ToR, 2005). For example, environmental NGOs may be willing to contribute funds towards saving the Dead Sea, while private companies might be interested in investing in energy generation through the project. Regardless, funding will come from multiple sources (ToR, 2005).

III. B. Evaluation

OECD's DAC Criteria for Evaluating Development Assistance will be used to evaluate the proposed Red Sea Dead Sea Water Conveyance. The four criteria include relevance, effectiveness, efficiency and impact.

III. B. 1. Relevance

With the impending negative effects of climate change on the Eastern Mediterranean, the proposed Red Sea Dead Sea Water Conveyance is a highly relevant plan. By providing potable water to a water-scarce region that will no doubt be further strapped for water due to climate change, by serving as a Peace Conduit, and by improving the state of the Dead Sea, the proposal addresses issues precisely at the intersection of climate change, drought and human security.

From an environmental perspective, the Red Sea Dead Sea Water Conveyance will help ameliorate the condition of the Dead Sea. The decreasing water table of the Dead Sea is severely impacting the geomorphology of the region and, in turn, the economic vitality of the area (Yechieli, 2006). The decreasing water level of the Sea increases the hydraulic gradient, or slope of the flow of groundwater, of the surrounding area, which increases groundwater flow into the Sea (Yechieli, 2006). This has been linked to the formation of sinkholes in the region (Gavrieli et al., 2005). This dangerous effect has prompted a building freeze, which no doubt has had negative repercussions for the tourism industry of the region, which relies on hotels and spas (Gavrieli et al., 2005). In addition, the decline in the water level in the northern end of the Dead Sea is causing the shoreline to inch away from the hotels and spas that benefit from their proximity to the water's edge (Anderson, 2005). On the other hand, in the southern end, where the mineral companies have built evaporation ponds, the water level is rising due to sedimentation of minerals, threatening the infrastructure along the shore (Anderson, 2005). Adding water in order to raise the level of the Dead Sea will create a positive water balance whereby inflow will exceed evaporation, and is viewed as the only way to overcome this challenge (Beyth, 2002).

From a security standpoint, the project holds positive implications for human security in the region: it would be the first joint project between Israel, the Palestinian Authority, and Jordan (Beiser, 2010). The project could cultivate positive relations as Jordan and Israel work together towards a common goal. Cooperation over a project meant to benefit two entities has the potential to reinforce each side's mutual dependence on the project, which would translate to interdependence and peaceful relations between the two states (Lowi, 1993). Furthermore, collaboration precludes corruption; perversion from either side ruins the project for both parties involved (Scherr, 2007). Therefore, it is in the interest of both actors to follow protocol. If the joint activity serves to improve relations between the two states, it could in turn improve overall security throughout the region. Certainly, cooperation is crucial. At one point or another both Jordan and Israel have devised their own versions of canal schemes. Examinations into the feasibility of both nations' plans have deemed a joint project as the only economically acceptable possibility (Katz-Mink, 2010). Fortunately, the 1993 Oslo Accords between Israel and the Palestinians and the 1994 Peace Treaty between Israel and Jordan opened the door for regional cooperation,

stressing the importance of joint projects aimed at increasing the water supply and a general understanding that shared projects will benefit all parties involved (Katz-Mink, 2010).

Indeed, peace is included as an intangible benefit within the economic analysis of the project. And, as pointed out by the World Bank (2005), peace is more likely to be achieved over tangible projects than through abstract terms. In other words, if Israel and Jordan work on a project that they both want and both believe will benefit them, then the joint work will bring them closer. Both parties can then take these experiences and roll them over to other areas of cooperation (ToR, 2005).

Another implication for human security in the region arises out of the project's aim to supplement the water resources of the region. The project would provide desalinated water to the beneficiary nations, with the majority going to Jordan. The water stress felt by Jordan is indicated by its planning of a unilateral conveyance project even before the Study Program of the joint project has been completed (Namrouqa, 2009). To that end, in 2009 Jordanian officials had requested that the Study Program process be sped up so that Jordan can utilize the results sooner (Namrouqa, 2009). Clearly, the additional water source provided by the canal would lessen the strain on existing resources. An increase in the water supply would thus represent a boon to the state of human security in the region by preventing future conflicts (Rumman, 2009). And experts argue that some environmental damage, as is inevitable and will soon be discussed, might even be worth the benefits of peaceful relations that such a project could encourage (Beiser, 2010). The joint project, however, must be implemented carefully so as not to exacerbate an already sensitive political situation. In this sense, the Red Sea Dead Sea Water Conveyance project is a double-edged sword and must be thoroughly evaluated during the Study Program.

III. B. 2. Effectiveness

Because the Red Sea Dead Sea Water Conveyance is only a proposal with the Feasibility Study and Environmental and Social Assessment currently in progress, one can only speculate as to the *future* effectiveness of the proposal. In addition, because there are multiple objectives to the project (improving the state of the Dead Sea, providing a source of drinking water, and serving as a Peace Conduit), which depend on different factors, to forecast the entire policy's effectiveness in detail is beyond the scope of this paper.

At this point it is not known whether the RSDSC will achieve the objective of improving the state of the Dead Sea. Factors affecting the achievement of this goal depend on the results of the studies now being performed. The data collection for the Dead Sea Modelling Study, which examines the impacts that the project will have on the Dead Sea, has been completed but data analysis is not yet finished (Environmental Resources Management, 2010a). It is expected to become available by December 2010 (Environmental Resources Management, 2010a).

It is highly likely that this proposal will succeed in providing a source of drinking water for the region. According to the Options Screening and Evaluation process of Coyne et Bellier (2010), the consulting firm heading the Feasibility Study, the desalination plant will be built to increase in capacity along with the rise in demand for potable water in the region to a maximum capacity of 850 MCM/year. The consulting firm has also identified two possible locations for the desalination plant site, both in the vicinity of the southern shore of the Dead Sea (Coyne et Bellier, 2010). This objective thus seems promising. The achievement of this objective, however, depends on the results of the Dead Sea Modelling Study. If the impacts on the Dead Sea are deemed too risky, then the conduit may not be implemented and the question of a desalination plant in the region would be moot.

Finally, it is perhaps too early to comment on whether the policy will be effective at increasing security in the region via improved relations between Israel, Jordan and the Palestinian Authority. Among the multiple factors that will influence achievement of this objective are the likelihood that the project will reach implementation, the success of the conduit if it does reach implementation, and the willingness of each beneficiary party to put past tensions behind them and work together towards a common goal.

III. B. 3. Efficiency

It is estimated that construction of the Red Sea Dead Sea Conveyance would take 10 years to complete (Katz-Mink, 2010). Estimates of the cost range from US $800 million as an initial investment (Israel Ministry of Foreign Affairs, 2002) to US $4.2 billion as a total investment (Israel Ministry of Foreign Affairs, 1995) to US $5 billion, with a more recent estimate suggesting far more, around US $15 billion (Picow, 2010a). Because the feasibility studies are still underway, the economic analysis has not been published yet. Therefore it is impossible to know for sure whether or not the project will be cost-effective. However, the Harza Group conducted a feasibility study in 1994 (Katz-Mink, 2010), and found that producing desalinated water from such a scheme may not be the most cost-effective solution as compared to providing water from desalination plants already in operation (Berke, 1998).

Despite this, multiple benefits may be borne out of the project that will be evaluated in an economic study of the project's cost-effectiveness. These benefits are divided into intangible and tangible benefits. Intangible benefits include saving the environmental state of the Dead Sea, reassuring the existence of a cultural heritage site, and lastly the potential peace dividend that will hopefully result from the project (ToR, 2005). Tangible benefits include the tourism and chemical (potash) industries that will be able to continue flourishing if the deterioration of the Sea is halted (ToR, 2005). Potable water supply and energy generation are also tangible benefits (ToR, 2005). Finally, job creation is cited as an important tangible benefit of the project (ToR, 2005). Employment plays a significant role in establishing and maintaining human security and stability by improving the economies of the parties involved (ToR, 2005).

III. B. 4. Impact

Given the goals of the Red Sea Dead Sea Water Conveyance proposal, the intended environmental impacts of the project are undoubtedly positive. It is anticipated that raising the level of the Dead Sea will provide stability to a region that is facing severe environmental decline due to human interference. As mentioned in section *III. B. 1. Relevance*, inputting water in order to raise the level of the Dead Sea is expected to halt the formation of sinkholes and restore the lake's original shoreline.

While the project could bring stability to the region, it should be noted that many questions remain about the effects of such interference on the ecology of the Dead Sea (Gavrieli et al., 2005). One such obstacle to the proposal is the unknown effects of mixing Dead Sea water with Red Sea water, and, in addition, mixing Dead Sea water with brine from the desalination process (Gavrieli et al., 2005). The addition of Red Sea water to the Dead Sea may have negative chemical and ecological effects (Gavrieli et al., 2005).

Most notable of the probable changes are the affects on the mineral composition of the Dead Sea, specifically increased gypsum formation (Gavrieli et al., 2005). Sulfate from incoming seawater will mix with calcium found in the Dead Sea to create gypsum (Gavrieli et al., 2005). Concern regarding this mineral combination arises from the likelihood that the gypsum will remain on the surface of the lake, which, as demonstrated in laboratory experiments, could whiten the water's surface (Gavrieli et al., 2005). The reflectivity of the water's surface determines the rate of evaporation from the lake (Gavrieli et al., 2005). If this is affected, the climate surrounding the Dead Sea could undergo changes (Gavrieli et al., 2005).

Additionally, the input of seawater or freshwater could cause algal blooming, which would give the lake a greenish-brown color (Gavrieli et al., 2005). Green algae consume phosphate, which would be introduced to the Dead Sea with the addition of water from the Red Sea (Gavrieli et al., 2005). Even more phosphates could enter the Dead Sea with the brine discharge that will be pumped from the proposed desalination plant, since most reverse-osmosis plants use polyphosphate-based compounds to prevent scaling (Gavrieli et al., 2005). Long periods of algal blooming could lead to increased water turbidity on the Sea's surface, which would speed up evaporation from the lake (Gavrieli et al., 2005). Thus more water would need to be supplied to the lake in order to maintain its desired level (Gavrieli et al., 2005).

A further change that could result from the addition of seawater to the Dead Sea is the formation of an anoxic lower water level in the Sea (Gavrieli et al., 2005). This would hold implications for mineral companies by affecting how they withdraw water from the Dead Sea (Gavrieli et al., 2005).

In addition, building of the proposed canal, desalination plant and hydropower facility would have significant impacts on land use in the region. The construction of such facilities would disrupt the natural ecosystem of the region, as well as decrease land available for recreational (Caspi-Oron, 2010). In addition, there are dangers inherent in

transporting highly saline seawater across a large expanse of the Arava aquifer, as is illustrated in Figure 1 (section *I. A. Geography of the Jordan Basin)*, especially in a seismic zone (Caspi-Oron, 2010). If the proposed canal or pipeline were to leak, it could damage freshwater stores below ground (Caspi-Oron, 2010).

Finally, use of the desalinated water produced as a result of the project carries its own public health concerns. Desalinated water is low in calcium and magnesium, essential minerals that must be added to the water prior to distribution (Caspi-Oron, 2010).

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clico
Climate Change, Hydro-conflicts and Human Security

SEVENTH FRAMEWORK PROGRAMME

Inventory and evaluation of policies and institutions in Italy

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Abstract

In relation to CLICO research, if we look at particular natural hazards such as floods and landslides, it is worth noting that hydrogeological risks represent the most frequent natural hazard occurring in Italy. In the last 80 years, more then 5,000 floods and 11,000 landslides have affected the Italian territory. On average, landslides provoked more than 60 fatalities and damages of one billion € (0.15 of GDP on average) for every year of the twentieth century. Climate change will boost extreme weather conditions with higher seasonal variation that can enhance the probability of floods, droughts and landslides. The links between precipitation and landslides is an object of debate and ongoing research, but there are serious concerns that changes in the distribution of rainfall may combine with other socio-environmental factors to increase landslides risks and damages in vulnerable regions.

The political status quo in Italy is not in a condition that allows an assessment of climate change policies. However, the present report offers a review of policies and actions developed in Italian territory with the aim of taking some steps towards adaptation actions and strategies for the country.

The present work analyses how these two important institutions such as ISPRA and NCPS put in place actions to increase awareness of climate change amongst Italian citizens, and whether they take into consideration how the degradation and/or depletion of the environment increase human insecurity and vulnerability.

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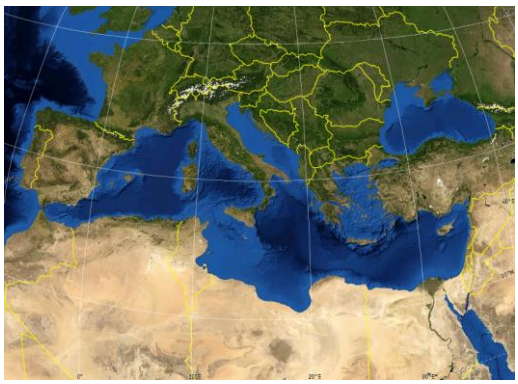
1. Inventory and evaluation of policies and institutions in Italy

1.1 Introduction

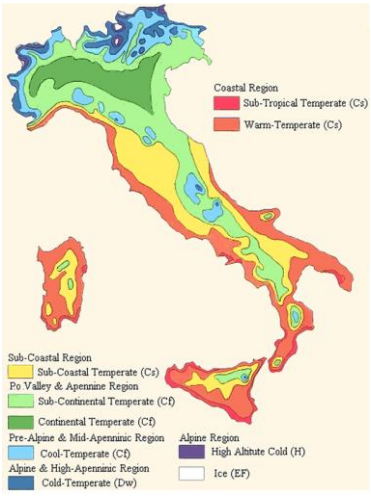
Italy is located in Southern Europe and is surrounded by the north of the Mediterranean Sea (Fig.1). Italy shares with other Northern Mediterranean countries environmental characteristics such as: semi-arid climatic conditions, presence of sub-humid areas, seasonal droughts and high rainfall variability with sudden and violent rains. Moreover, it is characterized by steep slopes, and fragmented landscapes, which suffer from soil erosion (Ceccarelli et all 2006, Perini et al. 2008).

Fig. 1 - Mediterranean Sea. Source: Wikipedia commons[1]



The Italian peninsula has a distribution of climatic characteristics typical of the Mediterranean region. Nevertheless, Italy can be divided into climatic regions with different geographical features due to numerous factors such as the structure of mountain slopes, the position in relation to the sea and the European continent. The Air Force Weather Service distinguishes nine main regions (Fig. 2) that vary from the cold temperature of alpine and high Apennine regions, to the sub-tropical temperate climates of some coastal regions in the South and islands, and the continental temperate of the Po valley and Apennine regions.

Fig. 2 – Italian climatic zones. Source: consumi e clima[2].



[1] http://commons.wikimedia.org/wiki/File:Mediterranean_Sea_political_map-blank.svg

[2] http://www.consumieclima.org/glossario.html

Other socio-environmental characteristics are also important to understand the complexity of the Italian territory, such as: the extensive forest coverage losses caused by human induced fire, both accidental and deliberate; the crisis of traditional agriculture and consequent land abandonment and soil deterioration; the unsustainable exploitation of water resources leading to serious environmental damage, including chemical pollution, salinization and the depletion of aquifers; the concentration of economic activities in coastal areas due to urban development, industrial activities, tourism and irrigated agriculture. All of these features were deemed problematic by the Italian government in the first National Communication to Combat Drought and Desertification (CIPE 154/1998). As the National Action Program to Combat Drought and Desertification (CIPE n. 229/1999) states: "*the most relevant problems along the Italian territory are traceable to human activities, in association with frequent extreme climatic events*". These conditions are most prevalent in the South of Italy but are present throughout the country. Nearly the entire Italian national territory is exposed to some type of major natural hazard. The cost over the last two decades is estimated to be 100 billion €, including damage to critical infrastructure. Within the OECD Countries, Italy has one of the highest percentages of GDP expenditure for natural disasters (OECD, 2010). In relation to CLICO research, if we look at particular natural hazards such as floods and landslides, it is worth noting that hydrogeological risks represent the most frequent natural hazard occurring in Italy. In the last 80 years, more then 5,000 floods and 11,000 landslides have affected the Italian territory. On average, landslides provoked more than 60 fatalities and damages of one billion € (0.15 of GDP on average) for every year of the twentieth century.

In Italy, the signs of climate change are mainly related to a reduced overall rainfall, with more frequent heavy rainfall as the major contributor to the total rate of annual rainfall, and increasing temperatures. (Ceccarelli et all 2006, Perini et al. 2008). Weather models forecast diminishing precipitations in Southern Europe, as well as an increase in extreme precipitation events (Carraro, 2008). Climate change will boost extreme weather conditions with higher seasonal variation that can enhance the probability of floods, droughts and landslides (OECD 2010). The links between precipitation and landslides is an object of debate and ongoing research[3], but there are serious concerns that changes in the distribution of rainfall may combine with other socio-environmental factors to increase landslides risks and damages in vulnerable regions. In Italy, it is clear that a large surface area shows aspects of land degradation which can be related to incorrect land management (Enne and Luise 2008), conducted in a fragile territory in the process of climatic change.

All the above-described issues call for the development of an adaptation strategy to climate change in Italy. Indeed, the Ministry of Environment, Land and Sea Protection, in 2007, organized the first National Conference on Climate Change[4], to develop a road map for the adoption of an adaptation plan. It helped to draw a first set of recommendations on adaptation measures and to stimulate debate, reserving a major follow up role for the Institute for Environmental Protection and Research (ISPRA). Conference participants outlined thirteen actions for a sustainable adaptation within a three-year timeline. In 2009 a European comparative study of different national adaptation strategies ranked Italy among the few countries with no available information (Swart el al. 2009). Thus, it is clear that the conference participants did not succeed in their ambitions. Currently, after almost four years, Italy still does not have a national adaptation strategy to climate change. OECD (2010) suggested that the National Civil Protection System (NCPS) could launch action plans to improve public understanding of climate change impacts on hydrogeological risks and heat waves. This action will revitalize the dormant debate, but it may struggle to reach any significant results at this time when the Italian parliament is characterized by positions denying

[3]European Commission in seventh framework programme is financing a consortium of University to improve the knowledge about the topic. The name of the project is SafeLand. http://www.safeland-fp7.eu/Area1.html

[4]http://www.apat.gov.it/site/it-IT/APAT/Conferenza_Cambiamenti_Climatici_2007/

climate change. In fact, the Senate of the Italian Republic approved a motion asking for a revision of the IPCC model and the 20-20-20 European Agreement (Senate of the Republic – 342nd Assembly, motion 1-00248, 2010). This motion confirms the inflexible attitude of the current Italian government resisting the UK and the Netherland's proposal for a 30% greenhouse reduction target for European countries (Cable 10THEHAGUE54, 2010).
It is then possible to observe that the political status quo in Italy is not in a condition that allows an assessment of climate change policies. However, the present report offers a review of policies and actions developed in Italian territory with the aim of taking some steps towards adaptation actions and strategies for the country. The general framework developed by CLICO partners suggested useful research questions to shed light on the Italian case, such as: *what is the relative importance of environmental risks compared to social and political factors? What constitutes the capacity of states and their institutions and other organizations to implement change, or even radical change necessary under times of stress? Under what conditions might policies of adaptation to perceived or experienced climate change impacts increase the vulnerability of some groups and/or exacerbate social conflict?* (Goulden and Porte 2010).
Two national institutions emerged from climate change debates as important actors in the development of a national adaptation plan. In 2007 in the National Conference on Climate Change there was general consensus that the central organization should be ISPRA. At the same time, the OECD (2010) has also highlighted the importance of NCPS to develop a better understanding of climate change implications in Italy. Starting from these agreements and suggestions, the present work analyses how these two important institutions put in place actions to increase awareness of climate change amongst Italian citizens, and whether they take into consideration how the degradation and/or depletion of the environment increase human insecurity and vulnerability. NCPS was created to ensure the security of Italians against major events, for this reason it is important to investigate some of the actions it puts in place to reduce vulnerability at different scales. In order to understand how NCPS tries to reach its objectives in its ordinary responsibilities, the second section assesses the River Operation campaign dealing with hydrogeological risk in Italy, developed by the Department of Civil Protection and Legambiente (an environmental NGO).
In order to investigate the other important Italian organization working on climate issues, the third section evaluates the climate change related items in GELSO, a database developed by ISPRA to collect the best practices on sustainability issues in Italy.
The fourth section will delineate some general conclusions.

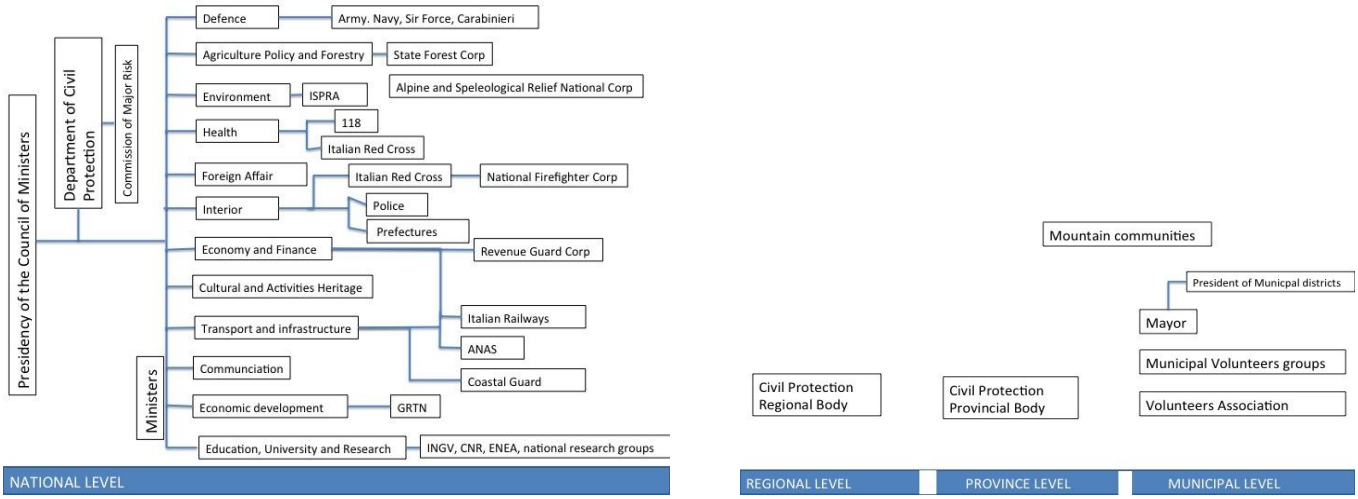
2. Ecosystems at Risk

As mentioned in the introduction, nearly the entire Italian national territory is exposed to some type of major natural hazard. To face this enormous problem, Italy set up the National Civil Protection System (NCPS). NCPS is a set of institutions and organizations responsible for managing any kind of disasters, such as earthquakes, volcano eruptions, floods, tsunamis, landslides, and forest fires in Italy. Investigating the NCPS will allow us to understand whether or not over the last decades Italy has been developing a coherent multi-risk approach to systematic natural hazard as the OECD 2010 report pointed out. The present overview of course cannot give an exhaustive response to the above question, but can probably delineate some characteristics and limits of the NCPS. The focus of the present analysis is "Operazione Fiumi" (Rivers Operation), a campaign devoted to information and prevention measures for adaptation to hydrological risk. In 2003, Legambiente, one of the most important Italian environmental NGOs, developed it in conjunction with the Department of Civil Protection (DCP).

2.1 The National Civil Protection System

All around Europe, the expression 'civil protection' is used to describe organized actions, driven by the State, aimed at coping with collective threats caused by natural or human induced disaster.
In Italy, Law n. 225/1992 instituted the National Service of Civil Protection for the safeguard of human lives, health, economic assets, cultural and architectural heritage, human settlements and environment from any kind of disaster either natural or man made (art. 1). Several articles (Artt. 8-17) describe the NCPS as a complex system of governance (FIG.1) where each institution and organization contribute and collaborate using their procedures and regulations. Volunteers (art. 18) have a very important role; indeed they are officially involved in the governance and participate to formal training while also autonomously organising informal training initiatives.
The vertical coordination from municipal level to national level is based on the 'subsidiarity' principle; this means that the central authority, i.e. the head of DCP, performs only those tasks, which cannot be performed effectively at local level, i.e. by the Mayor. The Mayor has primarily the responsibility for civil protection toward the local community, i.e. (s)he has to organize local resources to deal with the emergency according to fixed plans and specific risks of each area.

Fig. 1 National Civil Protection System



When a disaster occurs, the NCPS defines the scope of the event and assesses if local resources are sufficient to cope with it. If this is not the case, additional resources at provincial and then at regional level are mobilized. In case of a serious situation, the national level integrates local forces. National emergencies are the responsibility of the Head of Civil Protection Department, while the President of the Council of Ministers takes political responsibility. The Italian model situates DCP under the Presidency of the Council of Ministers ensuring coordination of resource use by central government, local government and the private sector. According to OECD (2010) this joined-up ability of the Italian model is spurring imitation on the part of other countries, in order to deal with public safety and security services at different scales. However the OECD does highlight that the NCPS should improve preventive information by disseminating risk maps thereby reducing the number of citizen exposed to natural hazard.
The activity of Civil Protection consists in forecasting, prevention and mitigation of risk occurrence, the rescue of the population and any other activities useful to overcome the emergency (art. 3, 225/1992). The civil protection intervention occurs mainly for two types of events:

1) natural or man made events that can be tackled through actions by one or more institutions in coordinated effort in their *ordinary responsibility*,
2) natural disasters and catastrophes or any other events that due to their intensity and extent need *extraordinary means and power* (art. 2, 225/1992).

Since 2002, with the law 286/2002, on the basis of life threatening or potentially risky events, the President of the Council of the Ministers can decide to activate the NSCP before declaring the state of emergency, while the Head of DPC is in charge of coordinating all the interventions necessary to face the emergency (OECD 2010).
In fact, the responsibilities of the different actors in the NCPS are no longer only those contained in the Law 225/1992 but have been increased by a new and more complex set of rules, such as Legislative Decree 112/1998, Legislative Decree 300/1998, Law 401/2001 and finally Law 286/2002. Different norms overlap and this complicates the definition of each duty for every institution and organization at different scales. For these reasons, some authors suggest that in order to produce effective actions, it would be useful to review the legal system and create a single code of Civil Protection that defines the responsibilities at the different levels, both vertically and horizontally (Corbo 2010, OECD, 2010).

2.1.1 Department of Civil Protection

The DCP coordinates the national civil protection activities and intervenes directly in the event of national disasters. DCP is under the political responsibility of the Prime Minister, who issues official orders, i.e. special regulations, to conduct emergency interventions or to manage "grand" events, such as G8 summits, international sport meetings or international religious conventions. The DPC defines common procedure and activities, suggests changes in the legislative framework, and directs the setting up and management of information networking for risk prevention (OECD, 2010). The Head of DCP is in charge of coordinating all the interventions to face the "State of Emergency", which is declared by the Presidency of Council of Ministers on the basis of life threatening potential risk of major events. In order to establish a national coordination the DCP set the Direction of Command and Control (Di.Coma.C), normally led by the Head of the Department. In case the Prime Minister has declared the State of Emergency, a Head Commissioner is nominated with the power to coordinate all the interventions regarding the major event, as has been happening for more than fifteen years with the "waste emergency" in the Campania Region.
Several authors and journalists in the last period have criticized the use and abuse of the declaration of "State of Emergency" by official orders, which give Special Commissioners, or directly the Head of DCP, enormous power to intervene in and make exemptions to several Laws. According to Ianello (2007) the abuse of this power is pretty evident if one looks at the enormous increase of official orders in the case of Campania's "waste emergency", which allow the commissioner to act in exemption of some very fundamental laws, such as the Environmental Impact Assessment for incinerators. The procedure was also criticised by several journalists (Bonaccorsi 2010, Puliafito 2010) in the case of the earthquake in L'Aquila and of the last G8 meeting, first planned in the Maddalena national park and then moved to L'Aquila. Critics highlight that part of civil society is worried about the increasing power of DCP whose extended command can be considered a threat for democracy once the real emergency is passed.

2.1.2 Legambiente

Legambiente is one of the most well known Italian environmental NGOs. It was born in 1980 thanks to the merging of several groups of environmentalists and antinuclear movements emerged in Italy in the mid 70s. The hallmark of the association has always been scientific environmentalism. The founding idea is to base all environmental initiatives on a solid scientific base, which should support each environmental battle with the designation of feasible alternatives. Therefore, Legambiente can be considered part of what Martinez-Alier (2004) defined the gospel of eco-efficiency.
The NGO can count on more than 115,000 members or supporters, as well as, about 1,000 local groups. The organization manages, directly or in collaboration with other local entities, more than

60 protected areas in the country. It can be considered one of more influential environmental lobbies in Italy; as a matter of fact several of its former presidents have become senators or deputies of the Italian parliament.
Legambiente develops several education programs and campaigns around Italy. Its activities range from monitoring bathing waters to protecting ecosystems of the Alps and rivers, from cleaning up damaged areas to preserving monuments, from the touristic valorisation of small towns and villages to the monitoring of environmental pollution and noise in large cities. Some of its current campaigns concern illegal constructions and urban speculation, the threats of GM foods and climate change: they are called Carovana del Clima (Climate Caravan) Clima e Povertà (Climate and Poverty), Stop the Fever, Per il Clima contro il nucleare (for Climate against Nuclear Power).
One major campaign that Legambiente has developed together with DCP is the one named Operazione Fiumi (Rivers Operation). The next section will explore this experience in more depth in order to evaluate the effects of this synergy between Legambiente and DCP, and the possibilities it might open to boost the achievement of a climate change adaptation plan in the country. Italy, in fact, is one of the few European nations that has not yet developed such a plan.

2.2 River Operation

The Rivers Operation (RO) campaign started in 2003, it consists of a caravan crossing the Italian territory with different stages for each year in different municipalities characterized by high levels of hydro-geological risk. Every stage is about three days long during which several public events and information initiatives take place. An itinerant front office is set up with exhibitions, informative banquets and entertainment activities for kids are developed. Volunteers try to explain to the children how and why landslides and floods occur; what kind of action can be useful to save oneself in case of emergency; which are the main characteristics of the civil protection plan in their city. Students discover what are considered the best practices to secure a river and the correct behaviour to be followed in the event of a disaster.
Voluntary works are the second main activities of each stage. Legambiente and civil protection association staff, together with local volunteers, clean up and rehabilitate the degraded river areas. They remove illegally dumped waste that can increase the risk of flooding, and restore stretches of dikes and neglected areas adjacent to watercourses.
A very important outcome of RO is the dossier Ecosistema rischio (Ecosystem at Risk), the result of a monitoring activity on the environmental condition of all Italian municipalities. Risk mitigation practices against landslides and floods are assessed and presented at each stage of RO. There are two main objectives: to develop the capacity to live with the risk and therefore to be able to handle emergencies; to promote a proper land management (Andreotti and Zambretti 2010). The relocation of assets exposed to risk, rebalancing of the sedimentary cycle, the estimation of the cost to expand the space for the river, increasing the storage capacity of minor drainage networks, the lamination of flow in urban areas, the expansion of the section of flow are some of the best practices spread around with RO initiatives. Ecosystem at Risk (ER) achieves a constant and up-to-date picture of the hydro-geological fragility of the Italian territory for evaluating the activities put in place by local authorities for the prevention and mitigation of the risks. This allows a proper classification of Italian municipalities' activities in the face of hydro-geological instability, the rating being a valuable tool to increase public awareness, to solicit interventions and enhance the abilities of weaker municipalities. Focusing on the municipal level is a good strategy because the Mayor is the first authority of civil protection and the municipality is responsible for emergency planning implementation, therefore (s)he could be the strategic element in the mitigation policies. The municipality can intervene properly preventing hydro-geological risk in different ways: 1) with the ordinary activities related to land management such as urban planning, relocation of housing and

manufacturing plants outside of risky areas, upholding the rule of River Basin Authority[5] and, finally developing and implementing a proper maintenance plan for the territory; 2) along with the preparation of the emergency plan, it should also be constantly updated and made known to the affected population, and finally 3) with the organization of effective local bodies of civil protection in case of flooding or landslides.

2.2.1 Ecosystem at Risk

Ecosystem at Risk (ER) is focused on municipalities characterized by high or very high hydro-geological risk. The survey aims to verify the effectiveness of the municipal interventions to face their major problem related to landslides and floods and their ability to adapt to future changes. ER dossiers monitor both the actual level of risk and the activities put in place by the municipalities to mitigate the hydrological risks and developed adaptation measures. The municipalities complete the dataset of ER with direct answers to questionnaires. Therefore, it can be considered as a sort of auto-certification of the municipal offices responsible for the hydrological risk and emergency planning. The result is an ordering of municipalities, which receive a note (0-10) to classify them according to their merit[6]. The assessment is based prevalently on two themes: territorial management and the local civil protection system.
The survey aims to be a useful tool not only to enhance the experience of the more active municipalities, but also to encourage local governments to develop good practices. Good synergies among different authorities should be developed to fulfil this objective. The maintenance and securing of watercourses, in fact, are not always a direct responsibility of local governments, and therefore the will of the municipal government, even if virtuous, is not sufficient and is conditioned by the choices of the River Basin Authority and the financial intervention of the State and Region (Dossier – Ecosystem at Risk 2008).
Almost 13 thousand hydro-geological disorder events have taken place in Italy between 1991 and 2001 (Dossier - Risky Ecosystem 2007). Counting just the main flooding events during the period 1993-2003, which concerned almost all Italian regions, there had been more then 350 death and over 6 billion € of economic damage (Dossier - Ecosystem at Risk 2005).
The Italian state spent 650 € millions on relief for the people affected by the major hydro-geological emergencies in 2010 - to give them some housing assistance and compensation for the productive activities hit by the event. Albeit very important, these types of post-factum interventions do not contribute to maintenance of the rivers and mountains and to developing good preventive tools (Dossier - Ecosystem at Risk 2010). Indeed, the number of municipalities at risk of flood or landslide has increased from 5,581 in 2003 to 6,663 in 2008 (Tab.1). On average, the municipalities at hydro-geological risk have increased by 7%, but in some cases, such as Sardegna and Puglia, they have increased much more (70% and 59% respectively). At present, 82% of Italy's municipalities have at least one area at hydro-geological risk in their territory. More then 3.5 million of people live in risky areas in Italy, almost 6% of the total population (Dossier - Ecosystem at Risk 2010).

[5]A key role for the Authority is to prepare the Basin Plan to set a long-term sustainable limit on the use of both surface and groundwater in a watershed.

[6]The merit class are assigned on the basis of all score coming out of the answers for the different parameter presented in the survey. Insufficient= 0 – 3.5; Mediocre= 4 – 5.5; Sufficient= 6 – 6.5; Good= 7 – 9; Excellent= 9.5 – 10.

Table 1 - Source: Ministry of Environment and Protection of the Territory and Union of Italian Provinces (UPI in Italian) 2003, and "Hydrogeological Risk in Italy" (2008 report of the Ministry of Environment and Protection of the Territory). My elaboration from *Ecosystem at Risk* data (2001-2009). Legend: * updated after the shifting of seventeen Municipalities from the region Marche to Emilia Romagna in 2009

Region	Risky municipalities (nº)		Risky municipalities (%)		Var. %
	2003	2008	2003	2008	2008-2003
Calabria	409	409	100%	100%	0%
Provincia Autonoma di Trento	-	222	-	100%	-
Molise	121	136	89%	100%	+11%
Basilicata	123	131	94%	100%	+6%
Umbria	92	92	100%	100%	0%
Valle d'Aosta	74	74	100%	100%	0%
Marche*	243	239	97%	99%	n.d.
Liguria	188	232	80%	99%	+19%
Lazio	366	372	97%	98%	+2%
Toscana	280	280	98%	98%	-
Abruzzo	178	294	58%	96%	+38%
Emilia Romagna*	302	313	89%	95%	n.d.
Campania	474	504	86%	92%	+6%
Friuli Venezia Giulia	137	201	63%	92%	+29%
Piemonte	1,046	1,049	87%	87%	-
Sardegna	42	306	11%	81%	+70%
Puglia	48	200	19%	78%	+59%
Sicilia	272	277	70%	71%	+1%
Lombardia	914	929	59%	60%	+1%
Provincia Autonoma di Bolzano	-	46	-	59%	-
Veneto	161	327	28%	56%	+28%
TOTAL	**5,581**	**6,633**	**70%**	**82%**	**+7%**

Since 2004, the responses to the survey received by Legambiente have been increasing, passing from the 870 of 2004 to 1,793 of 2010. In 2010, 37% (2,053) of municipalities with high-risk areas in their territory answered the questionnaire: about 260 declared that they had no industrial, commercial or household facilities in their risky area (Tab. 2).

Table 2 – Source: Risky Ecosystem 2003-2010. My elaboration.

Italy	*Risky Municipalities*	*Municipalities responding the survey*		*Municipalities declaring no structure in risky area.*	*Assessed Municipalities*
		N.	*%*		
2003	5,581	-	-	-	-
2004	5,581	870	15%	n.d.	870
2005	5,581	549	10%	60	489
2006	5,581	946	17%	83	863
2007	5,581	1,027	18%	183	844
2008	5,581	1,480	27%	236	1,244
2009	5,581	1,733	31%	249	1,484
2010	6,633	2,053	37%	260	1,793

Looking at these figures, it is clear that the ER dossiers are more and more effective and robust, signalling increased awareness around the problem of hydro-geological risks. However, more responses do not mean ever more reliable responses. Indeed, urbanization has been increasing in the last years in absolute terms and do not decrease in percentage (Tab. 3).

The delocalization has been increasing in absolute terms but it has been decreasing in percentage, the same lines for maintenance, safety measures, monitoring and warning systems. In general the preventative activities have been improving but too slowly. The same happened for planning for "state of emergencies". An increase in absolute terms is evident but on average the percentage is always the same, throughout the years. 79% of the municipalities in 2010 developed a good emergency plan but after two years, only half (51%) of these, update the plan. There is not enough public information or drill activities, as only 24% and 25% of municipalities respectively developed these activities during 2010. On the contrary, the improvement of all these activities should be required for all, in particular regarding prevention. Indeed, the delocalization could avoid major damages and allow some savings to the emergency system in the future. These savings could be spent in prevention activities, which Italy would have needed (Dossier – Ecosystem at Risk 2010). It is not admissible, in fact, that in 2010 there were houses in hydrological risk areas for 83% of the municipalities interviewed, whole districts in 31% of them and industrial facilities in 54% of the sample. The latter being problematic, not only because of the huge monetary damages for the local economy in case of disaster event, but, above all, for the environmental degradation ensuing from pollution leakage. What is more worrying is the fact that public administration contributes to build up 19% of sensitive facilities, such as schools and hospitals in risky areas (Tab.3). It shows, in fact, that most of the time the state does not promote delocalization but on the contrary contributes to increasing the number of facilities in high-risk areas.

Table 3- Source: Ecosystem Risk 2003-2010, my elaboration. Risk, prevention and planning of the municipalities. Legend = + sensible facilities; * accommodation facilities; " = safety measure plus a general delocalization; ! = information plus drill.

Municipality		*2010*	*2009*	*2008*	*2007*	*2006*	*2005*	*2004*	*2003*
		N. - (%)							
Urbanization in risk areas	Home	1,479 (83%)	1,180 (79%)	955 (77%)	679 (80%)	686 (80%)	- (90%)	- (67%)	- -
	District	560 (31%)	415 (28%)	366 (29%)	269 (32%)	277 (32%)	- -	- -	- -
	Industry	973 (54%)	810 (55%)	698 (56%)	529 (63%)	526 (61%)	- (56%)	- (26%)	- -
	Others	334 (19%)+	292 (20%)*	- -	- -	- -	- -	- -	- -
Prevention activities	Home	101 (6%)	98 (7%)	65 (5%)	92 (11%)	129 (15%)		- -	- -
	Delocalization	48 (3%)	49 (3%)	49 (4%)	49 (6%)	- -	- -	- -	- -
	Industry delocalization	- -	1,263 (85%)	1098 (88%)	- -	- -	- -	- -	- -
	Constraint of edification	1,229 (69%)	953 (64%), 1131 (76%)	721 (58%), 911 (73%)	517 (61%), 624 (74%)	548 (63%), 608 (70%)	- (58%) - (54%)"	- (67%) - -	- - -
	Maintenance, safety measures	741 (41%)	642 (43%)	557 (45%)	327 (39%)	322 (38%)	- (40%)	- -	- -
	Monitoring, warning system								
Planning for emergency	Plan of emergency	1,355 (76%)	1,219 (83%)	1022 (82%)	656 (78%)	680 (79%)	- (77%)	- (76%)	- -
	Update of the plan	906 (51%)	805 (54%)	714 (57%)	403 (48%)	455 (53%)	- (54%)	- (48%)	- -
	Information	454 (25%)	381 (26%)	344 (28%)	279 (33%)	159 (19%)	- (24%)	- -	- -
	Drill	437 (24%)	437 (29%)	397 (32%)	269 (32%)	260 (30%)	- (28%)	- (29%)!	- -

Looking at the mitigation and adaptation policies as a whole over recent years, it is evident that the municipalities did, on average, bad work (Tab.4). Throughout this period, the robustness and quality of the survey has improved a lot but it is undeniable that in 2010 almost 80% of the municipalities declared their own inability to develop good mitigation and adaptation activities. It is a worrisome result; only 22 % of the municipalities achieve good results with mitigation, while 43% of them do nothing to prevent floods or landslides. Even if 69% of the municipalities conduct ordinary maintenance of the watercourse edge, only 9% relocate houses or industries, which ultimately constitutes the only way to avoid deaths, huge monetary damages, dangerous pollutant leakages in the soil and water and effectively adapt to future climate change.

Table 4 - Source: Risky Ecosystem 2003-2010, my elaboration. Mitigation activities of the municipalities

Municipalities N. - (%)	Work done		Merit Class				
	Good	Bad	Excellent	Good	Sufficient	Mediocre	Insufficient
2010	(22%)	(78%)	1 - (0%)	96 - (5%)	300 - (17%)	620 - (35%)	776 - (43%)
2009	(32%)	(68%)	2 - (0%)	149 - (10%)	330 - (22%)	603 - (41%)	400 - (27%)
2008	(37%)	(63%)	4 - (0%)	136 - (11%)	318 - (26%)	482 - (39%)	304 - (24%)
2007	(29%)	(71%)	3 - (1%)	56 - (7%)	175 - (21%)	273- (32%)	377 - (39%)
2006	(41%)	(59%)	5 - (1%)	134 - (16%)	208 - (24%)	276- (31%)	240 - (28%)
2005	(31%)	(69%)	n.d. - (1%)	n.d. - (14%)	n.d. - (16%)	n.d. - (33%)	n.d. - (36%)
2004	(66%)	(34%)	n.d. - (24%)	n.d. - (42%)	-----	n.d. - (25%)	n.d. - (9%)
2003	(48%)	(52%)	n.d. - (25%)	n.d. – (23%)	-----	n.d. - (37%)	n.d. - 15%)

2.3 Brief Evaluation

OECD's DAC Criteria for Evaluating Development Assistance will be used to evaluate briefly the River Operation campaign. The four criteria include relevance, effectiveness, efficiency and impact.

2.3.1 Relevance

The RO in general and the RE dossier in particular are very relevant actions that are put in place by the DCP and Legambiente in order to empower the population in the fragile Italian territory. On one side the information campaign RO increases the awareness of laypersons about hydrogeological risk in the areas where they live, giving them also some important advice with which to face the moment of emergency when a catastrophe occurs. While on the other side, ER creates a more technical database, rich in information about the development of mitigation actions and adaptation practices developed by each municipality to secure its own population and prepare the territory to be able to face increasing probabilities of hydrogeological disaster due to climate change.

2.3.2 Effectiveness

The campaign is attaining good results relative to the main objective: to increase public awareness of the people and stimulate mayors to realize what they can do in order to face major hydrogeological risks affecting their territory. Since 2004, the answers of municipalities to Legambiente's questionnaires have been increasing by more than 100%. Re-conducting the

campaign could also increase the number of laypersons directly informed about hydrogeological risks, about the security measures put in place by the public administration in their territory, and the actions they can develop to adapt to new climatic conditions.

2.3.3 Efficiency

Proper efficiency estimation is not possible. Information about the cost of the campaign is not available and it will be very difficult to compare it with the direct and indirect benefits coming out of it. Some speculation is anyway possible regarding the local dynamics created by the RO dossiers and the increase in the cost-effectiveness of the questionnaires. Each year Legambiente awards the municipalities doing the best work in floods and landslides risk prevention with the flag "Safety River", just 1 Municipality in 2010. The worst performers, 7 Municipalities out of 2053 in 2010, receive the "maglia nera" (literally the "black jersey", the equivalent of the "wooden spoon" in English), symbolizing their complete inactivity to prevent hydrogeological risks. This competition pushes politicians to implement proper emergency plans for their territories and increase the number of participants in the survey. This sort of competition is also an important factor that contributes to the increase in answers to Legambiente's questionnaire, passing from 15% of municipalities at risk in 2004 to 37% in 2010 (Tab.2). It implies that with the same amount of fixed cost to prepare the questionnaires and circulate them, they receive voluntarily more answers and input from the municipalities to improve the security of their territory.

2.3.4 Impact

Since 2006 the RE dossiers have been presenting climate change as an important factor that can increase the probability of flood and landslides events, but no substantive assessment is done throughout the dossiers, thus actually it looks like a general formula without any significant relevance in the survey. The dreadful consequences that climate change may have for Italy are repeated as a mantra. More probable extreme events, much less frequent but more intensive rains, as well as more prolonged drought periods, are presented in the dossier but no specific links of such extreme events with floods and landslides are hypothesized or showed through the results. Still, the survey can become an important way to introduce the debate on the climate change at the municipal level.

3. Drought and desertification: the GELSO data base

Italy ratified The Convention to Combat Drought and Desertification in 1997 (L. 170/1997). With the aim of respecting the convention prescriptions and as a result of the predisposition of the National Action Plan (NAP), the Italian Government founded (DPCM 26th September 1997) the National Committee for Combat Desertification (CNLD)[7]. In 1999, the CNLD elaborated some Guidelines for NAP against drought and desertification (CIPE Deliberation n. 219/99). The guidelines underlined the need for coordination among different institutions, i.e. State, Regions and Basin Authorities, in order to reach the objective of preventing and mitigating the risk of the degradation of the territory, especially in the regions of southern Italy and in the islands. CIPE[8] then approved the NAP against drought and desertification in 1999 (Deliberation n. 299/99), with the objective of reducing the losses of productivity to the grounds caused by climatic changes and human activities. The NAP focused on four areas of intervention: 1) soil protection (recovery of

[7] It is worth noting that ISPRA ex APAT (Agency for the Environmental Protection and the technical services) is member of the CNLD.

[8] CIPE (Inter-ministerial Committee for Economic Planning)

degraded soil due to erosion and salinization); 2) sustainable management of water resources; 3) reduction of the impact of productive activities; 4) land management. All these interventions are present also in the relevant Italian legislation related to the topic (Tab.1), such as L.183/89, DLgs.152/99 and the Plans of Rural Development (Cecarelli et al. 2006, Monacelli et al. 2006).
The legislative decree 152/2006 (known as environmental code), a corpus of 318 articles, tries to simplify, streamline, and clarify the coordination of environmental legislation in Italy. It takes into account the Italian legislation and the European Directive 2000/60 and integrates it with the L.183/89, DLgs.152/99 partially modified. The code is divided in six parts, the third of which concerns soil protection, the fight against desertification, protection of water from pollution, and management of the integrated water system. The law mandates (art.65) the district basin authorities (DBAs) to integrate their basin plan with specific measures to combat drought and desertification. It confirms (art. 93) the obligation of regions and basin authorities to verify if, in the areas subjected to their jurisdictions, there are territories threatened by drought, land degradation and desertification processes, designating them as areas vulnerable to desertification.
According to the legislative framework, the measures to combat desertification are integrated into regional planning for the protection of water and in DBA plans. These measures merge within regional programs to combat desertification. The CNLD, on the other hand, promotes and coordinates the necessary support for Italian regions and DBAs and the adoption of standards and methods better suited to understand, prevent and alleviate desertification phenomena in "vulnerable areas" (Deliberation n. 299/99). Indeed, CNLD technical-scientific staff developed a series of publications to divulgate current scientific knowledge on droughts and desertification (Cecarelli et al., 2006; Monacelli et al. 2006; Enne and Luise, 2006; Costantini et al., 2007; Perini et al., 2008; Pontrandolfi, 2010).

Table 1 – Main Italian laws and acts related to drought and desertification issues.

Law	*Objective*
L.183/89	(Art.10) Defines the role of the region in water management and soil protection (Art. 12 – 20) Institutes and defines the role of the basin authority in water management and soil protection
L. 170/1997	Ratifies the Convention on the Struggle to Drought and Desertification
DPCM 9, 26th -1997	Founds the National Committee for the Struggle on Desertification (CNLD)
Dlgs. 152/99	(Art. 20) Establishes that regions and basin authority have to map areas that are vulnerable to desertification
CIPE n. 219/99	Provides guidelines for the approval of the national plan to combat desertification
CIPE n. 299/99	Approves the National Plan to combat desertification
Dir. 2000/60/CE	(Art. 1) Contributes to the mitigation of droughts (Art. 11) Promotes agriculture measures against droughts
D.lgs 152/2006	(Art.65) Obliges district basins authorities to insert in their plan measures to fight drought and desertification. (Art.93) Obliges regions and basin authorities to designate areas that are vulnerable to desertification

In the work edited by Enne and Luise (2006) interesting information is presented showing the amount of money allocated to combat desertification in different regions of southern Italy such as

Basilicata, Campania, Calabria, Molise, Puglia, Sardegna and Sicilia. The financial support totals 6.664.489.150 €, which is divided between soil protection, sustainable management of water resources, impact reduction of productive activities, territorial re-equilibrium and other transversal measures. The authors show that more than eleven research projects, financed by the Italian government and/or the European Commission, were completed or still ongoing on topics related to drought and desertification. Each had different approaches and focused on several themes such as soil erosion, land uses, hydric availability, soil quality, forest management, water and soil salinization, coast urbanization, climate change and vegetation dynamics.
The following section addresses the issue of whether the allocation of large sums of money and the application of several research projects to combat drought and desertification has produced, in the last decades, an increase in the number of policies and/or actions and/or informative campaigns at local level to spread the awareness regarding the risk of desertification in Italy and the possible increase of the process due to climate change. To accomplish this, I scrutinized the best practice section of the GELSO database. GELSO is part of the National Environmental Information System [9], a network whose task is to collect, process and disseminate data and information derived from environmental monitoring and information systems and is hosted on the ISPRA (ex APAT) website, the technical institution that is part of CNLD, as briefly described above.

3.1 GELSO[10] - GEstione Locale per la SOstenibilità (Local Management for Sustainability)

GELSO (Local Management for Sustainability) aims to collect a database on best practices for local sustainability and make it available to public administrators, environmental groups, technicians, environmental consultants and citizens. Thus, it is an instrument of knowledge and dissemination of information on innovation in the field of sustainable development at the local level useful for all actors who want to know what are, according to ISPRA (Institute for Protection and Environmental Research, ex APAT), the best practices on sustainability issues in Italy. Its primary objective is creating an active network of information exchange among local governments.
ISPRA implements the database in collaboration with several others organizations such as the Regional and Provincial Agencies for Environmental Protection (ARPA/APPA), National and Regional Parks, Environmental NGOs, regional, provincial and municipal administrations and associations which form part of the Italian coordination of Agenda 21st. The special session of GELSO referring to sustainable development projects formed by Italian natural parks and protected areas[11] is implemented with the help of Federparchi - the Italian Federation of Parks and Natural Reserves.
For the purposes of cataloguing and the subsequent inclusion in the database, any sustainable development project requires a prior approval by a group of specialists in different themes of sustainable development. The specialists analyze, evaluate and select those practices to be included in the GELSO database. An internal technical committee of ISPRA together with an external committee composed of recognized professionals with specific skills and knowledge in particular sectors (e.g. transport, waste, energy, etc.) form the assessment group, which evaluates the entries in the database (Zega and Brini, 2009). The criteria used for the selection are divided mainly in three categories:

- *eligibility criteria*: conforming to the following general requirements: 1) the project must be implemented or initiated, or at least funded, 2) the project must be easily exportable and replicable, 3) the project must be consistent with the quality objectives and targets adopted at national and

[9] On line: SINAnet http://www.sinanet.apat.it/it

[10] On line: http://www.sinanet.isprambiente.it/it/gelso

[11] On line: http://www.sinanet.apat.it/it/gelso/areeprotette

international level (the implementation of at least one target for social, economic and environmental sustainability is essential).

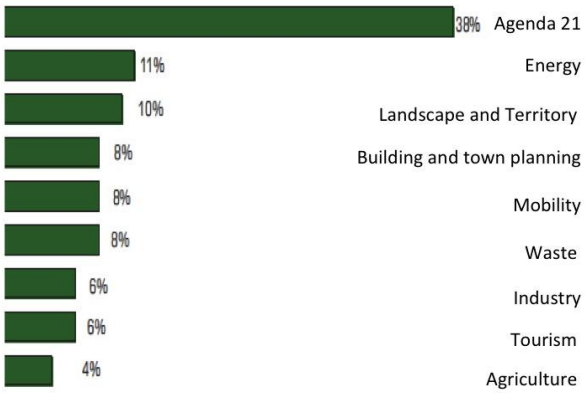
• *Qualification criteria*, which attempt the enforcement of at least one specific goal on one of the following priority sectors: agriculture, construction and urban planning, energy, industry, mobility, waste, landscape and territory and tourism.

•*Extra criteria of qualification* related to the integration of policies, the enforcement of partnerships, consensus building, and certainty of the fact that established institution develops the enforcement of the policies. The evaluation of new entries and monitoring of the policies which are already part of the database, are founded on four main aspects: the results of the projects, the means of achievement, the critical issue identified during the development of the action and the transferability of the experiences.

Monitoring is conducted by subjecting the project's leader, to a series of open-ended and multiple-choice questions. The responses produce a self-assessment on the achievement of environmental, economic and social objectives, the strength of the partnerships, the necessity for training of operational units, the level of community participation achieved, and whether the project influences the planning of other policies. Other information is requested to understand how the partnership ensures the transferability of the experience, what kind of critical issues were identified during project implementation, thus helping other actors to search for new solutions.

GELSO is included in the National Environmental Information System (SINAnet), a network whose task is to collect, process and disseminate data and information derived from national and local environmental monitoring and information systems. There are more than eight hundred entries in the database[12], which is divided into nine areas of activities. Most activities are part of more than one area of intervention (Figure 1).

Figure 1 – Area of interventions in GELSO. Source: Zega and Brini, 2009 – My elaboration.



Aside from the identification of best practices, three surveys are part of GELSO: 1) climate change mitigation and adaptation, 2) European Landscape Convention, and 3) sustainable tourism. Together with the specific information coming out of the survey, relevant documents, dossiers and laws concerning these themes are selected and published to present exhaustive content related to the three topics. In the case of climate change mitigation and adaption, the survey is related not just to municipalities implementing policies to respect the Kyoto Protocol but also to all local administrations that have signed the *Covenant of Mayor,* a commitment by signatory towns and cities to go beyond the objectives of EU energy policy in terms of the reduction in CO2 emissions through enhanced energy efficiency and cleaner energy production and use. There are more than one hundred best practices on communication and awareness on climate change (Table 1.)

3.1.1 Best practices against desertification

[12] The 5th January 2011 the entries are exactly 826.

The definition of a best practice applied to the items of the GELSO database refers to the general idea, promoted by European institution of: innovative and performing actions or practices that allow municipalities, communities or any other public administrations to move towards forms of sustainable management at the local level (Zega and Brini, 2009).

Table 1 – Best practice on communication and awareness on climate change. Source: Zega and Brini, 2009. My translation

Access to information (innovative initiatives to improve public information on climate change)	
Region of Lazio	Kyoto front office Lazio
Unioncamere Lombardia	Kyoto desk
Municipality of Reggio Emilia	LAKS - Local Accountability for Kyoto Goals
Province of Rimini	Ecoidea front office
Province of Ferrara	Ecoidea front office
Municpality of Firenze	Ecoequo front office
Education (Initiatives to promote and improve the integration of climate change in the school syllabum at all levels)	
Municipality of Reggio Emilia	Let's collect green miles
Training (training initiatives for workers and professionals to improve mitigation and adaptation to climate change in business, industry and public administration)	
Municipality of Rome	Roma for Kyoto
Energy and Environment Agency of Napoli	City Instruments - monitor, evaluate and transfer tools to combat Climate Change in Metropolitan Areas
Municipality of Venezia	Amica - Adaptation and Mitigation: an integrated approach to climate policy
Province of Livorno	LACRe - Local Alliance for Climate Responsibility
Public awareness (Initiatives to raise awareness and inform the public about climate change)	
ARPA Toscana	If I turn out, I do not waste and do not spend!
Province of Venezia	Biciclima
Municipality of Firenze	R.A.C.E.S. - Raising Awareness on Climate and Energy Saving
Municipality of Verona	TOWARDS CLASS A - Municipal buildings as case studies for energy saving
Polytechnic of Milan	Clean-E (Clean Energy Network for Europe) For the development of hallmarks for electricity produced from renewable sources
Energy and Environment Agency of Torino	Eco n'Home or how to reduce energy consumption in Household
Province of Savona	PURE - Promotion of the use of photovoltaic systems in urban structures through demonstration
Participation (Tools and experience to promote and facilitate public participation in policies and measures for climate change)	
Municipality of Bologna	K.I.T.H. Kyoto In The Home
Region of Marche	Regional Plan for Clime
Province of Trento	Trentino Clime Projects
Municipality of Venezia	ECHO ACTION – Energy - Conscious Household in ACTION
Municipality of Modena	BELIEF Building in Europe Local Intelligent Energy Forums
Province of Teramo	Strategy for energy sustainability and strengthening sustainable energy planning in sustainable Municipality or potentially sustainable
Creating networks (communication, education and public participation on issues of climate change. Networks to facilitate the dissemination of best practices and develop joint initiatives in these fields)	
Municipality of Modena	INNOVATIVE THINKING - Actions and strategies for sustainable growth through Community network and innovative thinking
IAL Cisl Emilia Romagna	ENERGY IN COMMON - Renewable energy sources. Mapping and dissemination of experiences, initiatives and structures activated by the government in the province of Modena.

For the aim of our work, this section analyses all the items (826 best practices) of the GELSO

database that directly or indirectly put in place measures to combat drought and desertification. Among the 11 actions and plans emerging from the hundreds items, nine of them have among their main objectives the combat of drought and desertification, the remaining two (CENT.OLI.MED and TRUST) refer to two environmental hazards as worrying process to deal with. Some of the GELSO best practices are not part of the present analysis, even if they develop similar policies and actions to the ones selected, because in their specification there is no explicit reference to desertification or drought. The mitigation policies, such as LAKS - Local Accountability for Kyoto Goals, Kyoto Lazio front office, are also excluded from the analysis, which will try to focus on adaptation activities.

CENT.OLI.MED. Identification and preservation of ancient olive groves with high natural value in the Mediterranean region

The leader of the project is the Mediterranean Agronomic Institute supported by two Italian governmental organizations, composed by the ministry of Environment and Sea and Territory Protection, the Apulia region, and a Greek partner, Mediterranean Agronomic Institute of Chania. The project aims to preserve the important role of ancient olive groves, which are extensive commercial cultures (with about 50 plants/ha) and constitute the elements of a mosaic of semi-natural and cultivated areas in the Mediterranean landscape. As High Nature Value Farmlands – HNVF, olive groves play an important role for the protection of biodiversity and the project wants to contribute to the governance of these sensitive rural areas, producing some robust guidelines[13]. The project started in 2009 and it is under implementation.

RACES - Raising Awareness on Climate and Energy Saving

The leader of the project is the European Direct Firenze[14]e supported by an Italian partnership such as the municipality of Firenze, CNR - Biometeorology Institute, Mach Foundation of Trento, municipality of Modena, EURO-NET of Potenza, University of Bari. The project had two main aims: 1) to inform the public on the issues and consequences of climate change at the local level (city); 2.) to propose action to some experimental specific groups: school teachers, families and other stakeholders (local authorities, associations, etc.). In order to accomplish these objectives, the partnership prepared: a) an informational campaign with public action and the use of media; b) actions for teachers, who received didactic tools to work on climate change with the students, c) action for families, who received help from the project team to voluntarily reduce their carbon footprint[15]; d) actions for the stakeholders, through a participative model to govern the impact of climate change on cities. Documentation on most of these outcomes is downloadable from the RACES webpage[16]. The project lasted for two years and ended in December 2010.

*TRUST - tools for assessing the storage of groundwater at regional scale to adapt to climate chang*e

The leader of the project is the River Basin Authority of Isonzo, Tagliamento, Livenza, Piave, and Brenta-Bacchiglione, supported by an Italian partnership, i.e. the Euro-Mediterranean Centre for Climate Change (CMCC) and SGI Studio Galli Ingegneria S.p.A. The aquifer of the Venetian and Friulian plans has been diminishing for the last 30-40 years. The project aims to implement innovative measures to stop the slow but steady decline, which could speed up because of climate change. The project foresees different actions: 1) to set up a stakeholders group interested in an

[13] http://www.lifecentolimed.iamb.it/index.php?lang=en

[14] http://www.edfirenze.eu/info/

[15] Some of them awarded in 2010: http://community.liferaces.eu/events.php?action=show_info&event_id=115

[16] http://www.liferaces.eu/en/project

integrated assessment of the aquifer (completed); 2) to acquire and evaluate present studies and data (in progress); 3) to use remote sensing and GIS tools for land use mapping and the studies of irrigation water deficit caused by climate change (completed); 4) to build climate change scenarios (completed); 5) to study the impact of climate change on future demands and recharge the aquifer (in progress); 6) to develop tools for large scale groundwater balance (to be developed). The project started in 2009 and it is under implementation[17].

Framework of regional plan for climate of Marche region

The Marche region implemented its regional strategy of environmental action for sustainability by approving a regional Climate Plan. It systematizes the mitigation policies and the adaptation actions to create synergies among the different funding opportunities offered by Operative Regional Plans (POR) and Rural Development Plans (PSR) 2007-2013. The plan includes five main axes: 1) energy efficiency aimed to orient the housing market towards zero emissions building; 2) renewable energy to strengthen the market for biofuels, geothermal and biogas from organic waste; 3) sustainable mobility and urban development to boost the use of public transport and car-sharing, and finally 4) transversal measures to increase the knowledge and awareness of citizens promoting personal behavior to tackle climate change. The regional government approved the plan in 2007.

Maintaining original land use

The province of Catania, through the measure 1.09 of Operative Regional Plans (POR), aims to maintain 'original' uses of the soil through the reintroduction of traditional forestry and land use, in order to recover natural system functionality, prevent forest fires and reduce desertification. The measures have the main objectives of: increasing the proportion of natural areas and the rate of biodiversity; combating climate change, desertification and drought; recovering and rehabilitating degraded areas; preserving morphology and soil properties. The plan started the 15th of November 2005 as part of POR 2000-2006.

AMICA - Adaptation and Mitigation: an integrated approach to climate policy

The leader of the project is the Italian Onlus Climate Alliance, supported by an international partnership formed by the province of Ferrara, the municipality of Venezia, the municipality of Dresden (Germany), the municipal of Stuttgart (Germany), the Upper Austrian Academy for Environment and Nature, the Climate Alliance Austria and Climate Alliance Netherlands, the Agence Local de l'Energie Lyon, and the Greater Lyon Urban Community. The aim of the project is to develop strategies for local and regional authorities for a comprehensive approach to climate change. The three central tools developed within AMICA are: the Adaptation Tool, the Mitigation Tool and the Integration Tool[18]. The first one mainly consists of an adaptation matrix to explore the various possibilities of adapting to climate variability and climate change on the local level, and a list of evaluated practice examples containing all adaptation measures, which are considered "Evaluated Practice". The second tool is presented as a compendium of measures in the fields of climate policy, urban development, energy, transport, agriculture and forestry, public procurement and North-South cooperation. The compendium is named AMICA Mitigation Scan. Finally, the Integration Tool is mainly a matrix presenting mitigation benefits and adaptation benefits at the local level with a focus on the three areas of energy, construction and spatial planning. The project started in 2005 and lasted for 30 months.

[17] The timetable project: http://www.lifetrust.it/cms/en/project/timetable.html

[18] http://www.amica-climate.net/materials.html

Planning and implementation of integrated methods for the recovery of the basin river of Valle Sellustra

The developer of the project was the municipality of Dozza in the Emilia-Romagna region. The project aims to demonstrate the effectiveness of phytoremediation application through the implementation of a basin for impoundment, the planting of wooded buffer strips (FTB) and the use of natural engineering in an integrated way for environmental restoration of the river basin Sellustra. For this reason, the project consisted of technical activities seeking to carry out concrete interventions on the course of the river and monitoring environmental performance. It also developed information dissemination activities to inform all the stakeholders about the techniques adopted. The project started in 2001 and lasted for24 months.

*SUMMACOP – Sustainable and multifunctional management of coppice in Umbri*a

The Umbria region developed SUMMACOP[19] to apply the pan-European guidelines for sustainable forest management (3rd Ministerial Conference on the Protection of Forests in Europe, Lisbon, 1998). A demonstrative project characterized by diversified approaches on small areas applying coppice practices and introducing timber tree for forest sustainable management. The aims of the project were: 1) the validation of methodology through the evaluation of its impacts on regeneration, productivity and the specific composition of the soil and its effect on landscape, 2) the disclosure of methodologies to public and private entities operating in forest management. The project started on the1st of July 1999 and lasted 24 months.

Green site

The developer of the project was the Vesuvius National park near Naples. The project had several aims: to classify and preserve the existing natural landscapes; to increase the proportion of natural areas in the park as well as the rate of biodiversity; to protect water quality, soil and atmosphere; to combat climate change, drought and desertification; to reduce the risk of landslides, coastal erosion and contamination by human activities; to recover and rehabilitate degraded areas, to protect traditions and historical and cultural values; to preserve the morphology and properties of the soil. All these actions developed with both the intervention of natural engineering and by re-evaluating traditional actions for the maintenance of the volcano. The enhanced project started in 1999 but efforts were obliterated by the national government's decision to open a new big landfill in the area of the national park[20].

Overall, information on the cost and financial support are not homogeneous (Table 2). This information is presented only for projects enhanced by European support. Between seven and eleven of the best practices are supported by LIFE projects and only for these are the costs evident in the specification.
None of the eleven best practices part of our analysis has a monitoring report developed by ISPRA[21] for some of the items in GELSO database this implies that there is no helpful assessment on the results of the projects presented in this section, neither on the condition of the their fulfillment, nor on the criticality of them, nor finally, on the transferability of these experiences. As consequence, although GELSO analysis allows us to take some first steps towards a better understanding of Italy's

[19] http://www.antincendi.regione.umbria.it/resources/bosco/html/PROGETTOSUM.HTML

[20] http://www.vesuviopark.it/pnv/home/LaParcumiera.html

[21] http://www.sinanet.isprambiente.it/it/gelso/monitoraggio

anti-drought and desertification policies, no systematic evaluation of their results is possible at this stage.

Table 2. Cost and financial support of the best practices related to drought and desertification.

Title	*Leader*	*Cost (€)*	*Financial support*
LAKS Local Accountability for Kyoto Goals	Municipality of Reggio Emilia	1.304.758	LIFE
CENT.OLI.MED. Identification and preservation of the ancient olive groves with high natural value in the Mediterranean region.	Mediterranean Agronomic Institute	1.506.435	LIFE (Co-fund LIFE+, 703.135)
RACES - Raising Awareness on Climate and Energy Saving	Europe Direct Firenze	1.031.682	LIFE
TRUST tools for assessment for storage of groundwater at regional scale to adapt to climate change.	Basin Authority of Isonzo, Tagliamento, Livenza, Piave, Brenta-Bacchiglione rivers.	1.838.380	LIFE (Co-fund LIFE+ , 898.380)
Kyoto Lazio front office	Sviluppo Lazio	-	-
Framework of regional plan for climate of Marche region	Marche region	-	-
Maintaining the original land use	Provinc of Catania	99.837	-
Amica - Adaptation and Mitigation: an integrated approach to climate policy	Climate Alliance Italian Onlus	827.561	INTERREG
Planning and implementation of integrated methods for the recovery of the basin river of Valle Sellustra	Municipality of Dozza	379.337	LIFE (Co-fund LIFE+ 38,46%, i.e. 145.898)
SUMMACOP – Sustainable and multifunctional Management of coppice in Umbria	Umbria region	426.696	LIFE (Co-fund LIFE+ 49%, i.e. 208,700)
Green site	Vesuvio National park	2.000.000	-

3.2 Brief Evaluation

OECD's DAC Criteria for Evaluating Development Assistance will be used to evaluate briefly the GELSO database. The four criteria include relevance, effectiveness, efficiency and impact.

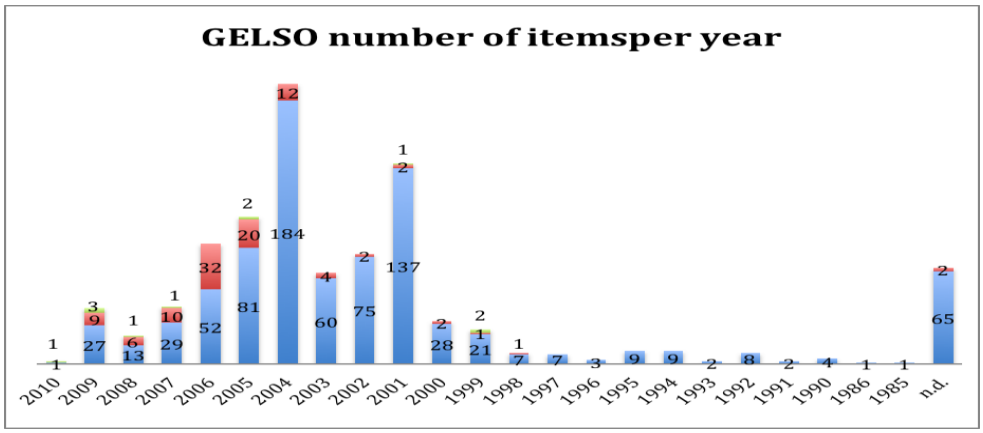
3.2.1 Relevance

Building up a database on Local Management for Sustainability is appropriate for the aim of understanding the Italian projects and policies designed to reach a sustainable future. This instrument of knowledge and dissemination on innovation in the field of sustainable development at the local level is useful for public administrators, environmental groups, technicians, environmental consultants and citizens in addressing their actions towards a future characterized by climate change. Moreover, over the last years a special section on mitigation policies was created to give evidence to more then 100 projects related to energy, urban planning and mobility. In 2010 GELSO started to collect adaptation policies as well. GELSO has as its primary objective the creation of an active network of information exchange among local governments; thus all the foundations are in place to reinforce the role of local actors in combating climate change.

3.2.2 Effectiveness

The objectives of the GELSO database are many and related in general terms to sustainability issues so the full evaluation of their achievement is beyond the scope of this paper. However, within the present work the effectiveness can be assessed in terms of the following question: what are the main drivers of best practices in drought and desertification presented in GELSO?

Figure 2 – Items of GELSO database – Legend: Blue = all the items; Red= reduction of GHs emission items; Green= drought and desertification items. My elaboration.



According to the available data, 2001 and 2004 have been the years with most projects put in place, 137 and 184 projects respectively (Figure 2). The best practices related to GHGs emissions have their peak in 2006 with more than 32 projects; drought and desertification issues are less than 1% of the database and they are more concentrated (8 out of 11) in the last 5 years (2005-2010). As shown in table 2, seven were cofounded by European Union (7 LIFE project and 1 INTERREG) so it is clear that the main achievements are based on EU financial support. It means that the Italian institutions at different scales are not autonomously developing relevant projects to achieve their own objectives on drought and desertification issues and they are overly dependent on the availability of EU funds.

3.2.3 Efficiency

The GELSO database provides few items related to drought and desertification, just eleven out of more than eight hundred items. Worse yet, none of them provide monitoring specifications that help with the efficiency assessment of the policies and actions planned at different administrative levels. This is a modest result considering the large amount of money (6.664.489.150 €) allocated by southern regions to measure issues related to drought and desertification.

3.2.4 Impact

The 'best practices' on drought and desertification are few, so their impacts in Italy in the short and medium run are not easily assessed. The GELSO database also registers a reduction of the amount of mitigation policies related to GHGs in the last years, since 2006 up to now (Figure 2). Thus there is not a clear positive effect triggering off new initiatives improving the adaptability of Italian institutions. In order to develop a proper climate change adaptation strategy, that is able to avoid

major damage and cope with future challenges, the effort of Italian institutions needs to increase exponentially and cannot be postponed.

4. Conclusion

According to the OECD Secretary-General Angel Gurría (2010): "*a feature that other OECD countries could learn from is the highly mobile force of volunteer organisations. Tens of thousands of volunteers could be mobilized to support professionals in emergency response, relief and recovery activities within just a few days. We commend the policy that enables volunteers to participate in exercises and actual relief missions. Mobilisations of the volunteer corps are an example to us all, not only nationally, but also abroad through its contributions to humanitarian aid missions in developing countries".* This positive assessment of the Italian National System of Civil Protection strongly encourages more research on this campaign where the Department of Civil Protection, and its volunteers staff, work together with Legambiente in order to spread awareness about the hydrogeological risks of our territory and aim to improve the performance of local government and public participation in building understanding of the common problems we face. Another insight coming from the OECD Secretary-General reinforcing the general idea of investigating campaigns to improve the public awareness of climate change (Gurría 2010): *"Another area for possible improvement is the area of public awareness. There are already information campaigns, use of the media and education programmes, but some countries go further than Italy by providing risk maps to communities about specific, local risks. For example, an action plan to improve the public's understanding of climate change impacts on hydro-geological risks and heat waves could be launched*.

As shown in the Ecosystems at Risk section, three main thematic areas now compose the RE survey: territorial management, emergency planning, and training and information (Dossier – Ecosystems at Risk 2005). It could be useful to add an area on climate as a fourth thematic of the survey, because it would give insights on the perceptions of climate change in several municipalities. It would also allow ISPRA to build up a useful database on climate policies at municipal levels, a fundamental step in moving towards a climate change adaptation plan for Italy.
This new survey of climate change adaptation plans would have the advantage of being developed from the bottom-up. It would give information on municipal climate actions, looking at local resources in terms of knowledge, management and planning. Climate change policies developed at a local level to face major events such as floods and landslides will create synergies with other levels ranging from the provincial, regional, river basin and up to the national level, to formulate a multi-scale adaptation plan. The second advantage of structuring the survey around the ER campaign is the possibility to create synergies with, and actively involve, an experienced team that has been travelling throughout Italy to spread information on hydrogeological risk since 2003. The new survey should try to obtain responses from all the municipalities and publicly explain its importance with a multi-faceted media campaign. Moreover it would be important to help the less proactive local governments to respond to the new format. This would guarantee robust and exhaustive information to develop a consistent climate change adaptation plan.

During the first National Conference on Climate Change in 2007, all the participants consensually emphasized the role of ISPRA as the central organization for the development of a climate adaptation plan in Italy. This has directed the author to analyze actions of ISPRA related to climate change with a focus on drought and desertification issues. Indeed, ISPRA is member of the CNLD (the National Committee to Combat Desertification) and could have a major role in information dissemination and raising public awareness about climate change and environmental security. Looking at the small number of items in the GELSO database related to desertification, two main criticisms emerge. First, CNLD has participated in several research projects over the last decade producing various maps of desertification risks at national and regional levels (Ceccarelli et al. 2006, Costantini et al. 2007, Perini et al. 2008); however these projects and their outcomes are entirely absent from the GELSO database. This absence is inexplicable because the maps would be

key strategic tools for involving civil society and public administrations in desertification debates. Second, none of the eleven items in the GELSO database mention the work or actions of CNLD, which is a strong indicator that the information dissemination of CNLD was not effective. These two issues are especially problematic as ISPRA, the institution responsible for updating GELSO, is also part of the technic-scientific team of CNLD.

The author offers two suggestions to improve the GELSO database. The first is that it is necessary to transparently prepare all of the items in the monitoring report to avoid opaquely converting them into a simple and reductive showcase, without robust assessment of each item. Second, it is very important to reinforce collaboration amongst the different departments of ISPRA in order to implement 'best practices', which are developed within ISPRA's institutions, but which may be absent in the GELSO database.

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Climate Change, Hydro-conflicts and Human Security

SEVENTH FRAMEWORK PROGRAMME

In depth assessment of national policies - Morocco

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Astract

The Government of Morocco has effectuated several institutional reforms in its attempts to overcome pressures related to extreme droughts as this fact became more frequent in the last decades threatening national economy and security. This study analyses 3 major water related policies: The Water Law, The Plan Maroc Vert, and the Plan National de lutte contre le réchauffement climatique, as they consider adaptation, peace and security strategies facing hydro-climatic conflicts influenced by drought. The evaluation criteria follow the Development Assistance principles being relevance, effectiveness, efficiency, and impact. For each of the criteria, we rated it as highly relevant, significant, moderate, and modest depending on its success in addressing the objectives of our study.

CREAF

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1. Introduction

During the last 2 decades, the Mediterranean basin has undergone rising pressures on its water resources. These pressures contribute to increasing the threat of this resource scarcity causing by this huge economical damages. This is a result of population dynamics and growth, agricultural intensification, economic and social development, touristic pressure, over consumption of water resources and climatic fluctuations[1].

In this region, there is a growing evidence of limited capacity to cope with socio-economic and agricultural demands in periods of drought. For example, water reserves were not able to cope with extensive droughts in the late 1990s in Spain, Morocco and Tunisia, causing many irrigation dependent agricultural systems to cease production. [2] This limited coping capacity is already leading to significant problems due to unbalanced distribution of water resources, causing conflicts among users, and between countries around the Mediterranean. Besides, the Mediterranean region is identified as one of the world's most exposed regions to climate change (CC) effects, where the forecasted increase in average annual temperature is expected to stimulate extreme events further. [3] Under these conditions, decision makers are undergoing a dilemma in fulfilling agricultural, social, and environmental targets while ensuring the sustainable use of water resources. The latter is not possible without making a crucial shift in present and future policies towards an integral management approach for vulnerable resources in the region, namely, water.

Being a Mediterranean country, Morocco is highly water-stressed suffering complex patterns of water scarcity due to an uneven geographical distribution of its water resources and its irregular seasonal rainfall. In the last decades, a shift towards drier conditions over the country is confirmed leading to major concerns of the Moroccan government in securing a continuous water supply for basic needs during dry periods. [4],[5]

Despite its relatively modest share of the national GDP (around 19%), agriculture is the main pillar of the Moroccan economy.[6] In rural areas, agriculture is the primary source of employment and income for about 80 percent of the labor force. Although rural poverty showed a decreasing tendency in the last decade, the rural-urban income gap remains significant. Poverty rates in rural areas are almost 3 times as high as in urban areas and 70 percent of poverty in Morocco remains rural. Agriculture is largely rainfed (around 90%) depending heavily on precipitation fluctuations,

[1] Sabater S., & Barceló D. eds. (2010) *Water Scarcity in the Mediterranean Perspectives Under Global Change*, London: Springer.

[2] Iglesias A., Garrote L., flores F. (2007) Challenges to manage the risk of water scarcity and climate change in the Mediterranean, 21, 775-778.

[3] Parry M.L., Canziani O.F., Palutikof J.P., van der Linden P.J., & Hanson C.E. eds. (2007) Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[4] Swearingen W.D. (1992) Drought Hazard in Morocco. *Geographical Review*, 82(4), 401-412.

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translated into heavy losses in yields in dry years, reaching around 50% of Morocco´s average national annual productions. In parallel, the lack of hydrological infrastructure does not allow the adequate use the country´s hydraulic potentials, resulting in increasing losses in this sector in extreme drought events. [7]

Moroccan agriculture operates nationally in a context of rising domestic demand for food driven by growing incomes and internationally as a result of significant product export opportunities to high-value markets abroad (namely USA and the EU).

Morocco has privileged access to the EU by virtue of its geographic position and trade agreements in addition to its abundant and low cost labor resources. Thanks to its climate, it has a potential comparative advantage in early-maturing, high-value fruits and vegetables, and in the development of a competitive agro-processing industry. With its recent agriculture reforms through the Plan Maroc Vert (2008), the Government of Morocco (GoM) reinforced agriculture and the agri-food sector to become an important source of broad-based economic development in rural areas. However, despite some successes in selected commodities, the agri-food sector's potential is still constrained by low productivity levels and limited international market integration. Morocco's 1.5 million agricultural holdings are small size farms, which are largely rainfed and vulnerable to recurrent droughts. These are semi-subsidized farms owned by aging household heads with low education level (more than 45 percent of the heads of farming families are over 55 years old, and 81 percent are illiterate), make limited use of modern technologies, and lack technical know-how. [8]

Due to a combination of sub-optimal irrigation practices, deficient water services, and rising input prices, average economic returns of irrigation water are low, of around 1.63 MAD/m^3, being well below its potential of 4 MAD/m^3. [9][10]

In such circumstances, and partially in response to the incentives provided through extensive government subsidy schemes and market protection, Moroccan smallholders typically engage in the production of low-value rainfed agricultural commodities such as wheat and barley so as to meet their food consumption and animal feed needs.

To add to these constraints on the agriculture sector, trade liberalization and CC are expected to impose increasing pressure and uncertainty on the country. From one side, the renegotiation of the existing Association Agreement (AA) with the EU and the Free Trade Agreement (FTA) with the

[7] Ater M. & Hmisa Y. (2008) Agriculture traditionalle et agrodiverrsité dans le bassin versant de l'Oued Laou. Du bassin versant vers la mer: Analyse multidisciplinaire pour une gestion durable. (eds Bayed A. & Ater M.), pp. 107-115. Rabat.

[8] WorldBank (2010). Project Information Document: Support Plan Maroc Vert DPL. Report No.: AB5373.

[9] Only 1.46 million ha or 16 percent of arable land is irrigated in Morocco.

[10] 1 MAD (Moroccan Dirham) = 0.08898 Euro.

United States, both of which entail a gradual broadening and deepening of agricultural trade liberalization, are resulting in enhanced competition from low-cost and high-quality foreign agricultural products in both domestic and regional export markets. On the other hand, it is expected that CC exacerbates the situation by introducing a great number of changes. Namely, the likely rise in temperature in the coming decades will result in profound transformations in the country´s natural habitats, losses in its biodiversity, and as a consequence, larger swings in food production. Current water scarce resources are expected to decrease further with CC affecting climate-sensitive agriculture further [11]

At present, the demand for water already exceeds renewable water resources in the majority of country´s watersheds. CC effects are expected to further decrease these resources diminishing consequently available water for surface irrigation and making ground water more vulnerable to overexploitation. As a consequence, CC effects are expected to negatively affect agriculture with yields projected to decline up to 10 percent, increasing further Morocco's dependency on staple crop imports (currently around 50 percent for cereals). [12] At the socio-economical level, these projections in CC effects will increase the vulnerability of the Moroccan society to disruption of their incomes or food supply by crop failure or by extreme events such as drought and flood.[13]

Increasing drought episodes in the last decades registered deterioration in water quality, reaching dangerous levels to human consumption in some cases as a consequence of waterborne diseases, and subjecting the population of the region to major health threats.[14]
The northward expansion range of vector water borne diseases like the malaria have been registered lately in Morocco which is expected to become an issue of major public health concern with the expected temperature increase in the country. [15]

In order to overcome these water related threats to national economy and human security, Morocco has effectuated several institutional reforms and investigated possible water channelling

[11] Agoumi (2003). Vulnerability of North African countries to CC. CC Knowledge Network 1-11.

[12] WorldBank (2010). Project Information Document: Support Plan Maroc Vert DPL. Report No.: AB5373.

[13] In the summary report of 2015 – 2030, FAO estimates that food security of poor people and countries could well be reduced by CC. Even by 2030 there will still be hundreds of millions of such people, who will be either undernourished or on the brink of undernourishment. They will be especially vulnerable to disruption of their incomes or food supply by crop failure or by extreme events such as drought and flood. ftp://ftp.fao.org/docrep/fao/004/y3557e/y3557e.pdf Retrieved 5 January 2011.

[14]In his research, Ramzi Touchan (see reference 2) identifies the second half of the 20th century as one of the driest in nine centuries in North Africa causing net declines of dam's water reserves, deficits in subterranean water resources, and limitations in drinking water and irrigation water supply.

[15]WHO 2005. Vector-borne diseases: addressing a re-emerging public health problem. http://www.emro.who.int/RC52/media/pdf/EMRC5203en.pdf Retrieved 22 February 2011.

from North to South. In addition it has invested heavily in reservoirs, and increased its water storage capacity by nine folds and an 80% of mobilization rate for surface water in the last decades.[16] Despite these efforts, severe water related problems remain, driven by frequent droughts dropping drastically reservoirs levels. In addition, successive droughts recorded in the last decades are leading to major socio-economic repercussions forcing the population to heavily rely on groundwater, leading to its overexploitation. [17]

The basic sets of laws with regard to water management did not change for a very long time in Morocco, but started to be seriously reviewed only in 1990 in an attempt to overcome frequent droughts. Since then, the GoM has developed some multi-sectoral policies to adapt and mitigate to climate fluctuations and water related pressures enhancing the national capacity to adapt to CC effects. Among all related sectors, agriculture and water are key concerns in Morocco's development as they relate directly to food security and national economy. [18]

Given these challenges, investments in the water and agricultural sectors are needed and have to be accompanied by systemic reforms to enable an equitable and sustainable national agricultural development.

This study aims at analyzing 3 major Moroccan water related policies: The Water Law, The Plan Maroc Vert (PMV), and the Plan National de lutte contre le réchauffement climatique (PNRC). The analysis evaluates whether these policies address adaptation, peace and security strategies facing hydro-climatic conflicts. The latter subjects are of major concern in Morocco due to the increasing dry episodes this country is expected to pass through in the future as a consequence of CC. The evaluation criteria follow the DAC principles for the Evaluation of Development Assistance[19] being relevance, effectiveness, efficiency, and impact.

In the 3 policies assessed, we rated each of the analysed criteria based on its success in addressing the studied strategies (adaptation, peace and security strategies facing hydro-climatic conflicts). The rating system we used in this study from high to low is the following:

1. Highly relevant,

[16]The World Bank, Water resources management project. 2009. http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/EC4A7ED8BF368B1A8525761E004FB91F/$file/Morocco_ppar_wrmp.pdf Retrieved 5 January 2011.

[17] Jong C., Cappy S., Finckh M., Funk D. 2008. A transdisciplinary analysis of water problems in the mountainous karst areas of Morocco. Engineering Geology 99: 228-238.

[18] UNDP. The African Drought Risk and Development Network. 2008. Addis Ababa, Ethiopia. A primer on climate change adaptation in the drylands of Africa.

[19] OECD (1991): *The DAC Principles for the Evaluation of Development Assistance.*

2. Significant,
3. Moderate, and
4. Modest.

At the end of the document, table 2 summarises the evaluation process of each policy listing its criteria.

In recent years, Morocco has developed some CC adaptation projects at the local level, in addition to some national and regional efforts. The government signed the Kyoto protocol and the United Nations Framework Convention on CC (UNFCCC) and is therefore expected to comply with them by implementing appropriate measures to stabilize greenhouse gas concentrations in the atmosphere. Morocco should address suitable adaptation strategies to CC effects and can in parallel take advantage of the Protocol's flexible mechanism to develop a framework to find out mitigation strategies to face CC effects.

The main shortcomings in the studied policies include serious gaps in addressing CC issues especially ground water regulations, supportive institutions for irrigated agriculture, and drought risk management. Furthermore, the

drought reactive approach and the lack of regulatory powers to the consultative institutions in charge of advising agencies and ministries regarding water and drought management are major concerns limiting the adaptation capacity of the country facing CC concerns. [20]

[20] Ouassou et al. identify the weakness of the drought policies to the fact that "when the drought cycle is over, the activity of the national inter-government committee is abandoned. Should the drought recur, the same procedures are reproduced regardless of the results of the previous drought episode".

2. The Water law

2.1. Description

In the early 1990s, and as a major response to changing water conditions and future economic requirements, the GoM decided to reform its water sector and in 1995, it approved unanimously the Water Code "Le Code des Eaux" by Law No. 10-95. [21]

Since its approval, this law introduced new regulations about water management at the national, regional and local levels.

- It stipulated state ownership of water, and assigned top priority to security of potable water supply. By 1990, most urban households had been provided secure access to water supply whereas only 14% of the rural households had secure water supply even by 1995. Since 2004, 82% of the population of Morocco has access to an improved water source, being mainly piped water in houses or yard of houses.
- It decentralised water management through the creation of water basin agencies as the main entities in charge of water issues at the water basin level,
- It introduced new taxes for water use based on water abstraction, and pollution by setting pollution taxes based on the contribution to the stream pollution and new instruments and decrees to deal with drought.

The institutional organization of water management in Morocco includes the main institutional stakeholders in the water sector at the national, regional, and local levels (Figure 1). They consist of key ministerial departments including Agriculture and Rural Development (MARD), Water and Environment, local collectives (Ministry of Interior), health, energy and mines, and finance departments (Figure 2). NGOs such as water user associations and natural resources/environment protection associations started to actively operate in the country in response to civil society's needs. This law is the comprehensive legal framework of any national and regional Moroccan water resource management decree and is the reference for water security issues of major importance for the country. It provides the necessary regulatory, legal and institutional framework to support sustainable water management. It includes several articles related to the protection and preservation of water resources, wastewater discharge, and the reuse of treated wastewater. The only available standards are those prepared by the National Office of Drinking Water (ONEP). They include:

- NM 03-7-001 related to drinking water quality

[21] Loi sur L'Eau. http://www.water.gov.ma/semide/FR/themes/loi.htm. Retrieved 5 January 2011.

- NM 03-7-002 for the monitoring of water supply systems.

Figure 1. Main stakeholders in water sectors in Morocco.

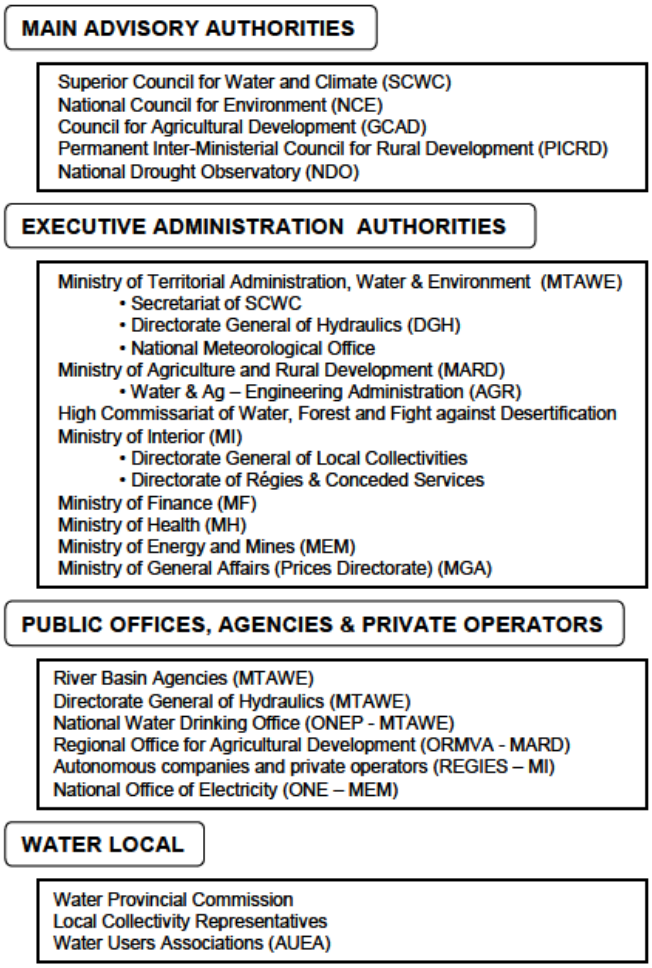
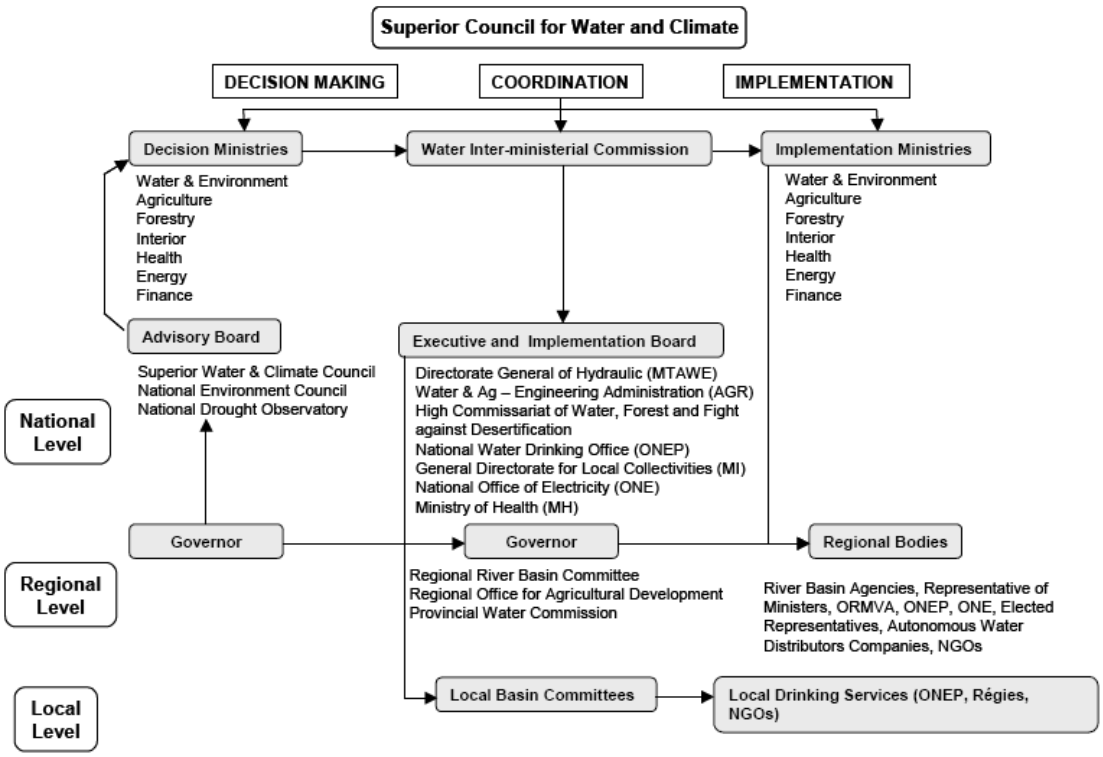


Figure 2. Water resources management in Morocco.



The overarching goal of this law is to use an integrated water resource management approach (IWRM) to integrate and coordinate the allocation and management of all water sources and users.[22] The latter are under a single but decentralized institutional arrangement centred on river basin agencies (RBAs), being the public authorities who control and monitor water from all sources. [23]

The RBAs have the authority to manage surface water storage and allocation, groundwater pumping and water pollution and quality. In addition, RBAs have considerable managerial and regulatory responsibilities besides their role in developing and supplying water. They can regulate and monitor water quality and use as well as plan and organise flood control and water-related emergencies within their respective basins. To fulfil their tasks, RBAs work with water sector partners in the basin area such as ORMVAs (Office Régional de Mise en Valeur Agricole), the National Authority of Drinking Water (ONEP), representatives from the environment, health, and provincial officers, and Water user Associations (WUAs). Article 16 of the Water law specifies the

[22] As defined in the UN Water report, the integrated Water Resources Management (IWRM) approach that has now been accepted internationally as the way forward for efficient and sustainable development and management of the world's limited water resources and for coping with conflicting demands. The most widely accepted definition of IWRM is that given by the Global Water Partnership: "IWRM is defined as a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems".

[23] The level of Authority of RBAs over groundwater is still being defined, as well as the relationships between RBAs and ORMVAs.

Plan Directeur being the Water Master Plan as a component of the National Water Master Plan (NWMP) which must be approved formally through a decree. [24] [25]

This twenty year Master Plan grants permits for water users to exploit groundwater, and takes stock of current water supplies available within a river basin and proposes allocations to municipal, industrial, and agricultural users.[26] This Master Plan, as specified in the Water law, can be reviewed and amended every 5 years.

Based on the inputs of national government, the main managerial and planning responsibilities of RBAs are the preparation of river basin management plans from both surface and subsurface water sources in their respective basins, following the principles of IWRM. Eight water basins are created (Figure 2) in which the water balance as well as the water supply and demand are quite heterogeneous (Table 1). While the major part of the water is gathered from surface water which supply is divided heterogeneously within the basins, groundwater is spread all over the basins, providing water for agriculture and domestic water use in areas lacking surface water.

In order to reinforce this law and put it into practice, several projects have been designed and financed by international organisations, among them the 1998 Water Resources Management Project (WRMP). This World Bank funded project was specifically designed to support and put in practice the goals and principles of the Water law by financing its activities. The policy reforms took an IWRM approach. They *inter alia* decentralized water management to the basin level and set up river basin agencies, while promoting further legislation to change the institutional structure and help the 1995 law become more functional. These water policy reforms addressed by the Water Law supported the development of a framework for long-term planning, the establishment of a regulatory framework to limit groundwater mining and to control water pollution, the promotion of economic incentives to control demand, and improvements in cost recovery for water-related services.

[24] According to the 1994 Water Law, the Council is in charge of adopting the water master plans drafted by the relevant water management directorates within MTAWE MARD. These authorities are in charge of preparing the National Water Plan which will be operational after recommendations of the SCWC which is headed by the King.

[25] Article 16 of the Water law calls for the preparation of the *Plan Directeur*. It specifies that "the principle objective is the management of water resources from the basin, including statuary waters to quantitatively and qualitatively ensure present and future needs of the many users of the water basin". In addition, the national water plan called for in Article 18 of the Water law, governs national priorities with respect to water resources and links individual river-basin plans with regional development.

[26] The Water law specifies that the priority water allocation is for drinking water, after which it is allocated to industry and agriculture. This is not considered a constraint to agriculture as municipal water requirements are relatively small.

Figure 2. Actual and projected inter-basin water transfers. Source: World Bank, 1995.

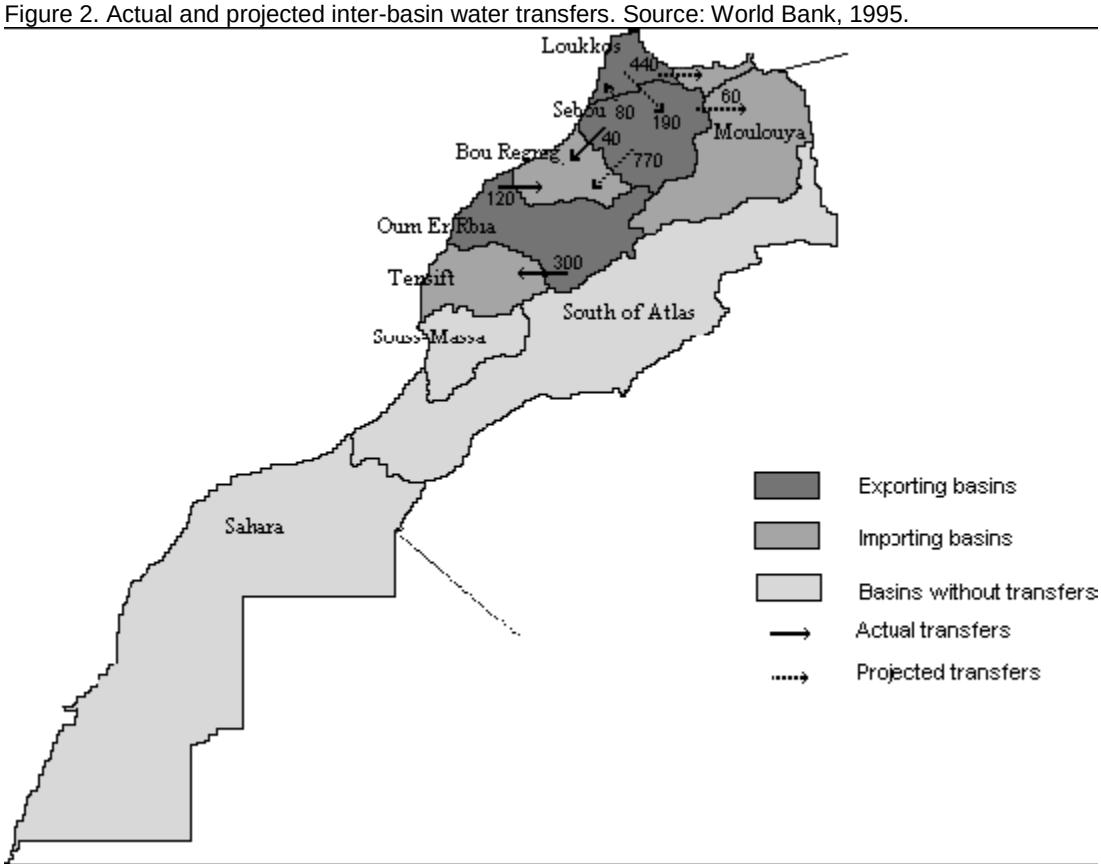


Table 1. Supply of and usage for water in eight basins in Morocco in 1990 (million m3).

	Supply of water			Demand for water				
Basins	Surface	Ground water	Total	M&I	Irrigation	Other	Total	Balance
Loukkos	630	90	720	110	380	230	720	0
Moulouya	930	230	1,180	70	1,090	0	1,180	0
Sebou	1,690	350	2,040	230	1,560	60	1,840	160
Bou Regreg	310	250	560	380	160	30	570	30
Om-er-Rbia	3,010	280	3,290	190	2,490	80	2,740	360
Tensift	880	850	1,330	150	1,300	150	1,800	-80
Souss-Massa	300	590	890	60	890	0	950	-60
South of Atlas	710	290	1,000	20	1,330	0	1,350	-350
Total	8,260	2,730	10,990	1,210	9,190530	10,930	60	

Source: World Bank, 1995

2.2. *Evaluation of the Water Law*

2.2.1. Relevance:

The set goals of the Water law are **highly relevant** as Morocco is a water scarce country, and is expected to become water stressed[27] in the near future.

- This law stipulates Water as a public hydraulic domain and adopts conservation and protection measures of these resources, providing a first step towards controlling water resources in the country.

- In contrast to previous public water related approaches, the water law designed a structure for the water administration, which directed efforts to improve water quality, and environmental conditions. These efforts are expected to increase the extent of water services, with special focus on assuring potable water throughout the country.

- The water law addresses water issues in an integrated and comprehensive manner through river basin agencies. It describes the needed institutional change in order to put into operation a more decentralised and participatory water management programme.

- The law sets rights and obligations for water use and differentiates between water uses by providing licenses for different uses (drinking, household, agriculture, industry, medical interest…). The introduction of new taxes, "redevance de bassin" based on water abstraction, and pollution taxes and penalties are practical measures to prevent infringements through water uses. These measures are planned to control water use and will be utilized in public investments to reduce pollution.

- The water law introduces new instruments providing the administration exceptional power to deal with drought. In the case of acute drought, a decree defines the area where the administration receives powers that allow mandating a reduction in abstraction and stipulates an obligation to use underground resources. This is an attempt to control drought situations by executing a reactive drought related mechanism.

[27] Based on UNDP Human Development Report (2006), *Beyond Scarcity*, defines countries under water stress as having less than 1,700 cubic meters of water available per person.

2.2.2. Effectiveness:

The effectiveness of this Law is rated as **high**,

- The parliament published decrees and public orders to support the institutional framework for IWRM, as the government found it an effective framework for management of its water resources who included it as a pivotal concept.

- Major river basins are now managed by basin agencies. RBAs manage watershed planning, collect user fees, protect the environment, and mitigate natural hazards. Environmental protection projects included stabilizing degraded hillsides around dams while mitigation actions include the construction of flood-prevention infrastructure and flood evacuation channels to reduce annual flooding in vulnerable cities. Furthermore, RBAs proved to be able to cover a major part of their expenses shortly after being set. They proved to improve public safety through several pilot projects that resulted in dramatic reductions in water chemical pollution.

- Cooperation among agencies and participation of private water user associations in management decisions started to take place. National and regional institutional responsibilities have been defined and consolidated. Procedures for allocation of water were established together with technical capacities to allocate and monitor water quantity and quality.

- Around 50 decrees and public orders were prepared and processed through the national administration, political, and legislative systems, and published; the most important being decrees related to water extraction and water pollution. This progress on the legal side is an indicator of putting the Water Law into practice. On the other hand, the reform process is far from complete and a far more important challenge is the creation of an institutional framework and a change in behaviour among the public sector and the population.

- Several of the RBAs, have put some of the Water law rules into practice since their creation. RBAs proved to be an effective way to introduce IWRM to Morocco. RBAs objectives include the allocation of water to the various users in each catchment, the control of water quality, the assurance of cost recovery via charges for extraction of water and

discharge of wastewaters, the maintenance of hydraulic infrastructure including dams, the enforcement of extraction, the effluent discharge licenses, and flood control procedures.

- Despite the setting of the Water law 16 years ago, and the continuous publishing of decrees, awareness efforts (i.e. the National Debate on Water[28]), in addition to many funds and grants to promote reforms in this sector, the political processes in Morocco are highly influenced by power gaining and losing, making efforts in political power and influence issues that need to be set to increase the effectiveness of the law.

- The question remains of how to sustain all the efforts done till the moment by ensuring project funding. Broader reforms need to be set for the law to function efficiently, both in the political and technical sides. Some problems still remain despite these considerable achievements, which is discussed later in the document.

2.2.3. Efficiency:

The efficiency of this Law is rated as **moderate**,

- RBAs have been established in major river basins, and they are covering 80 percent of their operating costs from fees[29], making them semi-autonomous.

- The principle of having a fully integrated management of water resources in Morocco is widely accepted by relevant ministries; the inconvenience is that individually they are unwilling to give up any authority. Lack of cooperation among agencies involved in the water sector as well as delays in funding allocation are the main facts reducing the efficiency and the implementation of the water law.

- Several evaluation, allocation, training, and development projects (African Development Bank, FAO, EU, World Bank) have been implemented in Morocco improving the capacity to monitor and evaluate water resources quality.

[28] National Debate on Water / Débat National sur l'Eau 2006.

[29] World Bank. Project Performance Assessment report, Morocco (2009).

- According to the World Bank, dam maintenance puts significant pressure on the RBAs budget as well as on staff time. This fact would indicate that the balance of resources and responsibilities need adjustments for an efficient functioning.

- The Administration is still largely in charge of the formulation of policies regarding water and the legislative control is not very well developed. The consultative institutions and stakeholders do not have regulatory powers and do not have a proper say on water issues. Their role is limited to advising the various agencies and ministries regarding water and drought management. The list of ministerial bodies involved in the sector shows very clearly the shortcomings of the actual setting limiting by this the efficiency of actively involving the legislative actors in future reforms.

- There are still serious reform gaps within the water sector, especially in areas such as groundwater regulation, systems adjustment within large irrigation schemes and supportive institutions for irrigated agriculture.

2.2.4. Impact:

The impact of this Law is rated as **moderately satisfactory**,

- The Water Law has created an institutional framework for IWRM in Morocco, but 16 years after having been passed the law it is still not fully implemented.

- Water agencies have been created with partial financial autonomy. By now, all the agencies are functional, and pocess a local autonomy and power allowing widening the dialogues on water issues at the local level with the stakeholders (water associations, and the civil society).

- Introduction of "water fees" in different sectors (though not completed)

- Flood-prevention and flood evacuation planning have started

- Capacity of water resources managers' has been improved

- Increase in the effectiveness of existing hydraulic infrastructure; and introduction of water pollution control measures.

- RBAs took many years and they still remain relatively weak entities.

The impacts of the measures established by the Water Law since 1995 have started to provide tangible results in Morocco. Though the efficiency of the policy needs to be improved, important policy impacts include:

- Improved water sources and expansion of potable water supply throughout the national territory,
- The creation of decentralised governmental agencies (water basins) staffed and trained,
- Improved coordination between agencies on managing water resources,
- Improved knowledge on water resource supply and demand at the local levels, and more preparedness to seasonal water supply and demand,
- Decrease in the number of disputes among water users,
- Improvement in the protection of aquatic ecosystems.

Though the Water Law made water resources a public domain and structured the water administration in Morocco, there are still some concerns about this sector. The uncontrolled development of socio-economic activities and excessive use of water resources among different sectors are contributing to its over exploitation and pollution. This situation is expected to worsen during the frequent droughts that affect the region and are expected to increase as a result of climate change events. Possible conflicts among users are expected and shortages in water availability in such period might affect the security of the local communities in case this law is not amended to include institutional structures that can deal with conflict management.

3. The Plan Maroc Vert (PMV)

The PMV is an ambitious strategy that aims to transform the agri-food sector into a stable source of growth, competitiveness, and broad-based economic development in rural areas through a combination of agricultural investments and systemic public sector reforms. The PMV addresses important constraints in the sector and embodies a paradigm shift from a highly protected to a more open market oriented agriculture and away from concerns with only farm level production and towards integrated value-addition all along the agri-food chain that will bring better opportunities to small and large farmers alike. Institutionally, it represents a major shift from state intervention that replaces private sector to one that focuses on delivering public goods and services and developing Public Private Partnerships (PPPs) to support the sector. In the period 2009-2020, an estimated 140 billion MAD (around €11 bn) of combined public and private sector investments are envisaged in around 1,500 commercial (Pillar I) and smallholder (Pillar II) agriculture investment projects. The latter would focus mainly on marginalized rural areas. In combination with the GoM's ongoing *Programme National d'Economie d'Eau en Irrigation* (PNEEI) and the systemic public sector reforms undertaken by the PMV, these investments are to realize the agri-food sector's domestic and export growth potential, particularly in fresh and processed high-value fruits and vegetables, stemming from Morocco's geographic position and privileged access to the EU and US markets, rising domestic demand for quality food driven by growing incomes, favourable climate, and abundant and relatively low cost labour. Through this investment, PMV seeks to create 1.5m jobs in the agriculture sector, and add around €7.65bn to GDP[30].

3.1. Description

As national growth requirements and poverty concerns needed to be balanced, agricultural development became an important component of Morocco's overall economic strategy since the mid-1960s until the 1980s.[31] The Green revolution in the 1960s was relatively successful in supporting the thinking towards an agriculture-oriented growth process by improving the productivity of the already irrigated agricultural areas, and the expansion of perennial irrigation to 1 Mha. [32]The latter part of the agriculture oriented is popularly referred to as the "million hectare" policy in Morocco.

[30] Economy of Morocco {http://en.wikipedia.org/wiki/Economy_of_Morocco}. Retrieved 28 February 2011.

[31] McAPM (2009). Offres du Plan Maroc Vert pour l'accompagnement des exploitations agricoles.

[32] Doukkali (2005). Water institutional reforms in Morocco. Water policy 7: 71-88.

In 2008, the Ministry of Agriculture and Maritime Fishery (MAPM) and the agricultural development agency adopted the PMV to make agriculture a national growth engine. The PMV sets forth agricultural reform measures to be fully implemented by 2020[33] based on two pillars:

I. Acceleration of high value added agriculture, through an investment of 10 billion USD in 600 – 700 national projects;

II. Struggle against rural poverty (2 billion USD social investments).

The strategy is founded on an equitable management throughout the national territory, improving the lives of the rural population which accounts for more than 80% of the national population and depends primarily on agriculture.

Currently, through international projects, the GoM is implementing cross-cutting policies and institutional reforms identified in its PMV agricultural development strategy. The main objectives are:

- Fight against rural poverty by improving farmers' income.
- Improve food security by guaranteeing that food availability at prices accessible for the whole Moroccan population (30 millions).
- Protect the natural resources of different regions: Sustainable development, especially in preservation of the water resources as the natural resource is most affected by drought and competitions in the region.
- Integrate the Moroccan agricultural products in the international markets.

Government actors agreed on a work mechanism, through which they coordinate integrated investment plans for water mobilization infrastructure and irrigation infrastructure development. Conventions between ORMVAs and RBAs were set establishing rules for allocating (surface) water quotas, and developing joint action plans for reducing overexploitation of groundwater resources. This strategy adopts models of conglomeration to develop a network among actors in this field and plans to mobilise 125 – 170 Billion DH yearly (~ 11 – 12 Billion Euros yearly) in funding and international loans.

The PMV aims at reinforcing the agriculture sector and sets strategies for a more sustainable use of natural resources (mainly water) for irrigation in the coming 15 to 20 years. This is expected to be translated in modernisation and a better organization in the agriculture sector. The major outcomes of this strategy are expected to contribute to GDP growth, the creation of jobs, in

[33] MAPM (2008), 'Plan Maroc vert : Premières Perspectives de la Stratégie Agricole, Meknès.

exportations and in rural poverty alleviation; the triggering of a new wave of massive investment around new national and international investors around plans of win-win conglomerations.

Though the PMV is a relatively new policy making its evaluation premature, some national and international actions started taking place since its adoption in 2008 and therefore would help to point out the implementation status of the policy. Several programmes have been designed to support the implementation of the PMV, a major one being the "National Irrigation Water Saving Programme (PNEEI)" formulated in 2009 by the Water and Environment Secretariat[34], which aims at providing support to the PMV by protecting water resources and improving the living conditions of rural populations through sustainable management of these resources. The implementation of this programme has been partially loaned by the African Development Bank by 53.59 million EUR, and the government of Morocco provided around 15 million EUR. The project will intervene in 3 water basins (2 with high water stress levels: the Oum Rbia and the Moulouya, and the 3rd basin, the Loukkos the selection of which was based on the desire to offset the imbalance between cost of energy and the relatively low levels of development). The project will finance the construction of irrigation infrastructure within these 3 basins covering about 20,000 ha, as well as irrigation water development measures and capacity building activities for the stakeholders involved (executing agencies, Agricultural Water Users' Associations, etc.). It will also directly affect 5,853 farms, with a target population of almost 30,000 inhabitants. Additional projects (concept phase) in support to the PMV are planned like the Development Policy Loan (DPL) operation and the Climate Change Integration (CCI) into the PMV.

DPL is potentially granted by the World Bank to the government of Morocco (estimated date of board approval is the 17th of March 2011) and the estimated cost of the planned operations is 206.38 million USD. [35] The proposed operation will support the implementation of the GoM's PMV program (2008-2020) by targeting supply and demand constraints to agricultural development. The DPL series is structured around four of the key cross cutting policy and institutional reform priorities identified in the PMV. The objectives of the proposed operation are to (i) improve the efficiency of domestic markets; (ii) improve the socio-economic impacts of Pillar II projects; (iii) improve agricultural services; and (iv) improve the use and management of irrigation water.

The CCI potentially granted by the Global Environment Facility (GEF) to the Government of Morocco (estimated date of board approval is the 17th of May 2011) and the estimated cost of the

34 African Development Bank (2009). National Irrigation water saving programme support project (PAPNEEI).

35World Bank. Programme Information Document – Appraisal stage. {http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/01/26/000003596_20110127100220/Rendered/PDF/PID0DPL0Morocco0Jan260En.pdf}. Retrieved on February 28th 2011.

planned operations within the project is 120million USD. [36] The project includes 2 components (i) to strengthen the institutional capacity for the integration of climate change in the planning of agriculture and water sectors (Indicative allocation: 15% of GEF grant). The main activities include consolidating and increasing knowledge of climate change, Morocco´s vulnerability to climate change effects, and climate change adaptation measures. This will support the agencies and institutions responsible for the implementation of the PMV by including adaptation measures in the design of future PMV projects.(ii) Promote agricultural techniques that improve resilience to climate change to farmers in target areas (Indicative allocation: 85% of GEF grant): This component will provide supplementary financing to PMV projects to incorporate climate change adaptation techniques that improve resilience to climate change in agriculture, such as rainwater harvesting, water-saving techniques, limited and no-tillage, crop and cultivar selection, and early warning systems.

3.2. Evaluation of "Plan Maroc Vert"

3.2.1. Relevance:

PMV is rated as **highly relevant** to CLICO's research objectives. By addressing a nationwide agricultural development strategy which objective is to improve the income of the rural society and improve the use and management of irrigation water. Through the planned activities of the DPL project (stated previously), Morocco is expected to publish an order requiring the beneficiaries of State assistance to install water metering systems, and the signature of the associated Instruction requiring these beneficiaries to include in their application package for the DPL assistance a declaration or authorization of water abstraction. Through major implementing partners (World Bank, ADF), the GoM started designing and implementing policies to promote more efficient water use. This is being achieved through tariff adjustment and improved monitoring mechanisms.

Regarding climate, strengthening the institutional capacity for the integration of climate change in the planning of agricultural and water sectors will support from one side the agencies and institutions responsible for the implementation of the PMV by including adaptation measures in the design of future PMV projects.On the other hand, the incorporation of climate change adaptation techniques that improve resilience to climate change in agriculture, such as rainwater

[36]Global Environment Facility. Integrated safeguards data sheet – Concept stage. { http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/07/07/000262044_20100707155707/Rendered/PDF/Integrated0Saf10Concept0Stage01GEF1.pdf}. Retrieved on February 28th 2011.

harvesting, water-saving techniques, limited and no-tillage, crop and cultivar selection, in addition to early warning systems will strengthen the national capacity to better cope dry period with decrease in the amount of agricultural crops improving the national human security.

3.2.2. Effectiveness

The effectiveness of this strategy is rated as **moderate**, as PMV is achieving partially its objectives. The CCI projects integrate further CC adaptation measures into the planning and implementation of selected agricultural projects within the PMV and increases the percentage of farmers adopting CC adaptation technologies. These measures are expected to enhance resilience to CC, namely through the adoption of CC resilient crops and improved cultivation practices and the development of a disaster prevention and management tools. Furthermore, early warning systems and weather-index based insurance schemes are planned to support in managing, monitoring, and evaluating CC effects on agriculture. Though PMV plans a comprehensive improvement of the agricultural cycle including diversification projects, reconversion projects and intensification projects, water fluctuations are still hindering the set objectives.

The main factor influencing the efficiency of the PMV in addressing cross-cutting issues like water resources and climate change will depend on improving national coordination mechanisms and operational collaboration for climate risk management among relevant stakeholders. Therefore the government needs to identify measures to promote national coordination mechanisms as responsibility for agriculture, water, and climate change is currently spread among a number of agencies and institutions with limited strategic coordination of their mandates.

3.2.3. Efficiency

The efficiency of the PMV is rated as **significant**, and the outputs of PMV are partially justified. To improve the PMV, funding to projects designed to meet the strategy's objectives have been mobilised by major international donors as the African Development Bank, the European Union, AFD, taking CC considerations in the implementation phase of the PMV.

On the water resources level, the agricultural sector consumes 87 percent of water resources in Morocco and faces increasing competition from urban and industrial consumers. Per capita annual renewable water resources are estimated at 800 m^3, implying that Morocco is already a water stressed country. [37] However, suboptimal irrigation practices and deficient water service contribute to low

[37] Roe et al. Understanding the Direct and Indirect Effects of Water Policy for Better Policy Decision Making: An application to irrigation water management in Morocco. International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.

irrigation water productivity. Average value-added of irrigation water is 1.63 MAD/m3, which is well below its potential of 4 MAD/m3. [38] Therefore, the GoM needs to allocate further state assistance at the national level targeting farmers to promote drip irrigation and water metering systems in order to control and make a better use of these resources.

The proximity of the country to potential European and US markets and the low cost of labour in the agricultural and agro-industry sectors is an advantage to export national products. In parallel, the liberalization of the trades in agriculture will contribute to seriously disadvantage local producers in the domestic market.

3.2.4. Impact

The impact of this Law is rated as **significant**. The major positive impacts of the PMV include the social and economic development measures which have considerable impact on rural development, and hunger and poverty alleviation. The use of efficient irrigation techniques affects positively the sustainable use of water resources decreasing the national vulnerability to confront the challenges of increased water deficiency in the future.

On the other hand, some negative environmental consequences are also expected, especially the increased pressure on scarce water and arable land resources due to increased demand and pollution resulting from accelerated agricultural development. [39] Appropriate measures to reduce these negative effects that the GoM should implement include the promotion of more efficient water use through tariff adjustment and improved monitoring mechanisms.

The GoM emphasized, through its development planning in the last three decades, on maximizing the capture of the country's surface water resources and providing for their optimal use in different sectors: irrigated agriculture, potable water supplies, industrialization and energy generation… In parallel, through the implementation of the PMV, the GoM did a big effort in increasing its agri-products and integrate Moroccan agricultural products in the international markets.

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[38] World Bank 2011.

{http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/01/26/000003596_20110127100220/Rendered/PDF/PID0DPL0Morocco0Jan260En.pdf}. Retrieved 28th of February 2011}

[39] [39] World Bank 2011.

{http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/01/26/000003596_20110127100220/Rendered/PDF/PID0DPL0Morocco0Jan260En.pdf}. Retrieved 28th of February 2011}.

This expansion of irrigated agriculture is shifting the government's efforts to ensure socially and technically efficient allocation of the existing water resources among competing consumers and the depletion of its water resources.

Projections to 2020 of this growing water scarcity and increasing water demand estimate Morocco to move from being defined as a "water stressed" to being a "chronically water stressed" country, [40] Expected consequences include tensions for water access and use which might spill over to conflict, affecting the wellbeing and security of its livelihoods.

[40] Clarke, Robin 1993. *Water: The International Crisis.* MIT Press.

4. The "Plan National de lutte contre le réchauffement climatique" (PNRC)

4.1. Description

The government of Morocco has recognised the negative effects of CC precisely on its territory by increasing hydrological stress, vegetation cover fragility, and desertification affecting consequently the security of its population.[41] In its attempts to combat CC effects, quite damaging in Morocco, the government signed the UNFCCC convention on CC in 1992 and ratified it in 1995. Further, in 2001, the GoM hosted the 7th conference of parties "COP7", which made operational the protocol of Kyoto. The GoM adopted this protocol during COP7, and accessed it in 2002. [42] The Kyoto protocol became legally binding on Morocco in 2005.

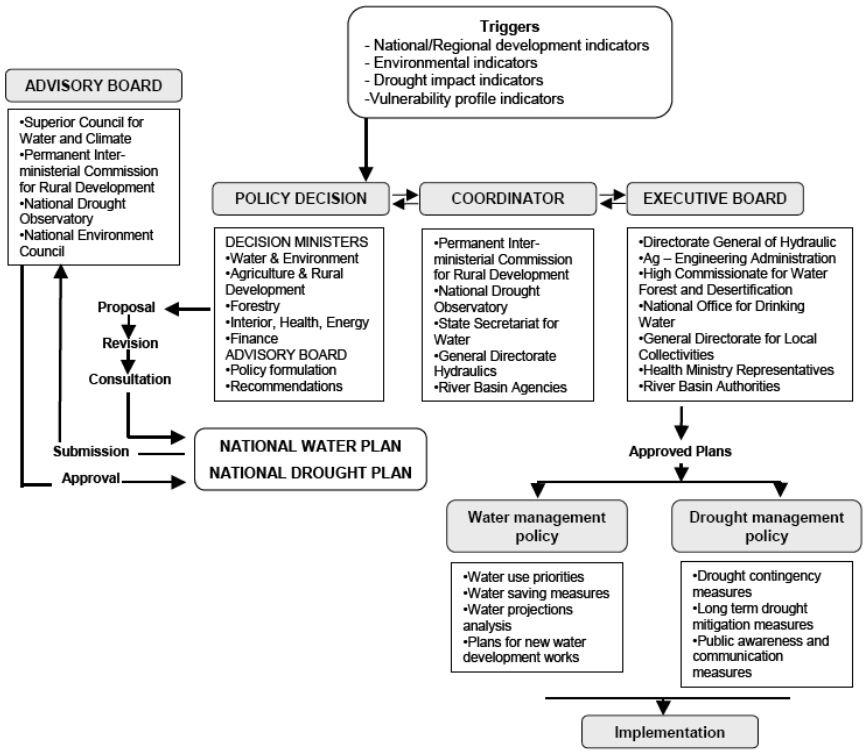
In its strategy to combat CC effects, the GoM improved its drought policies by shifting from crisis management to a more proactive drought management approach.[43] It created a network of representative stakeholders working on drought issues at the national/regional/local levels. The objective of the network is to assist decision makers and drought managers with the design of appropriate drought policies to achieve better risk management. The strategy is lead by the Moroccan ministry of Energy, Mines, Water, and the Environment (MEMWE) (Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement) who set up clear operating guidelines to improve drought characterization, monitoring and impact evaluation; to reflect regional differences in drought characteristics, vulnerability and impacts; and to effectively govern drought management. This ministry is responsible for revitalizing different sectors in the fight against climatic change and foresee interdepartmental conventions to the realization of the concerned actions. Furthermore, this strategy sets new principles for coordinating effectively the work between national scientific institutions and key stakeholders (Figure 3).

[41] Royaume du Maroc. Le Plan National de Lutte contre le Réchauffement Climatique. Département de l'Environment. 5-34. 2009.

42 Kyoto Protocol 2006. {http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf}. Retrieved on March,1, 2011.

[43] For an overview on the progress on National water reforms in Morocco, check: Ouassou et al. 2005.

Figure 3. Proactive strategy in hydrological and agricultural drought in Morocco (Ouassou et al. 2005)



PNRC aims at reinforcing governmental actions facing CC effects based on strengthening inter-ministerial efforts to mitigate CC effects, strengthening visibility and communication on inter-governmental actions, and initialising and optimizing interdepartmental management for these actions. In this strategy, the Ministry of Environment coordinates all sectors affected by CC and foresees future interdepartmental conventions necessary for the realization of actions against CC effects. The PNRC is subdivided into three parts:

- *Measures of mitigation* foreseen for the sectors of energy, transport, industry, agriculture, forestry, construction and waste management. Their objective is the promotion of a "Clean Development Mechanism", realization of inventories of greenhouse gas emissions, and a support of "green taxation").

- *Measures of adaptation* specifically in the sectors of meteorology, water, agriculture, forestry, fight against desertification, and overfishing. In addition, reforms in territorial planning, health issues and tourism are envisaged. The measures of adaptation are based on the Water Strategy and on certain elements of « Plan Maroc Vert » adopted for agriculture sector, both adopted in 2009.

- *Cross-cutting measures* support mainly adaptation projects (individual or community) related to water economy, and rain water harvesting.

The measures adapted are divided into functional and operational. At the functional side, this strategy creates a network of relevant ministries within the efforts to combat CC in Morocco. In addition, it leads to the supervision of regional plans and the increase in cooperation within the National Committee of Climatic Change as well as the activation of scientist and technical networks in this sector in order to study specific inter-sector impacts of CC. This strategy searches for international financing sources in order to implement the set action plans.

At the operational level, the strategy plans the creation of a yearly record on greenhouse effects, technological networks to measure climatic indicators, as well as increasing the capacities of people involved in CC studies in addition to the sensitization of the public in climatic changes.

4.2. Evaluation of PNRC

4.2.1. Relevance:

In Morocco, the impacts estimates of climate change, especially on agricultural production and water resources are plausible over the next 20 years. The most damaging impacts are a reduction of water resources below threshold levels [44] and increase in desertification, decrease in yields, with particular reductions in cereal crops and the disappearance of some crops, the loss of biodiversity and rising sea level. [45]

Therefore, the GoM needs to urgently manage its water demand, improve the efficiency of water use, and promote conservation in the different sectors as key ingredients in promoting adaptation to climate change and ultimately improving human security in Morocco. [46]

44 Sowers et al. (2010) show that the absolute water availability per capita is not expected to exceed the threshold of 500 m3/year/capita that defines water stress in Morocco in 2025.

[45] World Bank (2009). Morocco study on the impact of climate change on the agricultural sector. { http://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxkcnlsYW5kYWdyaWN1bHR1cmV8Z3g6NTIxMmQ3YTExZTQ1MWQxOA&pli=1}. Retrieved March, 2, 2011.

[46] Weinthal et al. 2010 confirm that almost all countries in the MENA region have sought to expand water distribution and storage systems through dams and canals, significant demand management of water consumption was not taken until severe droughts and falling water supplies in aquifers and lakes used as reservoirs became critical.

In this context, the adaptation measures set by the PNRC are **highly relevant** to CLICO's objectives as they mobilize efforts from social and economic actors to combat CC effects. This strategy reinforces the country's mechanism against its vulnerability in national and sectoral development priorities. It aims to strengthen technological trends (agricultural yield improvements, water management at the level of agricultural plot) and institutional capacity (reinforce water policies, increase the responsibilities of the water agencies) to tackle climate-related concerns in its key sectors being domestic economy - water resources and agriculture.[47]

This plan covers a gap on the needed national and local adaptations and crosscutting issues related to Climate effects in an interdisciplinary context. Therefore, the interdepartmental conventions efforts and coordination among the different ministries that the PNRC foresees are an opportunity to introducing / reinforcing the different thematic policies towards policies that take the CC effects into consideration.

4.2.2. Effectiveness

Though some results start to be achieved, the effectiveness of this plan is still **intangible** as it is a very recent measure put by the GoM to combat CC effects (November 2009), there are some regional and national actions that already predict an improvement in approaching CC related issues.

Energy-saving technology in different sectors, precisely in agriculture, forestry, water and industry is starting to be used in Morocco. In addition, the specific budget for regional projects implementation deposited by the MEMWE shows the government willingness to invest in CC initiatives. Furthermore, regional projects on climate adaptation measures have been planned and some got financed, especially in the context of community based water agreements[48], renewable energy, drought and flood warning, fight against land degradation, among others. [49]

On the other hand, to date, still some bottlenecks exist in the implementation of this strategy. There are different sectors involved in fighting CC, and thus the associated budgets, have been spread out

[47] The study on the impact of climate change on the agricultural sector of the World Bank (2009) states that the management of water, land and crops at the national, regional watershed and local (farm) level is the basis of climate change" adaptation"

[48] In Morocco, The Departmental Adaptation Plan within the Department of International Development of the UK funded new community water agreements which are being tested to help manage possible conflict over increasing water scarcity. { http://www.defra.gov.uk/environment/climate/documents/dfid-adaptation-plan.pdf }. Retrieved on March 3rd, 2011.

[49] 150 Million US$ are allocated for Morocco from the African Development Bank in CC related initiatives

amongst different administrative bodies. Problems are not appraised from a holistic perspective and no cross-sectoral solutions are elaborated. [50]

50Combating desertification. {http://www.desertifikation.de/bmz-cd013/BIN/PDF/INDEXC635.PDF?id=42&type=123&L=1}. Retrieved on March, 3rd, 2011.

4.2.3. Efficiency

The outputs of the PNRC specific to agriculture and water resources are **highly relevant** as CC effects which are estimated to worsen in the near future, are already highly harmful for Morocco.

This plan is an impulse to multi-sector synergies. The set adaptation measures go inline with other national strategies like the "Plan Maroc Vert" (improvement of crop varieties for better adaptation) specific to Agriculture and the "Water strategy" and the National Programme for Water Saving in Irrigation specific to using water resources sustainably (optimization of resources, strengthening infrastructure,…) launched in 2009. This cross-cutting strategy is pushing different sectors to integrate CC within their specific reforms and action plans. [51]

In the meteorological sector, the « Direction de la météorologie nationale » elaborated its 2010-2012 plan considering the reinforcement of its technical and human structures to monitor and research extreme climate events, improve its alert mechanisms in case of extreme meteorological events.[52]

In the water sector, the Department of Water is implementing several measures that are part of the National Water Strategy published in 2009. These measures, whose implementation is spread over the period 2010-2030, cover a wide range of sectors and provide measures to present risks of droughts and floods at the level of each hydrological basin, water saving measures (drinking and industrial water), reduce water use in agriculture, and water transfer, and institutional measures to better control water resources. In the water infrastructure sector, this strategy plans until 2030 include the creation of dams and of adaptation methods for including climate change factor in their management specially drought and excessive precipitation. Furthermore, it focuses on the protection of water sources, water tables, rivers and their interconnectivity. In addition, PNRC focuses on the socio-economic development of several regions through the North-South water transfer as CC adaptation measures.

[51] The UNDP programme in Morocco has recognized the efforts done by the GoM through the PNRC in different sectors, namely in meteorological predictions, water, agriculture, fisheries, habitats, land use management, health, and tourism. { http://www.un.org.ma/spip.php?article776 }. Retrieved on March 3rd, 2011.

[52] As a response to regional Climate projections of the Intergovernmental Panel on CC (IPCC), the Moroccan National Directorate of Meteorology has developed three-year adaptation plans (2010-2012). These measures have a budget of around 400 million dirham and aim at strengthening of human and technical development of the early warning of extreme weather events using new remote sensing techniques (radar, satellite, lightning), and the development of effective weather prediction models as well as climate research and specific studies on weather risk analysis to be used by different sectors.

In the agriculture sector, this plan reinforces work between the Directorates of the Ministry of Agriculture and Marine Fisheries (MoAMF), the National Institute of Agronomic Research (INRA) in research activities like breeding and impact of CC effects, improve in seed qualities for drought adaptation, and water harvesting techniques. In addition, it reinforces the work of MoAMF in implementing the "Plan Maroc Vert", namely in adaptation of agricultural practices to CC effects, modification of irrigation strategies, legislative and accompanying measures.

The PNRC specifies climate related measures to be taken in the health and tourism sectors. And one of the most innovative sides of this strategy is on resource mobilization in the non conventional waters, including the development of desalinisation factories using wind and solar energy, and water recycling for its reuse.

This strategy tackles needed institutional reforms to its good functioning stressing on a strengthening of RBAs in managing underground water and the authority of water police, particularly in cases of overexploitation of public water and groundwater. In addition, it specifies a complete governance mechanism for the implementation of its measures like its update, financing mechanism, periodic evaluation, reporting, awareness and communication.

4.2.4. Impact

The impact level of this strategy is rated as **significant**.

Through the PNRC, Morocco sets up a permanent process of piloting of its policies allowing significant advances in good governance and international cooperation. In addition, the governance measures presented in this strategy are beneficial for its adequate implementation. Though new, this strategy has already been adapted by the ministries of agriculture and interior strengthening their collaboration in different CC related aspects.

The reliability of this strategy in renewable energy such as the wind and solar energies is innovative and sustainable for the country due to its weather conditions favouring these sources as energy alternatives. This national strategy goes in line with Morocco's international efforts in combating CC impacts while securing energy and rational management of water resources. Through its hosting of the COP 7 in Marrakech in 2001 and its active involvement in high level negotiations, and through the implementation of the PNRC at the national level, the GoM is putting efforts to achieve sustainable development, developing strategies for rural and human development and to reach a more sustainable economy. [53]

[53] Within its Arab Region State of Implementation on Climate Change report, the Economic and Social Commission for Western Asia of the United Nations considers that Morocco has considered Climate change impacts as a high priority in the last decade..
{http://www.un.org/esa/sustdev/csd/csd14/escwaRIM_bp2.pdf}. Retrieved on March 3rd, 2011

Though the PNRC established a strategy for integrating climate change concerns in its sectoral policies and on focusing on solar energy as sustainable energy sources; actions need to be taken and implemented urgently, precisely in the sectors of water and agriculture, being fundamental for the human security of the country. Special mechanisms need to be planned and set in place for recurrent droughts situations in order to ensure the security of the local communities and to avoid possible conflicts.

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3. Summary

Although Morocco has contributed little to climate change, it is predicted to suffer disproportionately from the effects. The disadvantage already characterizing its resource-dependent rural households may be exacerbated in the face of future changes in regional precipitation and temperature patterns.

The fact that climate change is happening and its effects will continue to pressure further Morocco´s resources (specifically water), the GoM still needs to reform and better implement its policies to reduce climate-related effects on its population, particularly in rural areas.

The GoM has effectuated several institutional reforms in its attempts to overcome pressures related to extreme droughts which became more frequent threatening national economy and security. The policy analysis of the 3 major water related policies (table 2) presented in this document reveals that the rural livelihoods are still vulnerable to predictable resource-base changes. Irrigated agriculture are an essential pillar of economic and social development in Morocco and are still largely climate-sensitive due to the lack of infrastructure, improved practices, and low-water demanding crops. This fact makes the Moroccan agriculture production and food security largely vulnerable to CC, affecting the human security of the most vulnerable people in the region specifically to the rural population who are directly dependent on local agricultural production.

In general terms, the GoM needs to reinforce more efficiently different sectors to synergise their efforts to combat CC effects by introducing the "poverty reduction" factor in its policy reforms. In this way, development efforts, programs, and investments to reduce poverty will lessen livelihood vulnerability, ultimately increasing the national human security because of climate change.

Table 2. Summary of the 3 Moroccan policies rated in this study using the DAC principles for Evaluation.

Policy	Period	Sector	Relevance	Effectiveness	Efficiency	Impact	Instruments				
							Institutional organisation	*Management*	*Economic instruments*	*Monitoring*	*Research*
Loi sur	Starting	All	**HIGHLY RELEVANT**	**SIGNIFICANT**	**MODERATE**	**MODEST**	●	●	●		

Policy	Period	Sector	Relevance	Effectiveness	Efficiency	Impact	Instruments				
							Institutional organisation	*Management*	*Economic instruments*	*Monitoring*	*Research*
l'Eau	1995		• Integrated water management • Water quality • Rights and Obligations	•Decentralisation •Institutional cooperation •Prioritisation of water use •Full implementation •Funding	•80% of costs covered from fees •Capacity building (monitoring and evaluation) •Gaps in institutional cooperation •Pending regulations (water pollution, water pricing) •Minor role of consultative institutions	•Most of water agencies functional •Water fees for each sector •Flood-prevention and evacuation plans •Improved management of water infrastructures •Law not fully implemented after a decade •River Basin Authorities still weak					
Plan Maroc Vert	Starting 2008	Agriculture	**HIGHLY RELEVANT** • Food security • Modernisation • Capacity building • Water protection and management (allocation) • Equality and solidarity	MODERATE •Adoption of large number of projects •Adoption of CC resilient crops •Health and plant health obstacle for trade liberalisation (EU &USA) •Not enough resources for modernisation •Water fluctuation	**SIGNIFICANT** •Funding from international organisations •Implementation of irrigation efficient systems •Integration of CC issues •Land tenure: small properties	**SIGNIFICANT** •Decreased hunger (economic and social measures) •Increased revenues of small farmers •More sustainable use of water		●	●		

Policy	Period	Sector	Relevance	Effectiveness	Efficiency	Impact	Instruments				
							Institutional organisation	*Management*	*Economic instruments*	*Monitoring*	*Research*
Plan National de lutte contre le réchauffement climatique(PNRC)	Starting 2009	All	**HIGHLY RELEVANT** • Development of mechanisms according to Kyoto Protocol • Integration of scales, sectors and policies	**INTANGIBLE**[54] • Implementation of energy-saving technology • Some projects of flood and drought warning, and fight against land degradation already financed • Guidelines for project implementation (coordination of regional actors)	**HIGHLY RELEVANT** • Cross-cutting initiative in line with *Plan Vert* and *Water Law* • Mid-long term planning • Implementation of water efficiency in all sectors • Reinforcement of collaboration between agriculture and R&D • Mobilisation of non conventional waters (e..g desalinisation plants)	**SIGNIFICANT** • Already adopted by Ministry of Agriculture and Interior • Active involvement of Morocco in combating CC (e.g. COP 7 in Marrakech)	●	●		●	●

[54] Too early to evaluate its effectiveness.

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In-depth assessment of selected policies in Niger

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Abstract

This document presents an in-depth assessment of selected policies in Niger for step 3 of the work package 4.1 of the Climate Change, Hydro-Conflict, and Human Security (CLICO) project of the Seventh Framework Programme. Using the Organization for Economic Cooperation and Development's (OECD) evaluation criteria, we have evaluated the Water Code, Pastoral Code, and the National Action Program for Combating Desertification and for Natural Resource Management or PAN-LCD/GRN, all of which are policies relevant to the broader CLICO project. Following a social and legal approach, our study revealed conceptual strengths coupled with weaknesses in enforcement of the rural policies, as well as broader dependencies in relation to the PAN-LCD/GRN.

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1 Introduction

In the country of Niger, the distance between the government enclaves in the capital Niamey and the rural citizenry can often make for difficulties in developing legislation. In the country's recent elections, only 50% of the population that was registered turned out for voting. The constraints to participation in the democracy of this nation of 15.3 million ethnically-diverse people originate in the chronic poverty (63%), wide-spread illiteracy (71% over age 15), and frequent droughts which devastate the rural economy. According to the Human Development Index, Niger was ranked 167 out of 169 countries at the close of 2010, related to an extremely low education rate averaging 1.4 years per person. The Sahel's fragile environment coupled with the burgeoning needs of the population (growing at a 3.7% rate) have increased the vulnerability of both pastoral and agricultural peoples. Like many nations of the Sahel, the chronic climactic and poverty conditions contribute to rural-urban migration, famine, and a history of dependency on foreign aid.

To enhance their stability, Niger's pastoralists and agriculturalists, two groups with contradictory natural resource interests (Turner 2004; Lycklama 2000), have developed many different and sometimes conflictive adaptation mechanisms. To support cooperation and reduce the likelihood of conflict in the rural system, the Nigerien government has developed innovative legislation related to management of pastoralism (Pastoral Code), water resources (Water Code), and the fight against desertification (National Action Program for Combating Desertification and for Natural Resource Management or PAN-LCD/GRN).

This evaluation examines the relevance, effectiveness, efficiency, impact, and sustainability of the selected legislation, according to the OECD criteria of evaluation. The methods used to collect field data include expert interviews, focus groups, and participatory observation in Niamey and the regions of Zinder, Tahoua and Maradi. Participants included rural stakeholders, members of the *Commissions Foncières* (COFOs) or Land Commissions, and experts from governmental and non-governmental associations. Due to the short duration and physical constraints of the fieldwork, it was difficult to access a sufficient amount of data for each piece of legislation, particularly the PAN-LCD/GRN, especially since the majority of rural participants were not aware of such a document, nor its effects. To complete the data, we examined literature relative to the legislation and rural system in Niger. However, the information collected during the literature review was often incomplete or outdated and it

was often hard to verify its accuracy. Thus, this analysis is a juxtaposition of the judicial process of writing legislation and the reality of high disenfranchisement in the rural zone.

We begin with an explanation of the Rural Code, the original legislation that explains the rural system in Niger and provides a legal framework for both main rural groups – pastoralists and agriculturalists. We examine in detail two elements of that code – water and pastoralism. Finally, our analysis reveals the challenges of implementing legislation related to desertification, which emerged from Rio Earth Summit of 1992, the national legislation known as the PAN-LCD/GRN. Our analysis focuses on the most recent version of each piece of legislation.

2 Code Rural - Water and Pastoral Codes[1]

2.1 Historical Framework

The Code Rural was adopted on March 2, 1993. It was established through the ordinance n°93-105 of March, 2, 1993. This ordinance was later completed by different legislative and statutory texts which constitute the global jurisdictional device of the Rural Code.

The Comité National du Code Rural (CNCR) is in charge of defining the major orientations in terms of popularization and follow up in terms of land tenure. The Secretariat Permanent du Code Rural (SPCR) is the executing authority of the Comité National du Code Rural. It is therefore in charge of the implementation of this national policy in terms of tenure. Its mission is to elaborate proposed legislation which is complementary to the Rural Code, create a documentation centre on the rural land, follow up and evaluate the land commissions.

- The Rural Code was implemented with the aim of establishing a juridical framework for agricultural, silvicultural and pastoral activities in the perspective of territorial management, environmental protection, and support of inhabitants. It is carried out in accordance with the decentralization process which the country has been undergoing. The Code assures the security of rural producers through the recognition of their rights to land

[1] See Pastoral Code (2010). Notes: In late 2010, the government released a specific code on pastoral issues, which includes the 1961 decree fixing the base area for pastoralists; the full pastoral code will be considered for this analysis.

tenure and water and pasture access; thus it facilitates development through the rational organization of the rural world.[2] The code is a legal and strong constitutional instrument which resembles both modern judicial and the existing traditional frameworks, which allows for easier acceptance by rural constituents. Medium and long term missions dealing with land securitization of rural operators, the conservation and management of natural resources, the organisation of the rural world, the planning of the territory have been assigned to it.

One of the acclaimed innovations instituted through the Rural Code is the creation of Land Commissions: the COFOs. They are authorities which deal with the implementation of the national policy in terms of income from land. The land commission has a diverse composition made up of technical officers, administrative and customary authorities, women, young people and civil society representatives. It constitutes a consultative framework for reflexion and decision making in terms of natural resources management and conflict prevention.

There are three different operational levels of the territorial organisation of the land commissions:

- At the departmental level: Cofodép (Commission Foncière Départementale)
- At the communal level: Cofocom (Commission Foncière Municipale)
- At the village level: Cofob (Commission Foncière de Base)

Since the adoption of the ordinance a series of legislative and complementary regulatory texts have been elaborated and implemented. The following are relevant to our study:

- Ordinance n°93-014 of March 02 1993 modified by the law n°98-041 of December 7, 1998 dealing with the Water Regime
- Decree n°97-007/PRN/MAG/EL of January 10 1997 which sets the statute of home areas of pastoralists
- Decree n°97-008/PRN/MAG/EL of January 10 1997 dealing with the organisation, attribution and functioning of institutions in charge of the implementation of the orientation principles of the Code Rural
- Decree n°97-368/PRN/MHE of October 2 1997 dealing with the modalities of implementation of the Ordinance n°93-014 of March 2 1993 dealing with the Water Regime

[2] République du Niger, Ministère du Développement Agricole, Comité National du Code Rural, Secrétariat Permanent du Code Rural, (2006)

- Law n°98-041 which modifies the Ordinance n°93-014 of March 2 1993 dealing with the Water Regime
- Order n°98/MDA/CNCR/SP of November 25 2005 dealing the organisation, attributions and modalities of the land commissions of communes, villages and indigenous groups.
- Ordinance n°2010-09 on the Water Code determines the terms for the management of water resources over the entire Nigerien territory
- Ordinance nº2010-029 of the 20th of May, 2010 dealing with pastoralism (also referred to as the Pastoral Code)

The constraints facing the COFOs and the leaders of the Code Rural in this relatively newly-decentralized system are many. Despite the attempt to harmonize the Rural Code with existing traditional forms, the Rural Code constitutes a kind of deadline (Lund 1998) such that traditional rights and relationships are both taken into account and questioned by a new modern system. Individuals working at the COFO base essentially have the same responsibility to enact the law as those in regional capitals, though there are vast differences in the level of training and comprehension of legislation. What inhibits the changeover to the new system is the capacity of the COFOs to communicate the code to the many rural producers who will then institute a universal system of governance. This is especially true in the pastoral areas. As a result, conflicts and disputes are handled within the customary system, and a low degree conflicts reach the departmental or regional COFOs. As a result of this fragmentation, to inform rural producers about important attributes of the Code requires a concerted, coordinated effort from government officers, non-governmental organizations, and rural producer associations. It is of interest to note that, the wide-spread use of cell phones has broadened communication and reduced conflict, according to some experts. In pastoral areas, information is most likely shared on market days or during yearly, traditional festivals. The remainder of this section will focus specifically on the Water and Pastoral Codes.

2.2 Water Code

During the two decades of the great Sahelian droughts, Niger's emergency military regime (1974 – 1989) funded the construction and maintenance of wells and water points throughout the country. Towards the end of the 1980's the Nigerien state experienced a crisis of public finances. The crisis was characterized by the deflation of the country's primary export, uranium and a decreasing of international aid due to the refusal of the country to sign its second structural adjustment

programme. This crisis revealed gaps in the management of water by the state and prompted a reorganization of the water sector in the country. In the 1990s, efforts towards decentralisation reignited. The process shifted the balance of power from local aristocracies in favor of lower-level village authorities. Later in 2004, formal municipalities were created within the existing system of cantons (Mohamadou 2009). It was in the context of decentralisation in the 90s that a series of laws regarding the water sector were adopted and provided for the basis of the Water Regime (Tiadjani 2005).

The Water Regime was established in 1993 with the adoption of the Rural Code (Ordinance n° 93-014). The Code was updated in 1997 with the Decree n°97-368/PRN/MHE. This decree specified the set of legal rules for the construction and management of public water points and determined the measures for the qualitative protection of waters. The 1998 Law n°98-041 modifying the ordinance n° 93-014, further defined and determined the rules related to water within the whole of the Nigerien territory as well as the conditions of water usage.

In 2010, individuals from various organizations such as the Rural Code and the Ministry of Water, Environment, and the Fight Against Desertification formalized a national Water Code. The document contains language relative to all aspects of water management including water rights, all the different kinds of water usage, and the prevention of water degradation. This development is pertinent due especially to the great relevance of water to the rural system in Niger and the importance of its regulation to prevent conflict. Overall, the Water Code provides a unique legal framework that enables the usage and preservation of water.

Some key elements of the 2010 legislation are as follows:

- Every citizen has a fundamental right to water and it is the obligation of the State to assure that this right is fulfilled (Article 4-6)
- No individual has a priority over another to satisfy his needs or her animal's needs for water (Article 8)
- Those who cause water contamination through pollution must pay for the restoration of the water source. This obligation is enforced by the state (Article 13). Those who make efforts to clean up or restore water sources must be reimbursed by the polluter (Article 39).
- All water resources above and below the ground are property of the State, however individuals may create private water sources and manage theirs and others' water use both on private property (Articles 15 and 19). And in pastoral areas on a herder's *terroirs*

d'attache or family territory (Article 20). However, pastoralists cannot privatise the usage of water on their territory. Thus, access to public water points in the pastoral zone is open to all, including outsiders such as transhumant herders.

- Anyone who uses public water points has an obligation to contribute towards their maintenance and management. The sum is determined by the volume of water and by function of the service rendered (Article 38 and 70).
- Public water points have to be managed by Management Commissions ("*Commisions de Gestion*"), which must be formally established by the administration. Management Commissions are responsible for the general maintenance of the wells and the collection of users fees. (article 21 - 30)

The 2010 Ordinance n°2010-09 on the Water Code determines the terms for the management of water resources over the entire Nigerien territory. It specifies the conditions relating to the organisation of the supply in water of the populations and the livestock as well as those relating to the hydro-agricultural developments. The Ordinance recognizes the fundamental right for every citizen to access water. It states the obligation of the Nigerien state to make available for all water in sufficient quantity as well as in a satisfactory quality at an acceptable cost whenever and wherever needed. Furthermore, it foresees planning tools which are necessary to the sustainable management of water resources such as the national policy for water, the national action plan for the integrated management of water resources and the development plans and management of the water resources (Afrique Avenir website 2010).

Strengths of the Water Code

The 2010 Water Code was adopted two months after the February 2010 coup which overthrew the government of president Tandja. It provides a more in depth legislation on water than prior ones. The 1993 code provide a more technical overview of water legislation whereas the 2010 code completes this with a social emphasis. This is exemplified by Article number 4 which recognizes for every citizen the fundamental right of access to water as well as the right for everyone to have water corresponding to their personal and domestic needs. It restates the obligation of the state to provide for each water in sufficient quantity and of good quality and adds that water should be of an acceptable cost and should be available at all times and wherever there is a need for it.

In addition, the new Water Code acknowledges the fact that water is an ecological, social and economic good whose preservation is of general interest. It underlines that for its usage under any form everyone must contribute to its conservation and protection (Article 6). In Article 8 the principle of equality for water use is stated.

The social emphasis of the law is reinforced in Article 9 through the enumeration of certain principles such as: - the recognition of the key role played by women in the enhancement and preservation of water resources as well as the principle of an equitable and reasonable use of water.

Article 10 highlights the will of the State to inform and integrate the population to a participatory process of elaboration and implementation of decisions when concerned.

Furthermore, the 2010 code recognizes to a certain extent customary practices for the management of water as long as they do not impair the objectives of the Code (Article 11). Pastoralists may receive priority rights for the use of natural resources situated in their home base areas such as the access to water points. Pastoralists can only be deprived of this right due to public purposes and with a just compensation (Article 20). Articles 75, 76, 77, 78, 79 and 80 further set the rights for the pastoralists' access to water as well as the acknowledgement of relevant customary observations.

Niger through the Water Code commits itself to cooperate with other states and carry out all treaties, conventions and international agreements relative to transboundary water issues (Article 14)

Finally, the new Water legislation establishes a series of institutions such as: the Commission Nationale de l'Eau et de l'Assainissement (CNEA), the Commissions Régionales de l'Eau et de l'Assainissement (CREA), Commissions de Gestion de l'Eau and Unité de Gestions de l'Eau (UGE) to help manage water (Article 25,27, 28, 29, 30).

Meeting the Millennium Development Goals

Access to clean water has been underlined as a one of the key Millenium Development Goals (Goal 7, Targets 9, 10, 11). Furthermore, climate models for the Sahel region suggest increasing periods of drought and greater variability of rainfall (Hulme 2001; IPCC 2001, 2007; Hengsdijk and van Kuelen 2002). Article 4-6 of the 2010 Water Code of Niger states that every citizen has a fundamental right to water, and it is the obligation of the State to assure that this right is fulfilled.

Niger's legislation related to water provides a framework for the MDGs and meets the challenges related to climate change and drought.

Shortcomings of the Water Code

Paradigm of pastoral water management

Water-related conflicts in Niger persist between variant user groups, ethnic groups, or as part of longstanding feuds property rights. Most often, one hears of conflicts between herders and farmers. Herders, whose animals have a tendency to wander into farmers' fields, may restrict access to public wells located in villages to prevent crop damage. This restriction is allowed within the Code, given that farmers are working on private lands (Article 19). However, in the pastoral zone in northern Niger, the techniques for pasture management are driven by limiting water access. This mechanism is mentioned in the 2010 Water Code related to pastoralist's priority rights. Yet, the pastoral techniques of management are not fully protected in this new Code, despite the inclusive statement.

To prevent overgrazing in the pastoral system, pastoralists will limit the number of animals through regulation of water access. The more individuals and herds allowed to use a water point, the greater the likelihood of permanent damage to the pasture. Understanding the natural systems, pastoralists will limit the number of animals in a given location for a select amount of time during the rainy season. The customary tool of water regulation guards the integrity of the natural system.

However, in recent years there has been an increasing amount of animals penetrating the pastoral zone, and such customary regulation has become more and more difficult, inducing the possibility of increased conflict.

Pastoralists, renowned stewards of the pastoral territories (CBD 2010), lose some of their abilities to protect their land as a result of the Rural and Water Codes, both of which are arguably more relevant to agro-pastoral communities than pastoralists (see the critique of Niger's Rural Code by Thébaud et al 2006). The 2010 Water Code makes notable improvements by including more language relevant to pastoralists; what is missing is language that protects their environmental management systems.

The 2010 Water Code is summarized as:

All water resources above and below the ground are property of the State, however individuals may create private wells and manage theirs and others' water use both on private property (Article 15 and 19) and in pastoral areas on a herder's terroirs d'attache or family territory (Article 20).

Yet, pastoralists are not able to privatise the usage of water within their home territories. Thus, access to public water points in the pastoral zone is open to all, including outsiders such as transhumant herders. Furthermore, the 2010 Water Code allows visiting herders to build wells (Article 76). This factor, while ameliorating the potential for conflict due to the customary practice of limiting access might augment the tensions between cultural groups, who may impose their customary rights to the territory. In practice, often individuals who both understand the Rural Code and have more political power are able to build wells for personal use and are limiting access to others via the customary law.

If there is a well in the village or *terroir d'attache*, visiting herders typically are required to pay a fee for using the water, anywhere from 1,000 to 50,000 cfa per month (Project ZFD, date not known). Other times, visitors are requested to stay for a specific duration of time, after which they must move on. Yet, despite customary law and the provisions in the 2010 Water Code, transitory herders will often enter without negotiation.

Concurrently, a struggle is in progress in the pastoral zone to build wells in order to "grab" access to the land. Their modes of land tenure for some groups over others have evolved with changes brought about by colonization, drought, and development programs. The 'home territory' or *terroir d'attache* has submitted to this evolution. The influx of herders from southerly countries has further complicated the balance of access, power, and environmental management in the pastoral zone. To guarantee their access to resources herders who have only lived in Niger's pastoral zone for several generations build their own wells or 'adopt' government-built wells. Due to pressure from competing herder groups, these so-called visiting herders have been refused the right to build. More often, such herders have great difficulties finding access to water. This situation leads to a heightened risk of conflict.

The Water Code aims to equitably regulate water usage for the different actors in the country and to establish a legal framework enabling the protection of this natural resource from degradation.

However, the Code has not sufficiently overcome the conflicting practices of both customary and modern laws or codes.

Management Commissions too weak to protect resources

The decentralization process initiated through the Rural Code led to devolution of power to local governments over water management and supply also created issues of coordination between the new and previous entities (Thébaud et al. 2006). The Management Committees, whose role appears to be limited, have been particularly criticized for having been created in a hasty and standardized way (Hedger and Cacouris 2008). The consequence of which has led to them not benefiting from much legitimacy and encountering difficulties when managing the water resources. Their effectiveness has also been put into question due to financial and maintenance matters which have disabled their powers.

In the course of this study, some experts have pointed out the ways in which decentralization has not served the needs of the population in relation to water due to blatant corruption and inefficiency. In one instance, a borehole (servicing nearly 20,000 people and animals per year) management committee stopped collecting fees due to the conflicts the collection was creating with their neighbors. During the height of the dry season, the borehole fell into disrepair, requiring the aid and generosity of a local non-governmental organization (Ariane Kirtley, personal communication 2010). Boreholes also attract large numbers of users, greatly impacting the surrounding landscape, for which the management is not within the commission's jurisdiction.

Inadequacies of COFOs

The Water Code's implementation process has been criticized for not producing adequate results with regards to long-developed priorities (Hedger and Cacouris 2008). The Land Commissions (COFOs) typically are made up of agriculture or animal husbandry specialists, not lawyers or managers. Yet, their work is primarily one of a social nature and requires the skills of a community leader or educator. Very few agents of the COFOs or representatives from the regional water ministries pay regular visits to their constituents. Such travel requires resources that most of the

governmental services lack. One of the main constraints for the water management system, thus, is fiscal.

However, it has been underlined that the ministry in charge is trying to adequately address these long-term issues as well as involving donors. With donor help, the government's capacity to treat its own water problems will improve with time in both efficiency and effectiveness. The lack of resources has been underlined as being a major issue impeding the successful implementation of the laws which make up the water sector (Hedger and Cacouris 2008). The impact, effectiveness, and organization of the Code will increase as individuals gain greater civic understanding. Again, due to the many constraints facing this poor nation, it is difficult to foresee the road ahead.

Future of the Water Code in Niger

There are a large number of organizations working with rural producers to explain and interpret the rural codes. To prevent and reduce conflict, these associations hold meetings and large social gathering of rural groups to explain and interpret the legislative texts. One example is the Fédération Nationale des Eleveurs (National Federation of Herders). Beginning in 2001, the Federation has held meetings between Tuareg and Fulani pastoralists. The meetings are mostly social events, yet the Federation holds a meeting to address the complaints of both groups in an open forum. In 2009, the two communities, once in conflict over cattle theft have taken on the planning and activities of the event. This kind of engagement is important at various levels of governance to reduce the prevalence of conflict.

The overall goal of the Rural Code is to organize and plan the territory, conserve natural resources, and set up a system of natural resource management. In order to succeed in this goal, the Rural Code should continue to improve its system of rural management and legislation. The government must utilize its decentralized system to disseminate and seek information from those for whom the laws are written. The Water Code has greatly influenced the rural system, given especially to the importance of water in Niger. As the above examples have shown, corruption, customary practices, and land tenure issues have a great impact on the execution and acceptance of the law. When these fail, individuals with means find other ways to circumnavigate the Code.

2.3 Pastoral Code

Since the 1990s, after the Concord of the Tuareg Rebellion was signed, a slow paradigm shift began to occur amongst some pastoralists. While originally abhorrent of state power and activities, pastoral leaders, especially in the Tuareg community, moved from a state of resistance to one of collaboration. One aspect of this evolution was the need for written policies governing the pastoral zone, established by decree in 1961 (the law fixing a north-border setting the rights for culture), but poorly regulated. Another piece of legislation relative to pastoralism is the Decree fixing the home areas of pastoralists (*Terroirs d'attache*) (1997). Pastoral leaders from all ethnic groups and lawyers from Niamey gathered formally to work out the details of the code, revising the document collaboratively many times. Upon submission to the National Permanent Secretary of the Code Rural, the document spent three years in deliberation before being adopted in May 2010 and approved by the interim president of the Republic Djibo Salou.

The 2010 ordinance completes, defines and specifies the fundamental principles and rules which make up pastoralism in Niger which were previously set out by the Code Rural. Some of the major advances pointed out (RECA 2010) are:

- It recognizes mobility as a fundamental right of herders, pastoralists, nomads and transhumant. (Article 3)
- It deals with the prohibition of the seizure for private purposes of pastoral spaces which pertain to the public domain of the State and collectivities. (Article 5)
- It identifies Article 60 as crucial step forward as it deals with the anarchical and uncontrollable cutting and selling of pasture.
- It underlines that the property of pumping stations remains to the State of Niger, the region or department. (Article 23)
- It defines the securitization of the access paths of livestock to surface waters. (Article 25)
- It sets out a system for closing and for freeing the fields in the agricultural zones at the end of the harvest, in order to allow animals safe passage into the fallow fields. (Article 34)
- It seeks to solve the problems related to the base areas of pastoralists. (Article 52)

In 1961, an innovative law established a base area for agricultural cultivation (Ordinance 61-5) and essentially created a geographical border to divide Niger into two different land use areas. The North is reserved to pastoralism, and farming of new cultures are forbidden therein (Article 1). As a result, all the agricultural activities started by the farmers in the North ceased after the last harvest (article 3). Only the food subsistence culture made by the nomads as well the culture in the

oases are allowed. If farms persist in this zone, the damages done by the livestock on such illegal farms cannot be pursued (article 4). The law aims to solve conflicts arising between farmers and herders over agricultural land or pasture by completely separating the activities. However, despite this law, the growing demand for agricultural land is pushing farmers northwards. Thus, increasingly, farmers illegally cultivate lands that are considered lawfully part of the pastoral zone. Through this decree pastoralists benefit from priority rights of use of the base area and of the resources which belong to this area. It is not, however, a right to property.

The 2010 version of the Pastoral Code makes an interesting reference to climate change while evoking the status Law fixing a north-border setting the rights for the limits of cultivation. It states that the north-border remains applicable but evokes a future update which will take into account the decentralization context of Niger and climate changes (article 7).

Along with other aspects of the Rural Code, the COFOs are the instruments to manage the legal guidelines laid out in the Pastoral Code. Pastoralists are charged with ensuring the protection and rehabilitation of the hydraulic resources as well as pasture.

Therefore the 2010 Ordinance (Ordinance nº2010-029) relative to pastoralism addresses the above legislation and all other legal issues governing the pastoral way of life and territory (PFPN 2010).

Strengths of the Code

The establishment of a Pastoral Code, housed within the Rural Code brings to the forefront the needs of livestock producers that have been largely ignored in government and development programs dominated by farming initiatives. Firstly, the Code defines and supports mobility for all types of animal husbandry activities in Niger. Secondly, it assures the safety of passage and access to water points and areas of pasture in the zone of cultivation. Thirdly, it establishes a legal method for interaction between those individuals practicing animal husbandry and alternate land use groups such as agriculturalists, mining companies, or commercial livestock production on ranches.

If the goal of the Pastoral Code is to reduce conflict by defining and specifying the principles important to pastoralism, it does so by emphasizing the importance of mobility. One important element to the lifestyle of herding peoples is the ability to move freely in search of pasture and water. This is shown first in Article 3, which states “mobility is a fundamental right for pastoralists,”

following with definitions of how this mobility will be secured (for example no appropriation of land that could inhibit the practice of pastoralism, Article 5). This further establishes the pastoral zone as an open area available to all types of animal husbandry – pastoralism, nomads, and transhumant herders. This inclusion eliminates any restrictions of animal husbandry activities in the zone, but excludes agricultural activities that were first outlawed by the 1961 Ordinance 61-5. Furthermore, as part of the West African Economic Zone (ECOWAS), the pastoral areas of Niger are therefore opened to herders from Cameroon, Nigeria, Ghana, Mali, and other West African states.

Since the 1961 Ordinance, the farming areas have not ceased to expand into the pastoral zone, a fact which has been acknowledged by customary and national leadership. The Code further outlaws agricultural activities in this zone, requiring no monetary compensation for animal consumption of agricultural produce in the zone. The cutting and selling of grass in the pastoral zone is also outlawed. Moreover, any activities that would inhibit access to pasture, such as enclosure of land in the pastoral zone is prohibited. The Code, thus, strengthens this concept of a pastoral zone, owned and managed by the Nigerien government through the Land Commissions at local, commune, and regional levels.

The needs of livestock are also protected in the agricultural and agro-pastoral zones, where animal corridors are often limited due to few water points located on the routes, farmers planting crops inside the corridor, or an overall lack of fodder and trees available therein. As a result, herders meet great difficulties in transporting their animals between the pastoral zone in northern Niger and alternative pasture in the south. While this transhumant activity is not relevant for all groups of herders, the Code declares that pastoral corridors are protected for any livestock needs and any group of herders. Furthermore, though water points are not well established along the traditional corridors, herders are allowed to access nearby water points within this legislation.

Thus, the Code puts forth a framework, which also strengthens the overall Rural Code, and aims to reduce conflict. The establishment of the pastoral zone in 1961, followed by the consequential legislation relative to pastoralism have attempted to provide the conditions necessary to reduce conflict and enhance the capacity of herders and farmers, while taking into account the different interests and current traditional arrangements of rural groups. Though it is not likely to change the overall system of governance, the Pastoral Code emphasizes rights and obligations of individuals in the pastoral system and opens a discussion for improving the management and adaptation needs of the pastoral system in Niger.

Shortcomings of the Code

Limiting the adaptation strategies of pastoralists

Some of the Pastoral Code's stated strengths are also its weaknesses. The uninhibited right to mobility is one of the Code's great strength. However, this right can also be perceived as a weakness as it meets the needs of certain constituents and not others. Indeed the limits to cultivation impede customary practices of management and adaptation to climate change within the pastoral zone.

The new Code reiterates the established 1961 limit of cultivation, but it does not take into account the problems related to the enforcement of this legislation, nor the reality of the pastoral situation. Rather, it seems to mirror the framework of the agricultural (farming) system. To illustrate this inequity, one expert provided the following example. He stated that if a farmer planted in the pastoral zone 20 years ago, his farm would be "grandfathered" in and he would own the land. However, if a herder and his ancestors lived on a certain winter pasture for a century, he still has no ownership of the land.

. The term "pastoral zone" itself is not relevant to some groups of pastoralists whose families have lived within and upon the same winter territories for generations. Many of these pastoralists have settled into villages and taken up farming in the pastoral zone for economic reasons despite the law against this and the inadequacy of the soil for farming. Similarly herders, seeing the encroaching farms of southern farmers fear that they must either begin to cultivate or lose the land completely. Traditional chiefs have pointed to a decrease in conflict in and around water sources, due to peoples' fear of the consequences brought on by the government. Yet, such fears of government action are not present in regards to illegal farms. Thus, a key shortcoming of the Pastoral Code is the lack of enforcement of the 50- year-old legislation limiting cultivation. Furthermore, this law has not taken into account the direct needs of its constituents, pastoralists.

The concessions protecting the right of mobility in the Code are more beneficial to transitory herders who access the pastoral zone only during rainy seasons than those who continually dwell within the zone. The resources in this zone are considered common property by the government, but not necessarily by its primary inhabitants (Jeff Woodke, March 2011, personal communication). As a result the Code's protection of movements of transitory herders within the pastoral zone holds the possibility of increasing conflict between those with priority rights and those without. The importance of this system to manage and protect the pastoral resources is not mentioned in the language of the new Code.

Contradictions in the laws

While the Pastoral Code fulfills its purpose by enhancing the system of rural governance in the pastoral zone in word, the text still contains many contradictions. One may presume that the pastoral zone resembles Hardin's concept of "tragedy of the commons," or the dilemma of many self-interested individuals depleting an ultimately limited resource (1968). Examining Niger's pastoral system from this perspective ignores the customary structures and functions of the zone. The customary system governing the pastoral groups is based on solidarity. For instance, if this year I have a good amount of pasture in my home territory (*terroirs d'attache*) and next year yours is good, it promotes that I maintain good relations with you by sharing both water and pasture during my good year and vice versa. The basic theory is that those who face similar constraints and share the same resources are likely to cooperate.

While the Pastoral Code provides an important basis for governance of pastoral lands and activities, the many contradictions in the text, ignorance amongst the populace and corruption in the local governing bodies hinder its effectiveness. The protection of mobility, while clearly defined in Article 5, is contradicted in article 52, which allows for mining installations on pastoral lands. Furthermore, while there are clear instructions about pastoral pathways in the cultivation zone, many farmers do not respect these areas and plant their fields across the pathways. Also, the Code states that water points must be established within clearly specified distances from each other in the pastoral zone. However, due to the ease with which officials can be corrupted, many wells are built outside the established "grid." The Code, almost in support of this corruption states that certain deviations in the dimensions of the grid can be authorized by the Governor. Furthermore, typically the installation of a well must be decided by the community, based on the area's natural resource management needs. Pastoralists from outside a community are very often inhibited from building wells by insiders in the pastoral zone, making them more vulnerable during the dry season. Moreover, the *dossier rural* (rural file) that delineates the locations of family home territories, wells, pastoral pathways, and other elements of the rural landscape is rarely utilized or updated. While the Code provides a written guide for the pastoral population, traditional practices and rules often dominate in practice.

Difficulties in communication and implementation in pastoral zone

Overall, there are many constraints in the efficiency of the development and improvement of the pastoral code, based on the process of enforcement of past laws relative to pastoralism. This stems from a number of factors related to capacity and oversight from government offices. For instance, information about the presence or absence of records related to conflict in the pastoral zone are perceived by some officials (even those within the Code Rural) as inaccurate and unreliable. The reason for this is that most conflicts stemming from resource distribution and use are resolved at the local COFO (base) level. If the base level or village chief is not able to resolve the conflict, it is brought before the traditional leader or chef du canton (COFO Com). Very often, the chef du canton keeps no record of the adjudication, though agents from Code Rural are trying to sensibilize traditional leaders of the importance of record-keeping. Only when conflicts become violent do they arrive on the desks of officials in the regional capitals (COFO Dep). The COFO Dep and the Dept of Justice then creates a *Procès Verbale*, or verbal description of the problem. Depending on the level of violence, individuals are often put in jail until the case can be heard by a judge. Sometimes, individuals who have committed small crimes or no crime at all wait in jail for more than 2 years before they meet the justice system and have their case heard.

In some areas, experts spoke about relative improvements in the respect of law, because rural producers are fearful of police and the judicial system. Yet, concurrently there is little opportunity for rural people to learn about the laws that govern their system, especially due to the lack of capacity of COFOs to disseminate information. Thus, non-governmental associations made up of pastoralists and farmers often are left with the task of acting as both informants and in support of their respective groups on the political front. A proper dissemination and execution of the new pastoral code via the governmental system (COFOs) is appropriate to context of both the needs of the rural system and the effective implementation of law; however, such work demands a strong budget for education and outreach currently lacking in the present system.

Future of Pastoralism in Niger

The Pastoral Code and the participatory process of its creation are a remarkable feat. Yet its relevance is diminished by the work that remains to be seen as the Ordinance is put into action. Moreover, some participants in this study mentioned an increasing prevalence and use of arms for negotiation in the agro-pastoral zone. This fact should raise alarm bells for the Government of Niger and bring closer attention to the proper enactment of this legislation.

As the Pastoral Code has only recently emerged as legislation, its impact cannot yet be assessed. The COFOs and non-governmental associations have, at the writing only begun to present and explain this new code to the general population. As this process unfolds, it is clear that this important development will be transmitted throughout the pastoral system and the stakeholders will respond in various ways to the new freedoms and limitations put forth in the Code. Yet, the Code also may create greater vulnerabilities and challenges in the pastoral zone, especially for herders who have lost their pastoral livelihood. The extent of such social, political and environmental transformation resulting from the code should be analyzed in the coming years.

A proper and sustainable implementation of the pastoral code is dependent upon how effectively leaders both disseminate and uphold the contents of the new law. There are large difficulties in enforcing the existing Rural Code, due to both the problems associated with decentralization and a lack of accountability on behalf of politicians and the Commission Foncière. For instance, during the 1970s and 1980s two great droughts decimated the pastoralists' herder, causing many to settle in "illegal" villages in the pastoral zone. Due to the uncertainty of future crises similar to the great droughts, the sustainability of the Code Pastoral is indeed in question. However, with proper enforcement of the natural resources supporting the pastoralist's livelihood, perhaps their resilience to environmental change will be enhanced.

3 Programme d'Action National de Lutte contre la Désertification et de Gestion des Ressources Naturelles (PAN- LCD/GRN) / National Action Program for Combating Desertification and for Natural Resources Management

3.1 Introduction

The PAN-LCD/GRN was adopted in December 2000. It is one of the six priority programmes of the National Environmental Plan for a Sustainable Development (PNEDD). Through the national environmental plan the Nigerien government gives full priority to the issue of desertification control in the context of sustainable development in the country.

According to the national reports available, information and awareness campaigns conducted all over Niger have contributed to the elaboration of the PAN-LCD/GRN. Indeed, throughout the documentation available the focus is put on a participative approach involving the local population as well as the relevant stakeholders hence creating a partnership between the different parties. The PAN-LCD/GRN is moreover described as being a participatory process divided into three stages: the elaboration, implementation and continuous evaluation.

In 2000 the government created a specific ministry in charge of the management and implementation of the PAN-LCD/GRN. However, after 21 months of functioning this ministry was merged with the ministry of water resources. The ministry of Water, Environment and Fight against Desertification is now in charge as well as the National Environment Council for a Sustainable Development (CNEDD), NGO's which are members of the Technical Committee and of the permanent Secretariat of the Committee actively participate in the implementation of the PAN-LCD/GRN. The CNEDD acts as the coordinating body of the PAN-LCD/GRN and other international agreements founded during the Rio conference in 1992. It benefits from its position within the executive branch and guides the technical ministers and staff in charge of national implementation and programs relative to PAN-LCD/GRN, such as the Minister of Water, Environment, and the Fight to Combat desertification.

No specific budget has been voted during its implementation. Each year a specific budget is voted within the framework of public intervention of the state as well as the Special Programme of the President of the Republic for the production of seedling and their plantation, the defence and restoration of soil, conservation of waters and soil, the fight against bushfires, the construction of mini-dams, banks to contain manure and pastoral wells.

In 1999, the "Rapport National du Niger dans le Cadre de la Mise en Oeuvre de la CCD" identified the strategic domains which make up the basis of intervention priority areas of the National Action Programme. These are:

- Natural resources and their exploitation system
- Constraints related to natural resources management
- Support mechanisms to the battle against desertification and the management of natural resources

The general objectives of the PAN-LCD/GRN are:

- To identify factors which contribute to desertification and concrete measures to be taken to combat it and alleviate drought effects
- To create favourable conditions to the improvement of food security, the solution to the domestic energy crisis, the economic development of the population, and their empowerment in the management of natural resources

The specific objectives which will help reach the general objectives are:

- To analyse and follow up the factors that contribute to drought and desertification
- To promote a sustainable management of natural resources in the areas (to organize, train and make the population participate in the sustainable management of the natural resources)
- To improve the production and the rural communities conditions of life namely through the adoption of more appropriate technical ways
- To ensure an adequate funding of planned activities in the different sub-programmes

3.2 Strengths of the PAN-LCD/GRN

Institutional Support

The objectives of the PAN-LCD/GRN incorporate building knowledge about what causes desertification as well how to prevent it. Since its inception, international organisms such as CILSS, Agrhymet, and ICRISAT, as well as national bodies such as the CNEDD, the Ministry of Water, Environment, and the Combat against Desertification, the National Institute for Agricultural Research (INRAN) and the University of Abdul Moumouni in Niamey have developed techniques and management practices that will contribute to the fight against desertification. By researching and disseminating information about technical solutions such as zai holes, trenches, biological erosion barriers, natural regeneration, and rock walls, the national affiliates responsible for implementing the PAN-LCD/GRN are creating of favorable conditions for the enhancement of food security and the improvement of the natural system.

"Greening" the Sahel

In Niger, many low-tech techniques involving large populations of people have managed both desertification and improved overall human security by improving crop yields and providing economic alternatives. However, the extent and scale of these activities is limited due to an overall lack of national budgetary allocation. Thus, the majority of 'greening' activities have stemmed from the initiative of non-governmental organizations and Christian missionaries.

One activity carried out by the Nigerien government in the name of PAN-LCD/GRN has been incorporated into the nation's overall development plan via the Programme d'Actions Communautaires (PAC). The government-sponsored Acacia Senegal plantation initiative has multiple objectives of reducing the impacts of desertification, poverty reduction, and a sink for carbon to mitigate climate change. In this project alone, the National Budget has devoted from $600,000 to $1,000,000 USD since 2000, combined with external funding from partners including the World Bank. In 2007, the plantation project demanded greater investment from local communities of both monetary and social capital.

Another notable project is the Ader Doutchi Maggia Rural Development Project (PDR-ADM), known as the Keita Project. A non-governmental organization with long term (nearly 30 years) objective to increase food security while combating desertification, the Keita project has experimented with various re-forestry, land reclamation, creation of wind breaks and control of the flow of water with dams and other diversion schemes, while also supporting community development of schools, roads, and health centers. What makes Keita unique is that its long term commitment to one community has provided it with environmental analysis based on indicators from data and not models. Successes of the project include: increased cereal yields (39,000 to 55,000 tons), increased woodlands by 300% (10,000 ha in 1984 to 45,000 ha in 2002), and expanded production towards a long list of new products (gum Arabic, aquaculture, onions, sesame) (Di Vecchia 2005).

A simple initiative began with a grass-roots project initiated by missionaries of SIM (Serving in Mission) in the early 1990s. The initiative called farmer managed natural regeneration (FMNR) focuses on supporting natural tree growth instead of growing plantations of trees and transplanting (as in the national Acacia Senegal project). As a farmer is preparing his field, he delineates important species of trees for preservation, protecting them throughout the season. As trees grow, they provide services to the farm, such as nitrogen fixation, decreased soil evaporation, and erosion prevention. The project is passed from farmer to farmer through on-site trainings.

No one could have imagined that farmers in densely populated parts of Niger would significantly increase on-farm tree densities with minimal external support and that the scale at which they would do it would not be publicly recognized for many years. Ironically, this may have occurred precisely because donors did not place their signboards on it. The agro-environmental transformation depicted here may have been "invisible" to governments and donors because it was derived from the grassroots, needing little input from outsiders (Reij 2009).

The benefits of FMNR are numerous and the costs are minimal. Farmers have noted the improvement of crop yields (on average of 100kg/ha [Reij 2009]) and enhanced human security and opportunities for women (who typically are the seekers of fuel wood). Other services provided by the trees include: biodiversity, erosion-prevention, fodder, soil productivity, medicinal needs, fruit, and economic diversification (especially pertinent in droughts). FMNR is observable across a 300-km swath of land between Maradi to east of Mirriah (Reij 2009). Scientists have calculated that at least 5 million hectares have experienced a re-greening due to FMNR, mainly in areas of high population density.

Table 2. Summary table of impacts of farmer-managed natural regeneration (FMNR) in Niger (Reij et al 2009)

Indicator	*Farmer-managed natural regeneration in Niger*
Area concerned	5,000,000 ha
Average costs/ha	US$20 (household labor spent on protection)
Changes in crop yields	+ 100 kg/ha
Additional cereal production/year	500,000 tons
Impact on food security (annual per capita cereal requirements of 200 kg/ha)	2.5 million people (of a total national population of 14.2 million in 2007)
Number of farm households involved	1.25 million
Impact on local groundwater recharge	…
Increase in number of on-farm trees	Over 200 million (all age classes)
Average above ground biomass (tons/ha)	4.5 tons/ha (study area southeast of Zinder)

Note: some indicators measured through farmer's statements and perceptions

Low Costs and Long-term Benefits

The activities such as natural regeneration, the reclaiming of denuded land through zai holes, demi lunes, and other ameliorating technologies, and reforestation or gum Arabic plantations are relatively inexpensive modes of combating desertification. The second general objective of the PAN-LCD/GRN states: "*To create favourable conditions to the improvement of food security, the solution to the domestic energy crisis, the economic development of the population, and their empowerment in the management of natural resources*." The government of Niger has not yet quantified the number of persons receiving improved human security as a result of these activities, but research by several non-governmental institutions shows the following quantifiable impacts:

- On-farm regeneration of vegetation: at least 5 million ha in 20 years (average of 250.000 ha/yr)
- This equates to an average of 200 million trees allowed to grow in farmers fields 1990 – 2010
- Trees fix nitrogen, concurrently improving surrounding soil conditions, which has an ameliorating effect on agriculture
- Trees provide fruits and medicines to communities
- Improved ecosystem services: regenerated areas change the micro-climate, reduce wind erosion, contribute to the water cycle and improve soils
- Integrated agro-forestry techniques to increase overall productivity of the system (soil = agriculture, fuel wood = forestry, fodder = livestock)
- During times of vulnerability, communities in regeneration sites experience less shock, as trees are typically more resistant to drought than crops
- One could hypothesize that the increased human security stemming from natural regeneration equates to less conflict between individuals and communities

(Source: Reij 2009)

Such achievements, regardless of their origin are an important achievement for the human security of the rural producers of Niger.

Reforestation projects like the Keita Project and others require a long-term timeline (ten years or more), something not easily derived from international organizations and financial institutions. Yet, the results are not far from miraculous. In the area of Keita, what was 25 years ago 4,858 square kilometers of barren earth has now become a highly productive area, at the small price of

USD$100,000 (Mann 2008). The budget for FMNR has been extremely small, as the project is sustained by farmers themselves. However, few projects favor short-term result-producing ideas requiring higher inputs (fertilizers, irrigation, new seeds). These measures, while producing results with relatively small amounts of inputs are harmful and expensive in the long term, unlike the FMNR "barefoot" scientific techniques.

Laws that promote stewardship of forests

To be effective, policies and programs of the PAN-LCD/GRN must incorporate sound methods of natural resource management, appropriate technical measures for the social arrangement, long-term sustainability, and appropriate government policies. In Niger, convincing individuals to invest in land management would be close to impossible if government policies did not support farmers' ownership of land and the products (trees, millet, etc) of the land in the agricultural zone. In nearby Burkina Faso, farmers lease land, which gives them a temporary sense of stewardship. It also helps to have organized, long-term, and charismatic leadership at the beginning of any community-based activity such as FMNR. More costly activities like the Acacia plantations and Keita project require large inputs and high-level collaboration, as well as sustained funds. With plantations of gum arabic, some well-off farmers are seeing the lucrative benefits of the plantations and have begun to plant their own without government support. Poor farmers are incapable of this kind of innovation. Due to the relative low cost and high productivity of FMNR, it would behoove the coordinators of the PAN-LCD/GRN to sponsor wider trainings in this type of natural regeneration to produce a "greening" effect throughout Niger. Also, many of the other techniques of soil amelioration are cheap and highly productive, but farmers rarely receive visits from governmental staff from the environmental and agricultural ministries.

3.3 Shortcomings of the PAN-LCD/GRN

Budgetary Challenges

In order to sustain the PAN-LCD/GRN activities, the objective to promote a sustainable management of natural resources and to ensure an adequate funding of planned activities in the different sub-programmes must be considered by the Government of Niger.

Much of the activities described above relative to PAN-LCD/GRN necessitate non-governmental organizations' initial and maintenance funding. Rural people who know about programmes of natural regeneration may not understand the benefits due to traditional and environmental factors.

Natural regeneration, for instance requires many years of patience before a farmer might reap the benefits of his efforts. Though governmental efforts have been made to explain the importance of the fight against desertification through schools and other rural trainings, these have not been enough for rural producers to volunteer their time and energy to the difficult task of land restoration, tree planting, or natural regeneration. Such an effort requires a long-term approach and, possibly, government subsidization.

The government has established mechanisms to both encourage and enforce laws aimed at fulfilling the objectives of the PAN-LCD/GRN by protecting rare trees, requiring permits for harvesting wood, and other provisions. Despite the country's written commitment to fulfil the obligations of the PAN-LCD/GRN, enforcement of the rural laws has proven difficult or has simply been ignored. While agricultural and forestry agents have the skills and training to help rural producers to adapt to the conditions of desertification, rarely have they access to funding to travel to rural areas and train rural producers in these measures.

Thus, the initiatives of the PAN-LCD/GRN are often implemented through exterior programs, initiatives, and funding. However, even the frequency and number of such programs is limited. Development activities in Niger focus on food security, health, and agriculture. Environmental management projects that begin in the country often do not continue once the timeline for the funding has been expended. For instance, after the 2005 food crisis many humanitarian aid organizations started "food for work" projects focusing on turning hard pan soils into productive forests. Workers dug half-moon-shaped indentations in the soil and planted Acacia trees, a method of restoration for the hardpan soil. Unfortunately, such projects require long-term follow-up to protect sapling trees from animals or desiccation. In many cases, the reforestation was unsuccessful due to the short-term nature of the project.

The coordinators of PAN-LCD/GRN and the forestry department responsible for enacting legislation both have pointed to problems related to funds available to initiate activities to combat desertification. The country's national report on the PAN-LCD/GRN's progress has also not been submitted since 2004. Consistent funding coupled with a strategic plan would promote the sustainability of the PAN-LCD/GRN and the natural resources it is supposed to support.

3.4 Future of the PAN-LCD/GRN

Combating desertification remains a critical objective for this large nation facing high natural and economic constraints. Despite some successes in the fight, the damaging effects of desertification are very present and persistent, making the continuation and enhancement of the PAN-LCD/GRN's activities imperative.

While it appears that there are many hopeful initiatives related to the PAN-LCD/GRN legislation, much of the country of Niger has seen little activity to combat desertification. Individuals in the Sahelo-Saharan region of Niger increasingly are affected by dune encroachment, soil degradation, wind erosion, and drought. While it is unclear from climate models whether rainfall will increase or decrease for the region, it is clear that the nation is extremely vulnerable to food shortages, livestock losses, and economic crises due to the harsh environmental conditions. The government, despite the well-known nature of the problems, has focused its attention more on famine relief than on the contributing factors of environmental degradation. Yet, given the benefits of trees to the rural populace (food, fodder, soil enhancement, etc), promoting wide spread natural regenerative activities seems will greatly contribute to the country's adaptive capacity and security.

Conclusion

The Water Code, Pastoral Code under the umbrella of the Rural Code and the PAN-LCD/GRN, three pieces of Nigerien legislation have been analyzed throughout this evaluation. As highlighted earlier this analysis has been confronted with the difficulty of accessing data in Niger and the difficulty of verification. Following the February 2010 coup, a new political context emerged in Niger replacing the government of President Mamadou Tandja with temporary military rule. Although it has not been possible to assess the extent of the impact of this change in legislation, it seems most probable that it had had an effect on the development of certain laws such as the April 2010 Water Code and the May 2010 Pastoral Code.

After having exposed the historical context which led to the creation of the Rural Code, which serves as the overall legal framework for agricultural, silvicultural and pastoral activities in the country, the evaluation examined the different pieces of water legislation pertaining to the Water Code. It was found through the screening of legal texts from 1993 to 2010 that improvements have been made since the first law was adopted. Indeed, the 2010 Water Code builds upon the technicalities of the original Water legislation and enriches it with a more social and inclusive approach as well as taking into consideration to a certain extent customary practices in Niger. However, a number of discrepancies were underlined in the examination of the Water Code. It

appears that the new Code does not adequately provide for the safeguarding of specific pastoral management techniques, and it insufficiently addresses the potential areas of contention which exist between customary and modern laws.

The second part of this document focused on the analysis of pastoral legislation in Niger. The emergence of a Pastoral Code in 2010 has been seen as a considerable advance for the rights of pastoralists. An essential aspect of this law is the recognition and promotion of pastoralism as a way of life. It also provides the means for local executive structures such as the COFOs to address and prevent conflict which may emerge between different social groups in Niger. Nevertheless, a number of contradictions and shortcomings were pointed out in the evaluation of this piece of law as it has been found that legislation is often confronted with the reality of the terrain where customary rules and practice often take over, negatively affecting adaptation strategies of pastoralists.

Finally, the National Action Program for Combating Desertification and for Natural Resources Management PAN-LCD/GRN was examined. While the government has prescribed several notable actions to combat desertification, including incorporating a reforestation campaign as part of the President's special development program, overall there has not been significant progress towards combating desertification stemming uniquely from governmental activities due mostly to fiscal challenges. Despite this constraint, non-governmental organizations have made significant progress to slow the march of the desert and 'green' the Sahel, sometimes with very little monetary investment. The national government in collaboration with these partners have provided several best practices related to development activities. In regards to legislative practice, the PAN-LCD/GRN needs more critical evaluation to fully determine its strengths and areas for improvement.

Recommendations

Key challenges facing the management of Niger's natural resource base stem from residual ancestral alliances and fiscal challenges. To overcome these challenges requires an equitable approach to the two key rural constituents, farmers and herders. The marginalization of pastoralists due to both problems in the pastoral zone and difficulties of access in the agricultural zone may contribute to increasing conflict and negate the progress made by the two pieces of rural legislation Water and Pastoral Code. The conundrum of land tenure, water access, and increasing population in the pastoral areas must be handled through a careful participatory process.

To best govern the natural resources in the highly stressed environments of Niger, it is recommended that programs and legislation such as the PAN-LCD/GRN encouraging the stewardship of soil, trees and pasture be upheld and increased. In the pastoral zone, where herders have less control over their resources, this challenge is particularly critical. Overall, the Government of Niger is recommended to strategically develop its pastoral and agricultural resources in light of climate change and with the aid and assistance of international organizations and partners.

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PALESTINIAN HYDROLOGY GROUP
FOR WATER & ENVIRONMENTAL RESOURCES DEVELOPMENT

The Strategic Water Sector Plan in Palestine

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Abbreviations

AFD	Agence Française de Développement
AP	Action Plan
ARIJ	Applied Research Institute – Jerusalem
CM	Change Management
EQA	Environmental Quality Authority
GTZ	German Technical Assistance Unit
IWSR	Institutional Water Sector Review
JWU	Jerusalem Water Undertaking
LA	Legislative Review
MCM	Million Cubic Meters
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MoH	Ministry of Health
MoI	Ministry of Industry
MoLG	Ministry of Local Government
MoPAD	Ministry of Planning and Development
NGO	Non-Governmental Organization
NWC	National Water Council
OR	Organizational Reform
PA	Palestinian Authority
PLO	Palestinian Liberation Organization
PWA	Palestinian Water Authority
RSC	Reform Steering Committee
SIDA	Swedish International Development Cooperation Agency
TPAT	Technical Planning Advisory Team
WBWD	West Bank Water Department

Abstract

Since 1994, the Palestinian government has been developing its vision for a viable, independent Palestinian State. This planning must be far from any political constrictions resulting from Israeli occupation, and control over most elements and aspects of development, one of the most important of which is water resources. It is important to mention that Israel controls and limits the access to supplies and accessories that are needed for development, by means of its immediate control of borders and entry points. These conditions are part of the complexity of the internal Palestinian situation which has led to division between West Bank and Gaza Strip, in other words, fragmentation of nation and disintegrity of the country were the result of external and internal political factors.
Between 2008 and 2010 a new reform and development plan was formed based on the short term planning methodology. Regardless of the shift caused by the planning mechanisms, that were organized by associating them with a budget in agreement with the standards of developmental projects opposed to its predecessor which was based on the principles of cumulative increase, it was limited to governmental developmental planning and a vision separate from other sectors and powers involved in the developmental process.

In order to take advantage of the lessons learned by evaluating the past, the current government started preparing a sector plan which will take into consideration other sectors and powers concerned in the developmental process. These units are more or less involved in the planning process intertwined with other institutions. This approach has formed a basic reference which the Palestinian Water Authority (PWA) relies on when it prepares strategic plans. This applies to the PWA's sector plan which will be assessed and analyzed by the Ministry of Planning and in turn adopted as a reference for the preparation of the Comprehensive National Sector Plan.

PWA bases its planning on the vision of providing safe water in adequate quantities. This could be achieved by working on increasing and developing water sources in a sustainable way in accordance to solid environmental and economical principles and effective management. PWA must take into thought the criteria for the integrated management of water sources in accordance with a comprehensive vision that takes into account the Palestinian Authority's responsibilities, international commitments, actual growth demands and the needs of various sectors. These are all required to achieve the vision of an independent Palestinian state that has full sovereignty over its territory and sources. PWA has structured its duties and responsibilities in accordance to this vision. These tasks contain a series of goals they plan to achieve in a parallel manner and then merge together in their impact.

Introduction

The water situation in Palestine is considered as the most important component of the social, economical and political issues in the area. Water is one of the most important elements needed to guarantee actual independence and is a symbol of people's attachment to their land and an essential catalyst in all economical and social developmental aspects. The Palestinian Water Authority (PWA) in cooperation with various organizations working in the sector is seeking to improve the living standards of the citizens towards a more developmental, sustainable approach.

An estimated capacity of 785 to 825 million cubic meters of renewable groundwater and seasonal streams in valleys estimated at 215 million cubic meters is compose the main water resources in Palestine. In addition to the Jordan River whose annual discharge is around 1320 million cubic meters upon its entrance to the Tiberius Lake. The quantity of water decreases to 115 million cubic meters as it reaches the Dead Sea. Palestinians do not have access to their share from the Jordan River defined by previous agreements and according to International Law as a legal riparian.

It is important to know that in 2008, the total annual Palestinian consumption of domestic water was around 94 million cubic meters, 54 million cubic meters of it purchased from Israel, despite the fact that Palestinian consumption was quantified to be 101 million cubic meters in 2005, according to the Palestinian Authority and 118 million cubic meters in 1993 as determined in the Oslo Accords. An additional 123 million cubic meters of water was used for irrigation (this amount was 172 million cubic meters in 2005, according to studies conducted by the PA). Palestinian citizens currently require an annual 182 million cubic meters of water for domestic purposes.

Around 169 million cubic meters of water are consumed annually from the Coastal Basin in Gaza Strip for both agricultural and residential use. This exceeds by far the renewable groundwater which feeds into the Basin estimated to be around 55 million cubic meters annually. Overexploitation has resulted in the deterioration of the water quality, deeming it unfit for human consumption (according to current studies; only 10% of water extracted from the Basin is fit for human use).

In reference to water distribution in Palestine, PWA inherited (from the Israeli occupation) a defective infrastructural system with 160 residential communities completely lacking water distribution networks and approximately 90% of these residents without sewage networks. As a result, PWA was forced to give top priority to supplying these deprived communities with water as well as rehabilitate water networks with an annual water loss of approximately 50%. PWA aims to reduce the annual water loss by 20% within the next few years.

Poor water supply conditions have prompted several organizations to work on covering this extreme necessity. The size and scope of the problem have caused many Palestinian governmental and civilian institutions to take matters into their own hands in parallel with work being done by PWA. This has resulted in conflicts and overlaps of jurisdiction.

During the period of 1993 – 2009, PWA in cooperation with these organizations has reduced the number of non served residential communities to 121 communities. It hopes to further reduce this number to 50 within the next three years. Several water distribution networks in these communities have been rehabilitated, either partially or completely.

In reference to sewage networks, they have almost been absent from every agenda and have not been developed until recently. There is also a lack of operational plans linked with a clear strategic vision needed for development. The development of the water treatment system in Palestine has not surpassed the establishment of a few main projects, such as the water treatment plants in Northern Gaza, Gaza City and Al Bireh in addition to a few minor projects executed by civil organizations (even though they lack a strategic vision). Today, PWA in cooperation with the Ministry of Agriculture aspires to plan a strategy to develop the sanitation system, benefit from treated water and begin the implementation of this strategy.

Despite the fact that the Water Law No. 3 – 2002, issued on: 17/7/2002 is the legal framework governing water in Palestine there are still several institutions which work in the water sector one way or another alongside PWA. These institutions include: the Ministry of Agriculture (MoA), Environmental Quality Authority (EQA), the Ministry of Local Government (MoLG), the Ministry of Health (MoH), the Ministry of Industry (MoI), Regional Water Institutions: West Bank Water Department, the Association of Water Service Providers, the Water Consumers Association including Coastal Water Authority and Jerusalem Water Undertaking, Non-Governmental Organizations (NGOs), academic institutions such as local universities and research centers. In addition to the private sector, whose role is restricted to executing infrastructure water sector projects. This is due to the fact that Palestinian authority is in middle of the process of the unification of legal systems, institutions reform and building a consensus of water vision among different stakeholders.

In addition to the issues listed above, the water sector suffers from a lack of development as a result of restrictions and obstacles set forth by the Israeli occupation. This situation was dealt with in the second Oslo Accord (Article 40). However, the negative impact is still noticeable as far as inequality in the sharing of joint water resources (between Palestine and Israel) as well as the lack of freedom to exploit, develop and manage these sources. The inability to rehabilitate and manage the necessary infrastructure needed for wastewater services is also another issue. These issues negatively effect economic and social development in Palestine.

It is expected that by the end of 2013, Palestinian citizens will require 200 million cubic meters of water annually. This is not taking into consideration an increase in the population as a result of the return of refugees currently living outside of Palestine. It is vital for

Palestinians to be able to have full access to their water rights as well as be able to develop conventional and non-conventional methods to access more (desalination, water reuse, importing water from outside sources) in order to fulfill the increase in demand. For this, PWA, in cooperation with relevant parties, aspires to completely restructure and develop new regulations/systems for the water sector thus guaranteeing its effectiveness and longevity. This will in turn provide better services to Palestinian citizens on the basis of sound principles.

Challenges Facing the Water Sector

Taking into consideration the history of the water sector in Palestine and the young experience of the relevant institutions, several challenges are facing the sector, including:

1. Lack of integrated vision

The water sector is managed today under a joint governance system, with asymmetric power and capacity, that doesn't facilitate rational planning and development of Palestinian water resources and infrastructure**.**

2. Decreasing supply - demand ratio

Due to the high population growth rate (3.2%) and the consequent increase in the need of food, both domestic and agricultural water demands are growing rapidly**.** Approximately 30% of Palestinian communities in the West Bank, 700,000 people, 25% of which are under 16 years old, are not served by water networks and about 15% of the population is provided with water less than one day a week (National Water Council Report, 2007). Thus the current water demands cannot be used to predict future demand, (PWA, 2005)[1]. A recent study carried out by PWA in cooperation with the German Technical Assistance Unit (GTZ) indicated that the gap between supply and demand will increase dramatically in the coming years (PWA, 2007); therefore, the PA should develop new water resources and formulate new policies and management options to fill the gap.

3. Lack of proper institutional structure

The unique historical water situation in Palestine has resulted in suppressed water demand and water supplies are generally constrained due to technical, political, and institutional limitations. The roles and responsibilities in the water sector are scattered and fragmented due to the lack of national coordination and the multiplicity of providers: municipalities, water utilities, private vendors. For the last 40 years of occupation, the mixing of roles and responsibilities in the water sector has led to inefficient management and uncoordinated investment and policies. There is an urgent need to restructure the water sector in order to

[1] Due to the limited predefined water quota Palestinians consume whatever available and not their actual need.

regulate, monitor, and control the managerial, technical and financial performance of the national water suppliers[2].

4. Inadequate development and management of the water resources in the West Bank

The governance system established by Article 40 requires the approval of Israeli Authorities of any proposed PA management measure or infrastructure project within the West Bank., This approval of Palestinian projects highly depends on the Israeli Political decision makers .and the Israelis they are using the project approval as a tool for political pressure.

5. Low investment in and weak management of the West Bank water services

Investment and the investment efficiency in the West Bank water supply infrastructure have dropped to very low levels. The current investment in the water sector is one tenth of that planned.

6. Uncertain socio-economic and political conditions

The establishment of any component of a water policy should always be sensitive to specific national conditions. However, when the specific conditions are as complicated and uncertain as in Palestine, with a wide range of political, socio-economic, institutional and environmental uncertainties (see Table 1), the key step in the policy formulation process is to develop an integrated analysis based on several clusters of indicators such as socio-economic, poverty, institutional performance, political interests etc.

[2] Several local and international agencies attempt to formulate policy documents and reform plans, however the political willingness to do so is still low.

Table 1: Typology of uncertainties

Item	Components	Impact
	1.Internal and external violence	1. Poor utilities
A.Political Uncertinaities	2.Social polarisation	2.Lack of transpirancy
Instability of security	3.Weak law enforcment	3.Disability of policy implementation
War and violence	4. Political interest high priority	4.Bad governance
		5.Weak public sector monitoring and control on utilities
B.Socioeconomic uncertainities	1. Increasing poverty rate	1.Poor affordability
(fluctaution of the socioeconomic conditions)	2.Increasing unempoyment	2.Poor utilities revenues
	3. Increasing social conflicts	3.Social conflicts
		4.Poor servises and lack of costumer satisfaction
		5.Collapsing some of water supplier
		6.Increasing illegal conections
		7.Lack of transpirancy
		8.Poor infrastructure
C.Instituitional uncerainities	1.Iinstable Istituiitions	1.Poor performance
	2.Overlap responsibilities	2.Lackof policvies
	3.contradictory and scattered policies	3.High corruption
D.high dependency on International aid 60-80% of the public budget	1.No long term commitment from the donors	1.Weak public sector
	2.fund highly politisized	2.Scattered un-coordinated Policies
	3.Hidden agenda ofSome donor	3.Relief Projects more than development
		4.no linkage between short and long term plans
		5.post poning important project due political disput with israelies
E.Environmental Uncertinities	1.Long term drought	1.No experience in mitigation measures
	2.High water pollution	2. Reduction of availability of good water quality
		3.Lack of preperdeness

Impact of Climate Change

Agriculture and water resources are the most vulnerable to climate change and are expected to be exposed to direct effects of temperature and precipitation change, but still the potential impact of global climate change is one of the least addressed factors in water resources planning in developing countries. Moreover, the potential impacts of climate change have not been quantified at local level yet. (Abujamous and Mimi,2010)

PWA (2007) stated that the water deficit in the West Bank is expected to reach 260 MCM/year by 2015. In Gaza the situation is even worse where it's currently facing a water deficit of about 40-50 MCM/year. These numbers are estimated assuming that water supply will remain constant. Population increase is the fundamental parameter affecting future water needs, but to date, the potential impact of global climate change is one of the least addressed factors in water resources planning in Palestine as well as other developing countries.

Palestine suffers additional stress for three reasons; first, the impact of the Israeli occupation; the Palestinian natural ecosystems are a casualty of the Israeli occupation, due to the systematic uprooting of both natural and planted trees, to the demolition of fertile agricultural land, and to the destruction of groundwater aquifers. Over 1.3 million trees have been uprooted by the Israeli Occupation Forces between September 2000 and March 2006 (ARIJ, 2008). This will have a destructive effect on Palestine's climate, by disrupting the natural carbon sequestration process, in which carbon dioxide (CO_2) from the atmosphere is absorbed by trees, plants and crops through photosynthesis, and is stored as carbon in biomass (tree trunks, branches and roots) and soils.

Second, even if there is no change in the climatic trends, the population growth rate is one of the highest worldwide; 3.06% in the West Bank and 3.71% in Gaza Strip, while that of the world averages 1.14% (ARIJ, 2008), and this puts a great stress on the water resources.

Third, the increased population and industrial zones, and the expanded human and industrial activities, especially under lack of regulations and as a result of 60 years of the ongoing military occupation, in the Occupied Palestinian Territory, have increased the amount of smoke and hazardous gases, which includes greenhouse gases emitted into the air. In addition, there are many Israeli industrial sites throughout the West Bank, which pollute the atmosphere with huge amounts of greenhouse gases.

Climatic variables such as temperature and precipitation are essential inputs to agricultural production (Schlenker et al, 2007), so, it's important to assess the potential effect of climate change, not only the direct effects of climate on crop yields and farm profit, but also the effects of climate change on the effective water supply and the availability of water for agricultural users.

Increases in agricultural water demand are expected to be significant in all countries of the Middle East region, and the Palestinian Authority is one of the countries that will face harder

challenges to mitigate decreased water availability impact on agricultural economy (El-Fadel & Bou-Zeid, 2001).

Adaptation policy

The principles of cooperation and teamwork were adopted in preparing the sector plan. Major institutions related to the water sector, involved in the preparation of this plan were: PWA, Ministry of Planning (MoP), MoA, MoH, EQA, Non-Governmental Organizations and International Organizations.

Three primary technical committees were also formed to collect and analyze data and information. These committees were as follows: the Reality Analysis and Vision Committee, Water Resources Committee and the Sanitation Committee.

The three committees held a series of meetings to determine the scope of their work as well as the data and information needed to be collected and analyzed in order to draw the sector plan from. They then collected data and information and analyzed every indication or circumstance that may influence the plan, determining: strong and weak elements, opportunities and threats in order to derive all challenges facing the water sector. This process would become the main engine determining the objectives of the strategy for the sector.

As a result of the comprehensive analysis that took place, a vision describing the long term objectives of the water sector was formed. The teams then discussed this vision and modified it to make sure it would be achievable through the plans, activities, and successive efforts of the sector.

The teams then devised the strategic goals of the plan. There are five goals which fall within four tracks/main categories and are to be achieved by means of thirteen different policies (Annex 1).

Case Study One: National Strategy for Water Sector Reform

Background

The Palestinian and international interest in the development and rehabilitation of the water and wastewater sector began in the early stages of the Palestinian National Authority. It was triggered by the sector's poor condition following years of systematic negligence by Israel throughout its occupation of Palestinian lands, resulting in weak and marginalized infrastructure. Israel also prevented the Palestinian people from controlling, developing and managing their own water resources in line with their national needs. When PWA took charge of the sector, there was a quasi-total absence of institutional structures in charge of managing water and wastewater services according to a strategic vision based on sustainability and equity. This coincided with an increase in essential water needs for domestic purposes at a time when

the gap between supply and demand was more than colossal, the political agreement and the process of project approval are complicated the efforts of improving the supply
To establish a realistic and applicable participatory strategy for the sector, the national team built upon the realities of the current situation, including all basic elements that constitute and affect the sector such as the technical condition of the service, its legal status, institutional structure and organizational framework, the control and monitoring tools, as well as participation and decision-making mechanisms at all planning and management stages.

Background of the Case Study

The history of Palestine's water sector first began under Ottoman control, transitioned to the British Mandate, and finally Israel's occupation of the entire Palestinian territories by means of two wars. In 1948, Israel gained control of the upper Jordan River after occupying land outside both the green and truce lines. By 1950, the West Bank was under Jordanian control and the Gaza Strip was under Egyptian control. This control was accompanied by the establishment of administrative bodies for the water sector, such as the Jerusalem Water Undertaking (JWU) and the West Bank Water Department (WBWD). Following Israel's control of the Arab territories (West Bank, Gaza Strip, and Golan Heights) after the 1967 war; Israel assumed control of all water resources: surface and groundwater. Israel then issued military orders that stated that all of the water resources in these territories were property of the State of Israel and access to these resources, from this point forward, would require a special permit that could only be issued by a military governor. Israel then restricted the work of the existing JWU and WBWD. Following another military order in 1972, Israel established the Bethlehem Water and Sewage Authority (WSSA).

Israeli control over water resources continued and did not end with the change in the political situation that accompanied the mutual recognition between the Palestinian Liberation Organization (PLO) and Israel established by signing the Declaration of Principles Agreement in Oslo, Norway (Oslo Accord – Gaza and Jericho first) in 1993. This Declaration dictated the establishment of Palestinian autonomy by means of a transitional Palestinian Authority in 1995 for an envisioned period of 5 years. Afterwards, a Palestinian National Authority, along with its existing institutions, would be established to govern the West Bank and Gaza Strip. However, it would not include annexed lands, where Settlements were developed and Israeli military areas in both areas (Area C in the case of the West Bank), which was prior to the Israeli pullout of settlements from Gaza in 2005. The Oslo Accord would be extended for five years, during which a fair and just solution would be found for the six permanent status issues of the Palestinian-Israeli conflict: borders, refugees, settlements, Jerusalem, security, and water rights. In reference to these water rights, they were mentioned in the Transitional Stage Agreement (Oslo II) under Article 40: "The Economical Cooperation Protocol" of the transitional agreement entitled: "Water and Sewage".

On the basis of this agreement, Israel recognized Palestinian water rights in the West Bank and postponed agreement until after the final status negotiations have been resolved. As a result of

the Interim Agreement (Article 40), Israel agreed to allocate a total of 118 million cubic meters of water from existing sources (springs and water wells in the West Bank) to the Palestinian Authority. The PA was supposed to have been allowed to construct additional water wells that would add approximately 80 million cubic meters of water from the three water basins in the West Bank but restriction of development of new resources by the Joint Water Committee did not allow drilling, except for a very small number of wells, with a total that does not exceed 30 million cubic meters out of the 80 million mubic meters agreed upon to be made available within five years of the interim period.

PWA submitted a request to the Council of Ministers for the approval of a comprehensive reform plan for the water sector. This plan coincided with the government's plan to reform all of their institutions in accordance with the 13th Governments strategic vision, whereby PWA would play a crucial role. The Government's plan aims to develop the institutional situation of the water sector in a way that will ensure suitable water services for Palestinians residing in the West Bank and Gaza Strip. It will also work towards achieving Palestinian water rights, preserve and improve the management of water resources, ensure the sectors sustainability and its readiness to sustain the burden during the building of the nation. PWA's reform plan was adopted by the Council of Ministers by means of Legislation No. 13/13/04 in December 2009. As a result of the Legislation, a Reform Steering Committee (RSC) was formed to monitor its implementation. The RSC included Ministries that are related to the water sector (i.e. Ministry of Finance (MoF), MoLG, MoH, Ministry of Planning and Administrative Development (MoPAD) and MoA). It also included EQA and representatives from the PWA, service providers and the civil society. The Council of Ministers decided to implement this strategic water sector reform plan between 2011 and 2013. It should be noted here that the aforementioned legislation came in response to the dire need to rectify the current situation on the basis of independent third party evaluations and recommendations given by numerous credible organizations and water experts. The legislation also relied on both the monitoring and good water governance reports, which were included in the integrated program to reform the water and wastewater sectors due to the existing inefficiencies.

The reform covers the following elements: institutional, legal, legislative and administrative performance. PWA realized that the reform plan would not provide a radical solution for the water crisis due to the Israeli occupation. Despite this fact, the plan seeks to accomplish better management of the water sector by concentrating on the development of institutions in order to build a sector that can run with optimal efficiency under the status quo and contribute to the establishment of a Palestinian state. The reform plan consists of several fundamental elements (programs) which are closely interrelated. These elements depend on each other's outcomes, as the results and timeframe for implementation are intertwined.

Actors Responsible

Policy and Decision Making Level

This level is represented by the National Water Council (NWC), which consists of five ministers, six other members representing government and non-government organizations, union of local authorities and universities, and the head of PWA as the secretary of the Council. The members of the NWC gather to review and approve national water policy, review and approve quotas, reconsider the issue of private ownership of water, examine the central water projects, approve their implementation, and enhance regional and international co-operation in water.

Regulatory Level

PWA is the regulatory body in the Palestinian territories. In addition to the main challenge of securing the future water rights of the Palestinian society, the overall development goal of PWA includes achieving economic growth through securing the water rights of the Palestinians and enforcement of equitable allocation of water resources among sectors and achieving environmental aims through the effective conservation and protection of these same scarce resources.

Service Delivery Level

The main elements of the water and the wastewater sector policy are based upon the principles of sustainable development. The Service Delivery Level is responsible for:

- Adoption and implementation of discreet national water policy endeavored to insure that domestic, industrial, and agricultural capital investments are compatible with the availability, development, and conservation of the Nation's water resources.
- Operate water production facilities, purchase drinkable water from national and international suppliers, and deliver the water to local municipal and industrial water distribution systems.
- Operate and maintain the water systems within their service areas.

Supporting and Advisory Level

Universities

Palestinian universities provide support to the water sector research activities, training, and experience to Palestinians working in the water sector.

Non-Governmental Organizations (NGOs)[3]

NGOs have played a unique role in the water sector; even before the establishment of the PWA, the role of NGOs includes:

[3] NGOs in Palestine are playing a very important role since most of them were active before the establishment of the Palestinian Authority (PA).

i) Building up a team of water professional which has been involved in monitoring and developing the available water resources.
ii) Developing the base of the water information system.
iii) Highlighting the acuteness of the water problems locally and internationally.
iv) Working with national and international bodies for developing and protecting the water resources in the West Bank and Gaza.
v) Raising public awareness by working with the public to teach them the importance of water and environment in order to maintain water quantity and quality.

External Funders[4]

Many international organizations (governmental and non-governmental) have played and still play a very important role in the sustainability of water resources.

Main Mechanisms

The main mechanisms for implementation include the following:

The Institutional Water Sector Review (IWSR)

The Review shall propose a preferred institutional arrangement which will be derived by consensus.

The Legislative Review (LR)

This Review will compliment the submission to the Council of Ministers of the preferred institutional arrangement from the IWSR by providing a revised water law that will be compatible with the newly proposed institutional framework.

Capacity Building Program (Technical Planning Advisory Team – TPAT)

This program aims to provide capacity building and technical assistance to enable PWA to conform to the responsibilities entrusted to it, in accordance with the submission of the IWSR and LR, hence the new strategic vision. PWA shall define its principles regarding long term strategies, plans and programs as a result of the refocusing of the sector, upon approval by the Council of Ministers. These principles shall help the sector avoid the threat of failure from the inability to manage, preserve and benefit from their water and wastewater resources, as is required.

Organizational Reform (OR) and Change Management (CM) Program

On the short term, the program aims to rectify utility service procedures in a way that will ensure equitability in the provision of high quality services. It will also improve capabilities, recover operating

[4] The Palestinian Authority depends heavily on external funding.

costs of water facilities and organize them more effectively. In addition to that, the program seeks to achieve more sustainable management of strategic water resources by means of enhancing: institutional knowledge, policies, monitoring capabilities, follow up and the application of the water law. It will also increase awareness of managing water demand, by means of applying policies that will help to preserve the water resources. The long term goals of the program are to establish strong/capable institutions within the framework of sustainable development and a legal framework that shall clearly define the roles, responsibilities and interrelationship between institutions in the water and wastewater sector, as well as those institutions that share responsibility on the periphery of the sector.

In addition to emphasizing infrastructure requirements, the reform program will also focus on improving the strategies and investment policies regarding the supply of water and sewage provision and project design and implementation. This will be done to expedite the growth of the infrastructure in a way that will fulfill the country's requirements.

Table 2: Major Actors funding responsibilities and duration

Task	**Major actor**	**Committed fund (US$)**	**Duration**
The Institutional Water Sector Review – IWSR	Norwegian Government	55000	15/9/2010- 20/4/2011
Legislative Review – LR	Norwegian Government	60000	1/3/2011-: 30/4/2011
Capacity Building Program (Technical Planning Advisory Team – TPAT):	World Bank, Agence Française de Développement (AFD), and the Swedish International Development Cooperation Agency (SIDA)	5000000	1/4/2011-31/3/2014
The Organizational Reform (OR) and Change Management (CM) program**:**	No funder	-	1/8/2011 30/4/ 2013.

Implications of Climate Change

Climate change is one of the greatest environmental challenges facing the world today. In Palestine, water resources are already scarce making climate change a more sensitive issue in terms of water resources and the socio-economic situation of Palestinian people. Within the last 20 years and until this day, many studies have been conducted to investigate the climate change phenomena and how we can adapt with its impacts. Most of these studies were based on global as well as regional models which were developed on large scale grids (50 x 50 km). The latest report produced by the Intergovernmental Panel on Climate Change (IPCC) warns that temperatures in the Middle East have increased between 2-3 degrees Celsius in the last century, faster than the global average of about 1 degree. As a result, the Middle East region is expected to have fewer, but more violent, rain events, the rainfall is expected to decrease by 15-25% from the annual average, increasing drought, and decreasing resources of fresh water.

Evaluation

OECD's DAC Criteria for Evaluating Development Assistance will be used to evaluate the proposed strategic and reform plan. The four criteria include relevance, effectiveness, efficiency and impact.

Relevance

The proposed strategic and reform plan will serve the entire water sector, the four major pillars of the plan are important to qualify the Palestinian water sector to cope with the above mentioned challenges:

Water Security: based on the outcomes of the strategic and reform study an action plan (AP) will be developed. The main objective of the AP will be to enhance water supply to the areas affected by climate change or a long term drought. This enhancement will be conducted by using different mechanism mainly: improving the capacity of local authorities to use non-conventional water resources such as the reuse of treated wastewater for agricultural purposes, optimizing the use of brackish water and increasing the use of water harvesting. In addition to that the AP will focus on demand management by improving the irrigation techniques and encouraging the farmers to cultivate crops with a higher tolerance to water scarcity.

Social security: the plan highlighted the importance of the agriculture sector to the Palestinian livelihood and food security which is the main driver of social stability. The plan also takes into account the importance of social equity among Palestinians by providing the marginalized groups vulnerable to climate change with adequate agriculture and domestic water at affordable price**s.**

The plan also deals with main drivers of the micro (local) social conflicts on water by creating an active management plan for the reallocation between different sectors (agriculture , domestic and others). The management plan will focus on a transition period to reduce any anticipated backfire from farmers or citizens. Additionally, the interested parties can help change some traditional agricultural practices such as moving from banana plantation to date trees which require less water quantities and are more tolerant to salinity.

The plan took into consideration the future drivers of water demand being mainly:

- Population growth
- Increasing need for producing food at affordable prices
- Climate change
- Lack of regional stability which will reduce the possibility of joint projects or will make some demand management measures impossible

Transboundary cooperation: At macro level the plan highlighted the transboundary water conflict, despite the fact that the plan encourages transboundary cooperation and joint projects like desalination it also emphasizes that this must not compromise Palestinian water rights. Again, the plan clearly

highlighted the importance of Israeli- Palestinian cooperation to reduce the impact of water scarcity through joint projects to increase the availability of water and reduce the tension of water conflict.

Institutional arrangement: the plan highlighted the importance of integration and participatory approaches. The plan will be implemented with the full involvement of the stakeholders who will be the governing body of the plan. By comprehensive stakeholder participation the plan will be able to create efficient coping mechanisms to deal with climate change impacts.

Legal arrangement: since the plan was approved by the Government and has the blessing from all relevant parties, the legitimacy of each action borne from the plan will have the legitimacy and endorsement from the Government. Also by public participation and the creation of public ownership the legitimacy of the plan and the practicality of its implementation are enhanced.
In Summary, the PA Strategy and reform plans are to prepare the new born water institutions to be capable to deal with water scarcity, long term drought which partially lead to security problems (with Neighbor countries and social instability between different social groups , in particular between farmers and municipalities.

Assumptions and risks of the plan

Despite the fact of that the strategic and reform plan will have a positive impact on future water security and will reduce the impact of climate change the plan is based on some assumptions that might not be very realistic.

The plan assumed that the Israeli occupation will end within two years (PA Development plan 2010-2012)[5], while the signals from the peace process are not optimistic but on the contrary have reached to deadlock, in this case some parts of the plan may be categorized as a wishful thinking list .

The plan assumed that internal stability will be guaranteed and no unrest or internal conflict will occur during the implementation of the action plan., Again a very optimistic assumption when aligned with the current political division and lack of a unified consent on the upcoming elections which may destroy the whole institutional arrangement, a precondition to the implementation of the plan.

In addition to the above mentioned misassumptions, the major risk is the regional security which is open for all kinds of scenarios in particular from the angle of the Israeli-Arab relationships and conflict. The instability at regional level may be a major risk that could hinder the implementation of the plan. The final risk refers to the economic instability or economic crises which places a question mark on the donor community's fulfillment to their commitment to implementing the entire plan.

Effectiveness

The main factors that make the plan effective rely on the external and internal environment of the sector, the level of commitment of the relevant primary stakeholders and the stability of the momentum of the

[5] The plan title :end occupation –building state

process. By conducting a SWOT analysis for the water sector in Palestine (strengths, weaknesses, opportunities and threats) the following can be concluded:

Strengths:

- The existence the Palestinian Water Authority as regulating institution
- The existence of laws and regulations
- The existence of qualified staff in the water sector and institutions interested in the sector (universities, NGO's, research centers, etc.)
- The ownership of some water sources
- The existence of a National Water Council
- The existence of a coordination mechanism in the sector for the relevant institutions
- The existence of strategic elements which can be expanded
- The existence of a structure and system for some of the water providers
- The existence of regulatory instruments which PWA may benefit from and develop
- The provision of more than 70% of the main cities with sanitation services
- The existence of different levels of water treatment plants (treated water is a source that will save water and money)

Weaknesses

- Israel's control over water sources and Palestinians inability to access these sources
- PWA's inability to concentrate its efforts on being a regulator due to conflicting policies, the disintegration of institutions and their subordination
- The absence of a clear strategy in directing fund in the water sector/PWA
- Directing specific capacity building is not properly available in the water sector
- Inadequate development of various internationally funded projects
- The absence of clear mechanisms to enforce rules resolving conflicts and overlaps of entities involved in the water sector
- Conditional funding in some instances
- Underutilization of the National Water Council
- An absence of some required expertise and competencies
- The absence of environmental and water awareness regarding resources along with the absence of academic and social awareness
- Poor participation of interested groups in the planning and implementation of projects (e.g. women)
- The sanitation is not a priority of the water sector
- The high costs of establishing sanitation networks and facilities
- Difficulty in achieving a sanitation network that will recover full costs
- The absence of a clear strategy to manage the sanitation sector
- The lack of awareness, on the political level, on the topic of sanitation
- The inability to benefit from information technology systems

Despite the major deficiencies of the water sector, opportunities to implement the plan also exist, the main drivers of these **opportunities** are:

- Donors desire to support the sector
- The existence of capable staff in the water sector along with institutions concerned with the sector (universities, NGO's, research centers, etc.)
- The international community understanding the importance of the needs of the Palestinian water sector
- The willingness of parties involved in the water sector to restructure it and assume roles assigned to them. The presence of funding for the sector and a resolution from the Council of Ministers (Water Sector Reform)
- The ability to develop new and or alternative water sources
- The ability to gain personal income from the sector by means of services offered (following the provisioning of the appropriate legislations)

To place matters within a realistic context the following **threats** may also hinder the implementation of the plan:

- The internal political situation (Israeli occupation and the situation in Gaza)
- Israeli control over most water sources along with the contradictory control over the remainder by various entities in the West Bank and Gaza
- The increase in demand of water and the lack of resources
- The relocation of water sector expertise to different sectors
- The existence of contaminates that threaten basins and other water sources
- The poor conditions of the infrastructure (the percentage of water loss, sources, the low percentage of areas which receive water and sanitation coverage)
- The weakness of the self initiative spirit and a dependency on external assistance
- The high indebtedness of the PWA to the PA's treasury as a result of the lack of commitment of municipalities to pay their bills and the increase of wastewater treatment costs billed by Israel
- Dispersion of the responsibilities in the service utilities sector (water and wastewater) amongst various ministries, departments, municipalities, and refugee camp committees and the lack of benefiting from the principle of "economies of scale"

Despite all the mentioned above the analysis of the plan indicates that it will positively impact the water sector and will produce remarkable results with strong legal and institutional arrangements. The action plan will increase the availability of water by mechanisms to reduce the local and transboundary. All this will help Palestinians cope with future climate change impacts and will strengthen them to be a constructive player in the peace process to achieve stability at regional level. The plan creates several opportunities to develop the sector (willingness of donors, human resources availability, …etc) but also the political uncertainties are the major threat .

Efficiency

In order to measure the expected efficiency of the plan, it is essential to set a cluster of qualitative and quantitative indicators. The measurable indicators can be categorized as follows:

1. **The amount of increased water**

The strategic and reform plan is associated with an action plan which includes several major projects, the PWA initiated and planned more than 300 projects that aim to develop and rehabilitate the water and wastewater infrastructure. If the projects are implemented as planned (in different phases) the water availability will increase by 12% including around 40 million cubic meters of wastewater that will be treated and reused.

2. **The anticipated socio-economic development**

In the best case scenario (where the planned projects are to be implemented) more than 8 % of the people who have no access to water will receive tapped supplies. In this case these households will use the money saved, as they will not have to purchase water from venders anymore, on other basic needs such as education or health. It is important to note that the majority of the people who have no access to water are poor, marginalized communities that are more vulnerable to climate change impacts.

3. **Increased irrigated areas**

As known, Palestine is an agriculture oriented society. The agricultural sector is family based, which means that any increase in the quantities of irrigation water will directly be reflected on the livelihoods and socio-economic conditions of these families. The plans that include the treatment and reuse of wastewater plans will increase the irrigated land by 0.5 % of the total irrigated area and will allow the reallocation of more than 10 million cubic meter of fresh water used for agricultural purposes to domestic purposes. Additional to that, the planned water harvesting projects will increase the agriculture areas in the mountains which is mostly rain-fed (interview with MoA).

4. **Increased amounts of treated wastewater and amount to be reused for agriculture**

The amounts of treated wastewater are expected to increase by an estimated 40 million cubic meters, most of them in Jericho where the climate change effect is expected to be high. In addition to that of the treated wastewater could be used for artificial recharge of groundwater or to prevent groundwater pollution from the raw sewage.

5. **Percentage of completion of the institutional and legal reform**

As described above the creation of proper organizations and reforming the legal system will enable the Palestinians to deal with climate problems in different ways such as:

- More efficient negotiations and conflict resolution capacity
- Dealing with transboundary water conflicts more efficiently
- Reduction of social conflict and injustice by creation of good governance and transparent procedures

6. **Amount of financial investment in water sector**

The principle of cooperation in the development of aquatic resources along with providing the capabilities to build, rehabilitate and develop the infrastructure of both the water and wastewater sectors are among the main elements of the national strategy. This strategy aims to achieve the principle of complementarity in the management of water resources according to a vision built on the principles of sustainability and durability of these available sources along with the level of services provided. The estimated cost of the implementation of the actions to achieve the goal of the strategic and reform plan is estimated to be around 3 billion US$. This large sum is expected to be invested by donors and the private sector.

7. Number of project to deal with drought and climate change effects

Since the mitigation of climate change impact requires a multi-disciplinary action, several stakeholders need to come together. Several projects planned to be implemented through collective efforts include drought management, water harvesting and water as an entry point for livelihoods and food security. Additional to, that several policy and legal measures will be taken to deal with climate change issues.

8. The level of stakeholders dialogue and its efficiency

This plan aims to place the spotlight on the extent to which the needs of the communities have been addressed through multi stakeholders, and the level of cooperation between the public and civil society actors and how institutional legitimacy can improve service delivery, and thereby contribute to the legitimacy and effectiveness of state institutions. However, the poor culture of dialogue and the absence of an institutionalized stakeholders consultation process are the main obstacles to implement a participatory approach. Despite the fact that the plan mentioned the subject explicitly, it failed to develop proper mechanisms to achieve this specific objective, and the current situation clearly illustrates the hegemony of donors over the public institution.

In other words, because the lack of dialogue mechanisms , creation a common vision among different stakeholders on the proposed actions will be very complicated process , which means the water sector will be high vulnerable to the effect of climate change and the social security will be vulnerable for micro violence .

Impact

The strategic and reform plan is the first comprehensive, participatory water plan since the establishment of PWA**.** The 2008 – 2010 Reform and Development Plan (which covers all sectors) formed a new breakthrough which depended on the methodology of short term planning. Despite the shift caused by the planning mechanisms, which were prepared by associating them with a budget in accordance with the standards of developmental projects on the contrary of its predecessor which was based on the principles of cumulative increase, it was limited to governmental developmental planning and a vision separate from other sectors and powers involved in the developmental process.

Despite some short comings of the plan the expected impact on the water sector will be remarkable and can be summarized as follows:

1. The implementation of the plan will help increase the availability of water for marginalized and vulnerable groups.
2. The plan will enhance the Palestinian efforts for state building (by setting up the proper institutions) and increase the social stability by fair and just water distribution.
3. Increasing agricultural areas will support the efforts to increase the livelihood safety and food security.
4. The proposed reform for legal and institutional arrangement will empower the Palestinians to cope with the impact of climate change or long term drought.
5. The proposed reform and institutional arrangement will enable Palestinians to deal with transboundary water conflict and will qualify their organizations for equal footing cooperation with neighbors.
6. The long term planning will help the Palestinians rehabilitate and reconstruct damaged water infrastructure and will enable them to deal with socio-economic and political uncertainties

Despite the above mentioned positive impact of the proposed plan, it is also expected to have the following negative impacts:

1. The Palestinians' need for funding the plan will make them more vulnerable to donors pressure and agendas
2. The diversity of donors and different agendas may create scattered efforts or a fragmented water sector
3. The young Palestinian water institution may not be able to deal with large funds which may lead to the lack of transparency and accountability
4. Despite the fact that the plan was constructed in a participatory manner, the stakeholders involvement in the implementation process is very limited.
5. Private sector participation was ignored.

Conclusions and Recommendation

As described above the plan is the first serious, comprehensive plan to be developed for the water sector. It will be a constructive example of foreign aid effectiveness and a real exercise for long term planning, coping strategy and state building actions. However, the integration with other sectors, accumulation with the activities of other line ministries and its harmonization with other sectors' reform plans will lead to unprecedented national socio-economic impact. In other words, the precondition to make this plan a successful story is the integrated socio-economic vision. This vision will enable Palestinians to minimize the impact of political conflict and will qualify the society to create proper organizations to deal with all kinds of uncertainties. Based on the analysis above the following recommendations can be presented to the decision makers:

1. The importance to institutionalize the stakeholders' dialogue
2. The evaluation and monitoring plan should be part of the reform process
3. The transparency and accountability measures should be taken into consideration to gain the trust of the community and the donors.

4. Analysis of foreign aid effectiveness and its long term impact should be monitored and evaluated.
5. Engagement of the private sector or the private public partnership concept should be investigated and taken into consideration.

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Annex 1

The Priorities and Goals of the Strategy:

The First Strategic Objective: Achieving a political situation in Palestine which is just and fair on the national, regional and international levels

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Provide support for water and sanitation services in all parts of the country by means of separating the subject of water from internal and external political disputes	Discover a political context allowing work to be done in the Gaza Strip	The executive political level	Undetermined	PWA will be able to completely perform their duties in the West Bank and Gaza	70%	20%	10%
	Create a Palestinian community-based coalition between the West Bank and Gaza, as water is a humanitarian right that takes precedence over political differences	The executive political level	Undetermined	All water-related institutions will be able to perform their duties freely in the West Bank and Gaza	70%	20%	10%

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Ending the mis-proportion caused by	Creating a political situation that employs	The executive political level	2000	Water projects may be executed without being subjected to Israeli restrictions	70%	20%	10%

Article 40 in the 1995 Oslo Accord and ending threats posed by settlements	international political support to remove Israeli restrictions which include Article 40						

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Amend work rules with donors	Draft a Palestinian policy to direct investments	Ministry of Finance	Undetermined	Donor funding will be in accordance to the priorities of the sectoral plan	70%	20%	10%
	Prepare Palestinian institutions to lead and direct investments in the water sector	Ministry of Finance	500	Institutions working in the sector will devise their projects in accordance to the sectoral plan	70%	20%	10%

The Second Strategic Objective: The existence of a legal and institutional environment based on the principles of wise governance and able to manage the water sector in a way to insure its sustainability.

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Direct the current structure to the water sector	Repair and restructure the water sector which includes: the legal, institutional, and technical framework in order to ensure the sustainability of water institutions as well as compensate for the operation and maintenance expenses	The Palestinian Water Authority	28,000	A predetermined sector structure Develop the current water sector laws The absence of conflict in water related laws	25%	35%	40%

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Correct the legal situation governing the water sector including the ownership of water resources	Regulating the rights and duties of using water resources	The Palestinian Water Authority	400	Preparing a law project along with the regulations related to it	30%	40%	30%

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Achieve the principle of cost	Repair and restructure the	The Palestinian Water Authority	400	Service providers/ institutions capable of covering their own	50%	25%	25%

recovery for all expenses	water sector which includes: the legal, institutional, and technical framework in order to ensure the sustainability of water institutions as well as compensate for the operation and maintenance expenses			operating and maintenance expenses			

The Third Strategic Objective: The availability of water sources with suitable quantity and quality. Conserving these sources as well as being able to reach and utilize them.

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Increase and develop water sources. Rehabilitate the infrastructure, including water networks	Develop existing water resources by: **A.** digging and preparing 15 new wells	The Palestinian Water Authority	135,000	Providing 20 million cubic meters of additional water	20% by conserving quantities	35% by conserving quantities	45% by conserving quantities
	B. Establishing two water treatment plants in 1) Al Faskha 2) Gaza Strip	The Palestinian Water Authority	2,800,000	Treating 22 million cubic meters of water in Al Faskha Treating 50 million cubic meters of water in Gaza	10%	15%	35%
	C. Benefiting from the establishment of dams to collect rain water	The Palestinian Water Authority	15,000	Collecting 2 million cubic meters of water for different uses. Establishing 3 pioneering dams	35% 35%	45% 45%	20% 20%
	Rehabilitating 124 water wells		60,000	Increasing the productive capabilities of the wells by 20%	35%	45%	20%
	Develop the skills and improve the conditions of workers in the water sector	The Palestinian Water Authority	2000	Increase the level of job satisfaction for workers	35%	45%	20%

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Providing and maintaining qualified staff. Intensify the use	Improving sanitation networks	The Palestinian Water Authority	2,000,000	Providing 24 million cubic meters of water annually for agricultural purposes	15%	20%	30%
				Treating 35 million cubic	15%	20%	30%

of suitable technology				meters of water annually			
				Constructing 25 sewage networks	15%	20%	30%
				Construction 10 water treatment plants	15%	20%	30%
	Adopting suitable standards in regards to choosing the right technology based on local circumstances	The Palestinian Water Authority	9,200	Having a users guide for technology	15%	20%	30%

The Fourth Strategic Objective: Contributing to achieving an advanced level in the standards of: living, health, environment and social for all segments of society.

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Supplying communities with adequate quantities of high quality water and joining them with sanitation services.	Establishing and readying a water (from reliable sources) distribution network to serve areas not currently serviced	The Palestinian Water Authority	400,000	52 communities served by water distribution networks	40%	30%	30%
	Rehabilitating water networks	The Palestinian Water Authority	500,000	Rehabilitating the water networks of 100 residential communities	40%	30%	30%
	Activate a system to monitor and control water wells in the south	The Palestinian Water Authority	12,000	The southern wells will be joined to an effective monitoring and controlling system	40%	30%	30%
					40%	30%	30%
	Activate a system	The Palestinian	10,000	Effective and advanced labs	40%	30%	30%

	to monitor water quality	Water Authority					

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Considering the reuse of treated water as a source which will contribute to social, economical and environmental development	Establish regional and local systems to reuse treated water	The Ministry of Agriculture	60,000	5 effective regional systems and 5 effective local systems	33%	33%	34%
	Encouragement and incentive programs to urge farmers to use and benefit from treated water	The Ministry of Agriculture	20,000	60% of treated water will be used for agriculture	33%	33%	34%

The Fifth Strategic Objective: Institutions that work in an effective and competent manner based on the principle of participation of all segments of society

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Promote and maximize the participation of civilian institutions, the private sector, women's groups and marginalized groups in planning and decision making	Incorporating the principle of participation in planning and decision making within legislations of institutions working in the water sector	The Palestinian Water Authority	1200	Conducting 100 workshops	**33%**	**33%**	**34%**
				Conducting 20 workshops for local councils	**33%**	**33%**	**34%**

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Developing the capabilities of staff and institutions working in the water sector. Access and optimal use of information technology in the development of the sector	Assessing organizational and training needs of the sector. Organizing programs to develop capabilities in accordance with the National Training Policy	The Palestinian Water Authority	5000	A unit equipped to manage the training	40%	30%	30%
				Preparing and executing clear training programs	40%	30%	30%

Policy	Intervention	Responsible Party	Cost in thousands/Shekel	Indication	Specific Target		
					2011	2012	2013
Increasing the level of awareness in water issues on all levels	Assessing the level of awareness of various water issues on the national level. Placing suitable awareness programs	The Palestinian Water Authority	1000	70% of residents have been introduced to on awareness program	30%	30%	40%

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Contents

Case Study Two

Climate Change Adaptation Strategy for the Future Palestinian State (West Bank and Gaza Strip)

Abstract

The Document analyses in depth the vulnerability of the Palestinians for the future effects of climate change and the preparedness of their institutions to deal with these effects .The document prepared by participatory approach which based on intensive main stakeholders consultations and community focus groups sessions, however the document was considered the first exercise from the Palestinian to deal with this issue , the main recommendation to continue studying the impact of climate change and the possible impact on human security at regional and national levels.

Climate Change Adaptation Strategy for Future Palestinian State (West Bank and Gaza Strip) addressing the gap in basic knowledge concerning the relationship between climate change impacts, security and conflicts to help better design policy responses. This study is filling work package 4.1 (within a larger context of CLICO). Work Package 4.1 is focusing on selecting current legal frameworks and policies to be as the first step for work package 4.2 (surveying the expectations of key international and national stakeholders).

Introduction

Global warming is one of the major issues in our present time. It is one of the greatest environmental challenges facing the world today. Climate change is as well an issue that is multidisciplinary and will have various climatic impacts on different sectors.

In Palestine, water resources are already scarce making climate change a more sensitive issue in terms of water resources, water sector (among others) and the socio-economic situation of Palestinian people. The climate change impacts are felt in all sectors of society, through changes in temperature and precipitation and through changes in the frequency and intensity of climatic extreme events.

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Climate change has been portrayed as a potential security threat in the Middle East, mainly due to its potential effect on water availability (Brown & Crawford, 2009; Trondalen, 2009). Water is indeed found to be the main issue also in the more limited Israeli-Palestinian context analyzed here. However, based on analysis of extreme scenarios we find that the likely direct effects of climate change per-se on the Israeli-

Palestinian conflict are limited. While climate change may affect the livelihood of Palestinian farmers and semi-nomads, particularly in remote areas, it is unlikely to affect the welfare of the urban population substantially if some water re-allocation occurs, even under extreme case scenarios for the next 20 years

Climate change effects will target both ground and surface water supply for domestic and industrial uses, irrigation and in-stream ecosystems.

Palestine, Israel, Jordan, and most other mid-eastern countries which are generally Characterized by aridity have very limited water resources. The future Palestinian State is located in the Eastern shore of the Mediterranean. It is composed of two separate areas, Gaza Strip and the West Bank. It has one of the lowest per-capita water availability world-wide. With continuing population growth and Israeli control over shared water resources, predictions for climate change within the region and changes in rainfall amount and distribution will only intensify these problems.

There are two distinctive climatic seasons: a wet winter and a dry summer. Annual average rainfall in the West Bank and Gaza is approximately 450mm and 400mm respectively. The Jordan River system is the only surface water resource in the West Bank. There are two aquifers shared by Palestine and Israel: the Mountain Aquifer underlying the West Bank and the Coastal Aquifer underlying Gaza.

Palestine will experience serious deficit and the shortage is estimated to be 271×10^6 m^3 for the year2020.

The main part of this study argues that the proof of effective climate change adaptation strategies might be in improved resilience of the hundreds of millions of people living in communities, most vulnerable to the impacts of climate change. Involvement of local authorities and community based organizations in the development of adaptation strategies will be crucial.

Risk reduction and risk management are major elements of adaptation. Humanitarian organizations bring decades of experience in working with local actors to support local stakeholders to lead adaptation measures to protect their communities against impending climate risks.

Evaluating the potential impact and effects, we find that climate change would affect the Palestinian State's agriculture and food security in a negative way (by decreasing the precipitation (with significant seasonal variation) and significant warming).

Water resources, coastal zones, public health, climate-related disaster risk management, and natural resources management will also be affected negatively. This is the reason why climate change adaptation in that region must focus more on water insecurity as well as the lack of access of individuals to sufficient safe water for health and wellbeing – this priority was confirmed, and then developed, in consultations with stakeholders in Gaza and the West Bank during November 2008-January 2009.

Water insecurity is above all about the absence of control and effective management of scarce water resources. This can apply locally, nationally and across borders: if water is not

equitably allocated for agriculture and other food production, as in the case of trans-boundary water resources on both the Israel and Palestinian side, water insecurity can directly impact on food security[1]. So, the food and agriculture organization (FAO) studied food insecurity – defined for the Palestine as households with income and consumption below $1.6 US per capita per day and households showing a decrease in total food and non-food expenditures (Food and Agriculture Organization 2007a: 58) – as a potentially major outcome of climate variability and/or change in the Palestinians. (FAO,2007)

The Palestinian State climate change adaptation Strategy is the first output of a work programme for the Palestinian Environmental Quality Authority (EQA) funded by the United Nations Development Program/Program of Assistance to the Palestinian People (UNDP/PAPP). Informed by the Adaptation Policy Frameworks for Climate Change recommended by UNDP (Lim et al. 2005), the study adopted a vulnerability-based approach[2] in developing the Strategy. It is clearly known that the complex relationships between the climatic and non-climatic drivers of vulnerability in the future Palestinian State. (mark,2007)

The main goal behind studying the Vulnerability Assessment in the Palestinian Climate Change Adaptation Strategy is to comprise a Current Vulnerability Assessment for the Future Palestinian State and Climate Change and Vulnerable Communities.

Main objective:

The overriding goal of the *Adaptation Strategy in Palestine* is to identify the most effective means by which the PNA can enhance the capacity of the Palestinians to cope with current and future climate hazards. There are important technical and financial challenges to the development of Palestinian adaptive capacity; however the most significant constraints are external political barriers, as represented by the continuing Israeli occupation of the West Bank and Gaza. The political feasibility of addressing these barriers depends of the uncertain prospect of final status negotiations between the Palestinians and Israelis.

Current Vulnerability Assessment for the (Future Palestinian State)

Current climate conditions

The climate of Palestine is traditionally described as 'Mediterranean', with varied internal climate depending on altitude and latitude. Over this century, there has been a significant decrease in the amount of rainfall and a noticeable increase in the amount of warming. It is been predicted by the IPCC an increase of 2.2-2.5^{o}C and over 10% further decrease in rainfall post 2020.(Hassan ,2010)

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[1] See the remarks on the links between water and food security made by the United Nations Deputy Secretary-General Asha-Rose Migiro at the *High-Level Symposium on Water Security* at the United Nations, New York, 4-6 February 2009: http://www.un.org/News/Press/docs/2009/dsgsm439.doc.htm

[2] Studying and assessing Possible socioeconomic effects

The Jordan basin Area is currently in drought, over the past 5 decades, the Jordan River lost over 90 percent of its normal flow. Upstream, the Sea of Galilee is diverted for Israeli agriculture. Climate change will lead to an intensification of the global hydrological cycle and is likely to have major impacts on regional water resources, affecting both ground and surface water supply for domestic and industrial uses, irrigation, in-stream ecosystems and water-based recreation. According to a 2009 projection from the International Institute for Sustainable Development (IISD), by the middle of the 21 century, the all region is expected to rise in temperature due to global warming.

While some aspects of climate change – such as longer growing seasons and warmer temperatures may bring benefits – there will also be a range of adverse impacts, including reduced water availability and more frequent extreme weather events. Agriculture is still directly dependent on climate, since heat, sunlight and water are the main drivers of crop growth. Changes in the total amount of precipitation and in its frequency and intensity directly affect the magnitude and timing of runoff and the intensity of floods and droughts (IPCC ,2007).

At the same time, Palestine is witnessing rapid demographic growth and restrictions on economic development and water resources from Israel that is adding pressure on already scarce resources. Palestine is predicted to witness increased water stress and climate change, with a decrease in annual precipitation. To assess the vulnerability and predict future climatic changes, a number of models were used, but none of which are region specific or take into account the socio-economic specificity of Palestine.However, the micro conflict among different social groups and different sectors may be result from the climate change effect , such as the current big conflict between farmers associations and municipality of Jericho to reallocate water from agriculture to drinking , due the insufficient water resources the conflict rapidly is increasing and will accelerated with the impact of climate change .

As Shown in figure1, these impacts may put agricultural activities, certainly at the level of individual land managers and farm estates, at significant risk (AEA Energy & Environment 2007).

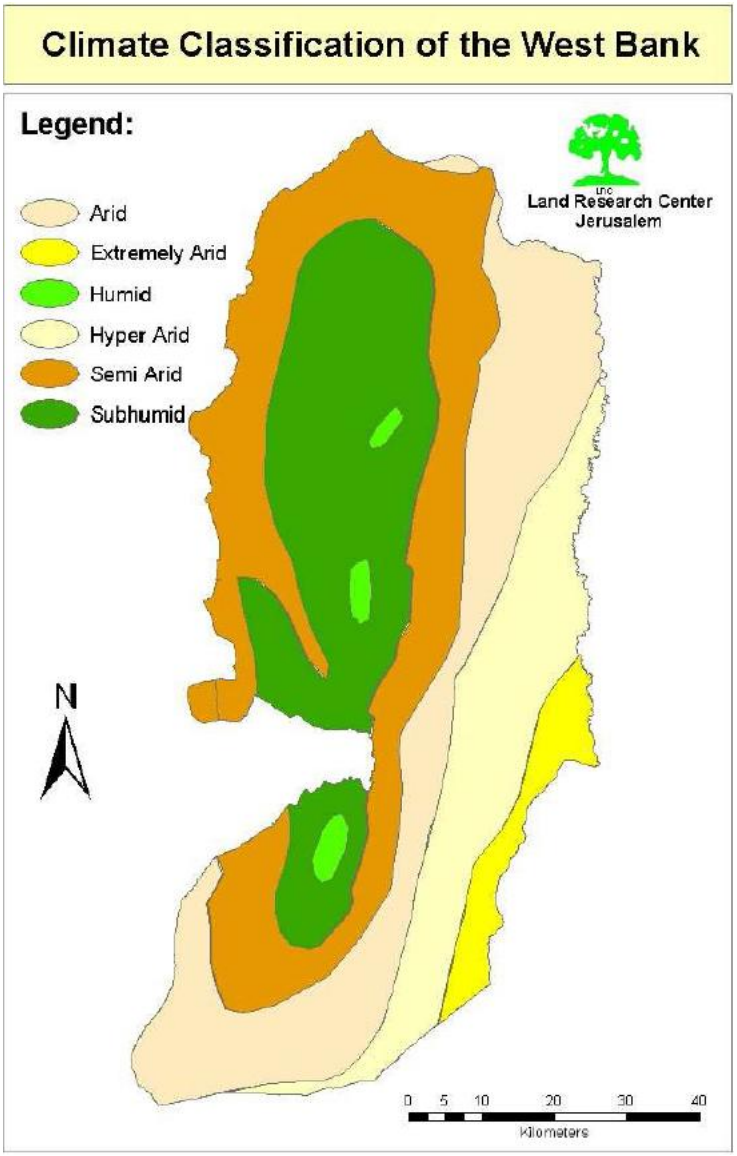

Figure:1 Climate classification of the West Bank (Zaytoun,2010)

Annual rainfall in the northern part of the West Bank is higher than in the southern part of it, in the north the rain fall can get up to 700mm (around Jenin), yet it reached the lowest in the Dead Sea area 80 to 100mm (the southern part of the West Bank): alongside this latitudinal variation is an orographic one – the western slopes receive 500-600mm, while the eastern slopes receive 150-45mm (Ministry of Agriculture 2008: 2). Thus, the area suffering from greatest aridity (44%) is located at the south-eastern edge of the West Bank. This area, which is lightly populated, has been proposed as a strategic reserve of agricultural land for a future Palestinian state (Dudeen 2007). Regardless of its generally flat terrain and small area (365km2), there are also significant variations in Gaza‘s temperate climate: the average seasonal rainfall is 522mm in the northern Beit Lahiya governorate and 225mm in the southern Rafah governorate (Palestinian Water Authority 2007). Gaza is hot and dry during summers and mild during winters. Evidence shows that

global warming is affecting Gaza: an analysis of daily temperature data from 1976 to 1995 has shown an increase in mean temperature of 0.4C, which reflects above all an upward trend in minimum temperature values (El Kadi 2005). This finding is corroborated by Israeli research demonstrating that average temperatures in the eastern Mediterranean have increased steadily over the last 100 years (Krichak et. Al 2007).

The current problems in Palestine that related to water are numerous and varied. As in Israel and Jordan – also with limited water resources – the last five years have seen a serious, recurrent winter drought. The 2007-8 winters saw a drastic drop in rainfall across Palestine. The average rainfall was 26 percent of the expected amount (based on average annual rainfall). Arid areas along the Jordan Valley and eastern slopes may have had even less of their expected rainfall, but as these areas were not monitored there is no local data (Ministry of Agriculture 2008). The drought was even more pronounced in 2008-9, with precipitation data for the West Bank meteorological stations recording on average 82.5% of the rainfall of the 2007-8 winters[3].

Palestine also has low levels of per-capita water availability – three-quarters of the population are estimated to consume between 60-100 liters for domestic use per person per day (Zeitoun 2008: 14), compared to 330 liters/person/day in Israel. In the West Bank, average water availability for Palestinians is lowest at 50 liters/person/day compared to 369 liters/person/day for Israeli settlers (Palestinian Hydrology Group 2006; World Bank 2009). The WHO minimal standard for daily water consumption for direct human consumptive and hygiene needs is 100 liter/person/day (Chenoweth 2008: 247). Continuing population growth and predictions for regional climate change – with associated changes in precipitation levels and distribution – will intensify these problems. Indeed, it has been estimated that Palestine will experience a water deficit of 271x106 m3 by 2020 (Mimi et al. 2003).

Forecasted climate changes for the eastern Mediterranean mainly affect the start and duration of the different seasons, and the quantity of rainfall. This has two anticipated effects: firstly, periods of heavier rainfall will be concentrated in a shorter time, with consequent increased run-off and erosion and decreased absorption capacities of the soil. Less retained water will result in lower pasture production, forcing herders to purchase (more) fodder. Secondly, on the other hand, poorer rainfall would result in a lower quantity of water harvested and stored in cisterns, forcing herders to purchase (more) tankered water.

Description and Background

This Climate Change Adaptation Strategy for Palestine is a key output of a work program for the Palestinian Environmental Quality Authority (EQA) funded by the United Nations Development Program/ Program of Assistance to the Palestinian People (UNDP/PAPP). Informed by the Adaptation Policy Frameworks for Climate Change recommended by UNDP (Lim et al. 2005), the Project Team adapted a vulnerability-based approach in developing the Strategy. In Palestine there are complex relationships between the climatic and non-climatic drivers of vulnerability. Climate-related events that are potentially harmful

[3] This is for rainfall records up to the end of March 2009: see http://www.pmd.ps/ar/rainyseason.htm

constitute hazards (Jones and Boer 2005: 99). Climate hazards are physical manifestations of climate variability or change: these can be events – such as droughts and heavy rainfall episodes – or longer-term changes in the mean value of climatic variables (Brooks 2003: 4). It is not possible at the moment to differentiate climate hazards in Palestine on the basis of climate variability or long-term climate change with any scientific reason, however recent experience in the region does not falsify precipitation and temperature trends predicted by climate modeling. Moreover, it will be argued in this report that a precautionary approach is warranted in which improving adaptive capacity in Palestine– both for institutions and communities – will deliver 'no regrets' and 'low regrets' benefits (i.e. 'do no harm') in terms of disaster risk reduction and human development even if long-term climate trends are less harmful than predicted.

The Main components of the adaptation strategy

The main objective of this document to increase the preparedness of the Palestinians of any impact of climate change might be occurred in the near future , also, this adaptation policy will help in assessing the future human security at national and regional will be effected by climate change .

The strategy has the following major components

1. Current vulnerability assessment which includes
    - Current climate change
    - Current socioeconomic conditions and stakeholders perceptions
    - Sources of vulnerability
    - International legal context of Palestinian vulnerability to climate change
2. Climate change and vulnerable communities
3. Future Climate-Risks Assessment this component focuses on Future climate change risks, Extrapolations of existing socio-economic trend to 2020 and 2050 and Impacts on policy sectors
4. Proposed Adaptation Measures : The strategy highlights the National proactive adaptation to climate change, Identification of adaptation measures Prioritization of adaptation measures, Climate change adaptation in strategic national planning and Inclusion in development assistance frameworks
5. Adaptive Capacity-building which includes
6. Information needs for climate risk management and National-level institutional capacity-building.

The scale of expected climate impact

Current predictions from general circulation models (GCMs) are for significant decreases in annual rainfall over the region by the 2050s. This is combined with an increase in temperatures. A global - scale scenario cannot be reliably applied to Palestine, because of the small size of the country, the coarse resolution of current models and the great spatial inaccuracy of global models. The level of confidence in using GCM output directly is very low, so more sophisticated methods of "downscaling" GCM output for Palestine must be performed - primarily using dynamical method that is a high resolution regional model

embedded within the GCM. Climate change is projected to have significant impacts on conditions affecting Palestinian agriculture. (Abujjamous, 2010) although the results presented by Abujjamous estimated and provided a preliminary idea about the potential impact of climate change on agricultural water demand. Taking into consideration that these results showed the impact on irrigated open field agriculture only, which means that the deficit in agricultural water demand will become greater when considering the impact of climate change on rain-fed agriculture and greenhouses.

Evaluation

In order to evaluate the adaptation strategy, OECD evaluation criteria have been chosen. However, the evaluation has taken into consideration the Palestinian political and socioeconomic context.

Responsible Actors

The adaptation strategy implementation is the responsibility of all stakeholders; however, responsibilities are divided into three levels:

Primary stakeholders: Palestinian official departments such as Water Authority, Ministry of Agriculture and Environmental Quality Authority;

Secondary stakeholders: NGOs, community based organizations and private sector;

Other stakeholders: Donors and others;

Evaluation

Relevancy

The adaptation strategy was an innovative work since it is the first time that the Palestinians decided to institutionalize the climate change issue; by endorsing this document the Palestinian Environmental Quality Authority is giving the signal of the importance of the issue within the Palestinian political, socioeconomic context. The relevancy of the document is shown by the following items:

1. The document analyzed the capacity of stakeholders to cope with adverse climate change impact.
2. The document assessed the vulnerability of Palestinian areas to the climate change impact.
3. The adaptation strategy identified the most effective means by which Palestinian Authority can enhance the capacity of the Palestinians to cope with current and future climate hazards.
4. Based on the overall review of climate change scenarios for the eastern Mediterranean, The document highlighted the conclusion that the most important environmental effects of climate change for the Palestinian territories (PT) over the course of this century are likely to be a decrease in precipitation and significant warming.

5. The document specified the socioeconomic conditions of the most vulnerable areas and the possible future scenarios of climate change impact.
   However, the document is the first national document highlighting the impact of climate change on the Palestinians , also the document explained the possible effect of future human security at national and regional level ,in Particulare the impact of growing water scarcity on the social stability and the Israeli-Palestinian Conflict .

Effectiveness

Since the document is a macro level strategy document it is too early to measure its effectiveness .However, the objectives of the adaptation strategy are achievable but it is subject to pre conditions such as funding availability, willingness of political circles and efficient coordination among all stakeholders.

Historic forms of household and community coping by Palestinians in the face of climate and other hazards offer cultural templates for adaptation to climate change in Palestine. However, the ongoing effects of the Israeli occupation undermine the conditions necessary to their operation, both economic – the free movement of goods and people – and also political – national self determination and democratic governance. The occupation fosters a wide range of maladaptive policies and practices (e.g. subsidized water-intensive livestock farming by settlers and the destruction of Palestinian olive groves) that severely restrict the development of resilience to climate hazards. There are also maladaptive Palestinian practices that need to be addressed (e.g. unlicensed wells), though these are of less significant than the far-reaching effects of the occupation. The PNA is recommended to adapt this Climate Change Adaptation Strategy for Palestine, as the most effective means by which the PNA can enhance the capacity of Palestinians to cope with current and future climate hazards. Initial efforts should be directed at addressing the six major climate-induced risks to food and water security identified in this strategy:

- Crop area changes due to decreases in optimal farming
  Conditions
- Decreased crop and livestock productivity;
- Increased risk of floods
- Increased risk of drought and water scarcity;
- Increased irrigation requirements
- Increased risks to public health from reduced drinking water quality

It is recommended that prioritization is given to those no-regrets (low cost) which are judged to have the highest levels of adaptive capacity and technical feasibility:

1. Developing flood contingency plans
2. Local Increases in rainfall interception capacity
3. Setting clear water use priorities
4. Increased use of night irrigation
5. Reviewing drinking water quality management systems to Incorporate climate risks
6. Increasing water and wastewater re-use

Subject to the availability of funding support, it is also recommended that
Consideration is given by the PNA to adapting also these low-regrets (medium

Cost) measures which have the highest levels of adaptive capacity and Technical feasibility:

1. Increase in irrigation for highest value crops
2. Increased use of water harvesting
3. Increased organic olive oil production
4. Rural livelihood diversification
5. Precision agriculture: improved soil and crop management
6. Adaptive land use planning
7. Altering crop rotations for more tolerance to heat and drought
8. Reducing over-pumping of groundwater the PNA, through its line agency for climate change – EQA – is committed to the development of an inclusive national strategy for climate change Adaptation.

Efficiency

The adaptation strategy adopted several measures and indicators to evaluate and monitor the expected outputs .The strategy categorized the adaptation measures as following:

1. No regrets(low cost) measures as setting clear water use priorities, reviewing the quality of drinking water ….etc
2. Low regrets (medium cost) measures such as rural livelihood diversification, water harvesting ….etc.

Also the adaptation strategy document mentioned clearly two strategic outcomes:

1. **Water security –** sustained access of individuals to sufficient safe Water for health and well-being in the face of significant climate risks (e.g. water scarcity and reduced quality). One relevant benchmark that could be considered for adoption is the WHO *minima* standard of daily water consumption for direct human consumptive and hygiene needs – 100 liters/person/day

2. **Food security –** sustained household income and consumption above $1.6 US per capita per day, with no decreases in total food and non-food expenditures, in the face of significant climate risks.

Impact

the implementation of the strategy will help the Palestinian to achieve the following :

- Improved capacity of Palestinian institutions to deal with climate change issues.
- The active participation of stakeholders will help to define their own infrastructure of protection against climate change and other risks is consistent , and supports
- Qualified will equipped Palestinian organizations will help in dealing with trans-boundary climate challenges (water and environmental conflicts) management
- Enabling Palestinians to cooperate where possible at technical and political levels with regional neighbors.
- The Palestinian community will be relatively more prepared to deal with climate uncertainties in particular the agricultural sector.

Conclusion and recommendations

The change in the climate variables will have the significant impact on agriculture from high resolution regional models that have delivered similar forecasts of climate change for the eastern Mediterranean. This research studied part of the most significant environmental effects of climate change for Palestineduring this century. These are likely to be a decrease in precipitation (with significant seasonal variation) and significant warming.

This study concluded the immediate complete assessment of future climate risks in Palestine. This study identified need for the PNA to acquire increased capacity for monitoring and modeling rainfall variability and long-term climate change in Palestine. One of the recommended practices is that priority be given to the low-cost and medium cost measures which are judged to have the highest levels of adaptive capacity and technical feasibility. Capacity-building is necessary, as well as training and increased public awareness. International support to build and strengthen environmental and sectoral institutions is also crucial.

It is time for planners to think in terms of expected change in water requirement due to climate change while estimating the future water demands and planning for development of future water resources in Palestine. Climate change will have large impacts on the agricultural water demand, reliability and security of water systems in Palestine. Adaptation practices should be implemented after careful evaluation. Effective adaptation practices are responsive to a wide variety of economic, social, political, geographic and environmental conditions, so criteria for success may be context specific. The process of identifying potential adaptation measures should involve two main stages: analysis of relevant literature and ongoing studies and a stakeholder consultation exercise to obtain practical information on adaptation measures. Many of the possible adaptation measures can be applied at farm level, with the majority of measures being management related. This implies that these should be more easily orchestrated, with many categorized as applicable over a mid-term timescale (5 -10 years). However, before many of these can be implemented, short - term measures involving policy development and partnerships must first be put in place.

1. Adaptation efforts must focus more in communities where vulnerabilities are highest and where the need for safety and resilience is greatest.

2. Climate change projects must build based on trends in today's risk and vulnerability assessment as well as current climate variability.

3. Fully integrate adaptation into longer term national and local sustainable development and poverty reduction strategies. Development and poverty reduction strategies.

4. The strength of existing capacities must be – among local authorities, civil society organizations, and the private sector – to lay the foundations for the robust management of climate risk and the rapid scaling up of adaptation through community-based risk reduction and effective local governance.

5. Develop strong resource mobilization mechanisms for adaptation that ensure the flow of both financial and technical support to local actors.

Leverage the opportunities in disaster prevention and response, through improved early warning systems, contingency planning and integrated response, to promote effective community-based adaptation and risk reduction

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Assessment of Spanish climate change adaptation and water policies

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Abstract

This report assesses three Spanish policies at the interface of climate change adaptation and water resources: the Spanish National Climate Change Adaptation Plan, the AGUA Programme and the Drought Management Plans (DMPs). The objectives and main mechanisms as well the main actors involved in each policy are described, and the policies are evaluated in terms of relevance, effectiveness, efficiency and impacts. All of the policies are regarded as highly relevant in the context of climate change adaptation and water resources, and they all have brought important changes and innovations to Spanish policy making, but at the same time certain weaknesses are identified, mainly in terms of implementation.

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1. Introduction

Like other Mediterranean countries, Spain is highly vulnerable to climatic change and its impacts on water resources. Spain is a country that is already experiencing water stress, and decreasing precipitation rates and increased variability of rainfall due to climate change are projected to have severe impacts on freshwater availability and the frequency and severity of drought events.

Water has been a key resource for economic and social development in Spain during the last decades, and traditionally the aim of water policy has been the one of guaranteeing water supply, responding to increasing demands; this has been realized with a strong focus on large hydrological infrastructure projects. Due to a "structural scarcity" of water resources – especially in the Mediterranean basins – water management and water use is often a conflictive issue, with competition between users, regions and administrations, especially during drought periods.

These conflicts over water in Spain are closely related to territory. In the light of diverging interests between and within regions and political parties on how to allocate water resources, the term of "water wars" has become common in newspaper headlines.[1] The debate on the transfer of water from the Ebro river to water-scarce southern provinces and the Metropolitan Area of Barcelona, as it was planned in the National Hydrological Plan (NHP) of 2001, is certainly the most emblematic case of an hydro-territorial conflict in Spain.[2]

Yet conflicts on water do not only exist between regional governments, but at multiple scales also within Autonomous Communities and on the local level. In addition to conflicts between traditional stakeholders, i.e. water users, environmental concerns are increasingly the trigger for water-related conflict. In Andalusia, for example, the "Network for a New Water Culture", a collective of different environmental NGOs lists several local conflicts related to water in each Andalusian province.[3] Causes are manifold and include aquifer overexploitation, contamination or impacts of transport infrastructure. Another indication for increased public concern on the water environment is the increasing number of regional and local civil society platforms that have been formed in last years in defence of their local environment.

According to Saurí and del Moral, a debate shaped by regional, economic and environmental dimensions finally led to "end of the hydraulic age" in Spain, to which also requirements of new European European Water Framework Directive (WFD) contributed strongly.[4] The transition of Spanish water policy has been marked by a decentralisation process, giving more decision-making competences to the Autonomous Communities. Today, water management takes place at multiple levels. In the quasi-federal system of the

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1 See for example *El País* (31.03.2008), *El Mundo* (21.04.2010)

2 See also chapter 3 on the AGUA Programme

3 http://www.redandaluzagua.org/modules/3kcontenido/index.php?id=15

4 Saurí and del Moral (2001)

Spanish state, competences in water policy are located both on the state and on the Autonomous Community level. Autonomous Communities have further far-reaching powers in land-use planning, agriculture policy and environmental protection. Inter-community river basins are managed by river basin authorities that depend on the central Ministry for Environment and Rural and Marine Affairs (MARM), whereas internal basin districts are under exclusive planning and management competence of the respective Autonomous Community. Further, municipalities are responsible for wastewater management and urban water supply, and have competences in local land-use planning (Varela Ortega and Hernández-Mora 2010).

This report assesses three of the main policies at the interface of water and climate change in Spain, each of those having more or less direct implications on conflicts and human security issues related to water resources in the light of climatic change:

The Spanish National Climate Change Adaptation Plan serves as the general framework for all climate change adaptation actions in Spain and aims at integrating climate change adaptation into sectoral policies and at the different levels of governance. The PNACC is regarded as a relevant in the context of the CLICO project as its objective is to assess climate change impacts, vulnerabilities and adaptation options in different sectors. Water is regarded as a priority sector in the policy, due to its impacts on other sectors. The main outcome of the policy has so far been the generation of regional climate scenarios, which are to be taken into consideration in water planning at the river basin level. The PNACC is being implemented in a modular approach, based on work programmes and follow-up reports that monitor progress and define future implementation steps.

The AGUA Programme has been the Spanish government's alternative water policy after cancelling the highly conflictive plan of transferring water from the Ebro river to various water-stressed river basins. It profoundly changed the paradigm of Spanish water policy from large-scale supply infrastructure including inter-basin water transfers towards the principles of integrated water management based on the Water Framework Directive. Also, the policy has a strong focus on desalination to ensure water supply guarantee in the Mediterranean river basins in the context of climate change. However, the actual implementation of the policy has largely failed to introduce demand side measures and economic principles to water policy and results mainly in a strong increase in desalination capacity. Rather than being considered as an overall “good practice” example, the analysis provides important lessons on the opportunities and problems of desalination, and on the difficulties to implement sustainable water policies in Spain.

The Drought Management Plans (DMPs) have the objective to increase preparedness and adaptiveness to drought events in Spanish river basins and mark an important shift in dealing with droughts in Spain. Drought management plans are developed and implemented on the river basin level, establishing concrete drought management measures according to previously define thresholds. These thresholds are based on a global hydrological indicator system provided by the Ministry for Environment which exercises control and monitoring functions. As projected climate change is expected to considerably increase the frequency and severity of droughts in Spain, the DMPs are considered as a highly relevant policy in the context of the CLICO project.

2. The National Climate Change Adaptation Plan (PNACC)

2.1. Background

Recognizing the country's vulnerability to climate change due to its geographic situation and its socio-economic characteristics, and realizing the necessity to adapt to the projected impacts of climate change, the Spanish government established the National Climate Change Adaptation Plan (PNACC in the Spanish acronym) in 2006. The plan provides a general framework for all activities among the different public

administrations related to the evaluation of climate change impacts, vulnerability and adaptation options. Further, with the elaboration of the PNACC, the Spanish government complies to the UN Framework Convention on Climate Change (UNFCCC), which is directly referred to in the plan. Having adopted the PNACC in 2006, Spain has been one of the first European countries to set up a National Adaptation Strategy (NAS) to climate change.[5]

The knowledge and information base for the plan was delivered by the ECCE[6] project, a preliminary assessment of climate change impacts in Spain. Existing scientific research on climate change impacts and vulnerability in Spain was reviewed under the participation of more than 400 Spanish and international experts, scientists and professionals. The ECCE project was carried out in 2003 and 2004, in cooperation with the University Castilla-La Mancha, and the main results were published in 2005 under the title "Preliminary evaluation of climate change impacts in Spain".[7]

Further, a study on tools, strategies and actions for the Spanish coast to adapt to climate change was carried out in cooperation with the University of Cantabria between 2003 and 2005, before setting up the PNACC.

2.2. Actors

The Spanish Climate Change Office (OECC) is the responsible institution for the development and coordination of all climate-related policies in Spain and it was set up in 2001 as a General Directorate within the Ministry for Environment. The PNACC was prepared by the Ministry through the OECC and in consultation with the National Climate Council, the Coordination Commission of Climate Change Policies and the Environmental Sector Conference. The Ministry highlights the public participation process that accompanied the formulation of the plan, however, Swart et al. (2009) report that only around 50 enquiries were received in the public consultation process.

As the PNACC intends to address the vertical and horizontal integration of climate change adaptation in Spain, other ministries and government agencies both at the national level and at the Autonomous Community level are important actors. Autonomous Communities play an important role for the implementation of adaptation actions, as they hold far-reaching competences in various sector policies, among them environmental policy, and, in the case of internal river basins, water policy.

The National Climate Council is composed of representatives from the central government, the Autonomous Communities, the Spanish Federation of Municipalities and Provinces, science, the civil society and non-governmental organizations. Besides being in charge of the development, monitoring and evaluation of the Spanish Climate Change and Clean Energy Strategy (focused on climate change mitigation), the Council gives also proposals and recommendations in the field of climate change adaptation strategies. The role of the council gains special importance taking in mind that many competences in policy-making are decentralized

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5 For an overview on the progress on National Adaptation Strategies in Europe see: http://www.eea.europa.eu/themes/climate/national-adaptation-strategies

6 *Efectos del Cambio Climático en España* – Climate change effects in Spain

7 MARM (2005)

to the Autonomous Communities and local governments play an important role in planning and implementation (see Introduction).

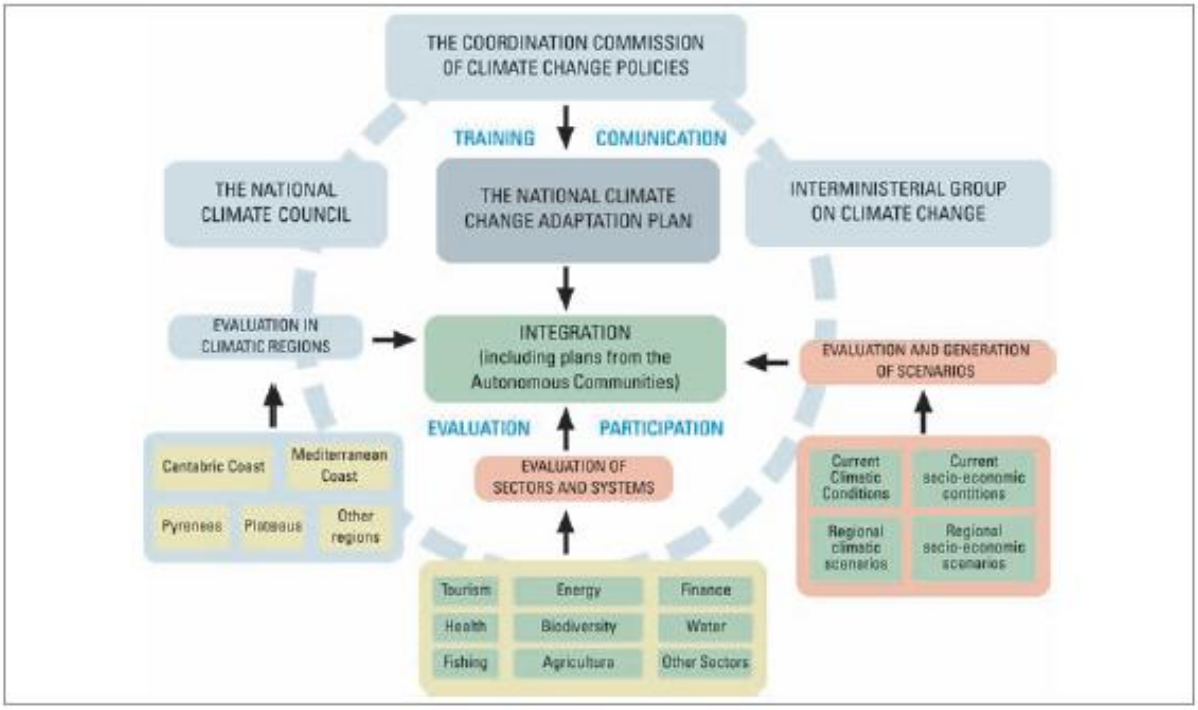
In 2005, the Coordination Commission of Climate Change Policies was created and is composed of five representatives of the central government administration, one representative of each Autonomous Community and one representative of local governments. The Commission was set up to ensure coordination and collaboration between the central and the autonomous community administrations related to the application of the emissions trading scheme. Despite the Commission's strong focus on climate change mitigation policy when it was created, also the monitoring and evaluation of climate change adaptation strategies are among the functions of the Commission's functions. Therefore, a working group on climate change impacts and adaptation was created.

On the central government level, an Interministerial Group on Climate Change was created in 2004, including the State Secretaries, General Secretaries and General Directors of all ministries, in order to improve coordination on climate change policy. However, this group is mainly focused on climate change mitigation policies, and the same stands for the Delegate Commission on Climate Change, set up in 2008.

Figure 1: The process of defining the PNACC and main institutions involved[8]

[8] Source: MARM (2006c)

The process of defining the PNACC and main institutions involved



Further, universities are another important actor related to the adaptation plan, given the fact that one of the major aspects of the plan is the assessment of impacts and vulnerabilities in different environmental systems and socio-economic sectors. The collaboration with research organizations is therefore crucial to improve the knowledge base, like the initial studies carried out by the University of Castilla-La Mancha and the University of Cantabria. Universities and research organizations are further involved in different studies of the plan's work programmes.

Finally, the State Meteorological Agency is an important contributor, providing climate change scenarios for all Autonomous Communities in Spain under the PNACC.

2.3. Objectives and main mechanisms

The plan's general objective is to evaluate the vulnerability of different socio-economic sectors and environmental systems that are sensitive to climate change, and to study the adaptation options for these sectors and systems. In this sense, the plan was adopted to serve as a "reference framework tool for the coordination of Public Administrations' efforts dealing with the assessment of impacts, vulnerability, and adaptation to climate change in the Spanish sectors acknowledged as potentially affected".[9]

Also, the plan states as an aim to continuously provide assistance to all interested administrations and organizations, both public and private, in evaluating the impacts of climate change in the respective sector, facilitating evaluation knowledge, tools and methods.

The plan follows a sectoral approach, identifying 15 sectors and systems, that are most affected by climate change: Biodiversity, water resources, forests, agriculture, coastal areas, hunting and inland fishing,

[9] MARM (2006)

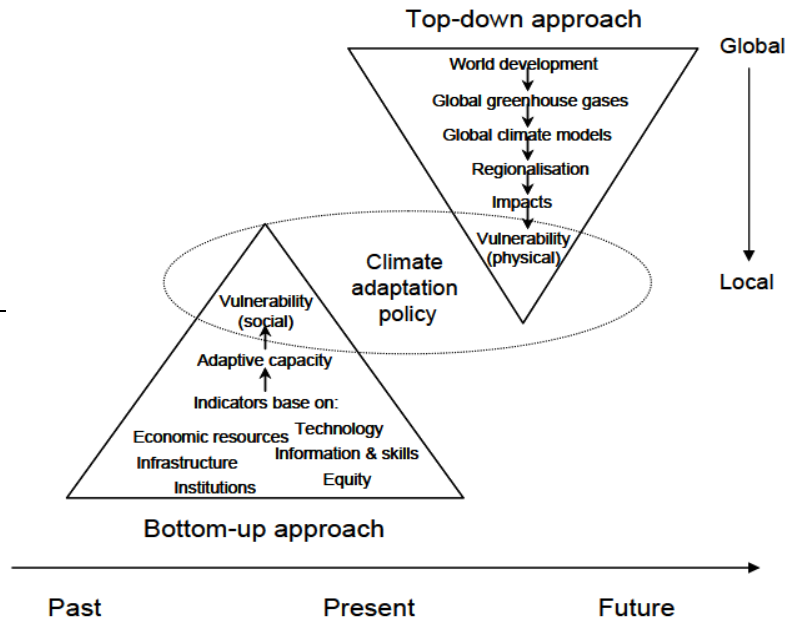
mountain areas, soil, fishing and marine ecosystems, transport, human health, industry and energy, tourism, finance and insurance policies and urban planning and construction.

The agenda and issues for implementation of the plan are defined in work programmes. Together with the plan itself, the first work programme was adopted in 2006; in 2009, the second work programme was set up. The plan also established an evaluation and monitoring scheme for the plan and its work programmes through follow-up reports and individual reports for all completed projects. So far, however, only one follow-up report was published in 2008, *inter alia* compiling regional climate scenarios for all Autonomous Communities.[10] The second monitoring report is currently being finalized and had been foreseen to be published in February 2011,[11] however, to date it is not publicly available.

The first work programme focuses on water resources, biodiversity and coastal zones as priority systems to be evaluated and addressed, as these systems also have major impacts on other sectors (e.g. agriculture or tourism). In this sense, these three systems are regarded as cross-cutting issues in adaptation to climate change in Spain. Besides the focus on water resources, biodiversity and coastal zones, the generation of regional climate scenarios in Spain is the fourth priority of the first work programme.

According to the PNACC, the assessment and evaluation of impacts and vulnerabilities is carried out with an approach that combines first and second generation vulnerability assessments. Physical vulnerability is to be assessed through a so-called top-down approach, identifying the main climate change impacts in the long term, and analysing to which point adaptation can reduce negative effects. Social vulnerability is to be assessed through a bottom-up approach, analysing how a country or autonomous community can adapt to climate change, and how adaptation policies can be better developed and applied. The PNACC refers in this respect to the FINADAPT Project[12] in Finland, which itself builds on conceptual work by Dessai and Hulme.[13]

Figure 2: Top-down" and "bottom-up" approaches used to inform climate adaptation policy[14]



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2.4. Evaluation

2.4.1. Relevance

As a general framework, the National Adaptation Plan is the most relevant policy on climate change adaptation in Spain, with the aim to generate the knowledge and information base for all adaptation activities in all sectors, and promoting a coordinated approach to climate change adaptation among sector policies and different administrative levels.

Of special relevance are its focus on water resources as one priority area (besides biodiversity and coastal zones) and the implicit recognition of water as a cross-cutting issue in climate change adaptation in Spain, with a high importance to other sectors – following the reasoning that in climate change adaptation, "deciding what to do first is often as important as deciding what to do at all".[15]

The human security dimension of climate change is explicitly addressed in the policy: the PNACC states that in the evaluation of climate change impacts and vulnerability in each of the sectors and systems, also impacts on human security and other human security-related aspects like food security, poverty or social inequality have to be considered – along with factors that determine adaptation options related to these impacts. Institutions, governance, demography, culture and social values are stated as examples. However, the plan remains imprecise in this field and does not provide for further descriptions how human security impacts will be addressed and how related adaptation options can be developed. Security policy itself is not mentioned explicitly in the plan.

2.4.2. Effectiveness

Integrating or mainstreaming adaptation into different policy sectors and at various governance levels is a major challenge of climate change policy, in any country.

The PNACC states as one central goal the integration of climate change adaptation into relevant sector policies in Spain. Hence, one criterion for assessing the policy's effectiveness is the degree to which climate change adaptation has already been taken into account in other policy sectors, and how it is coordinated with other government departments.

Some results in integrating climate change adaptation into different sector policies have so far been achieved in the sectors of water, desertification and forests: Future climate change impacts need to be taken into account in river basin plans (see below), the Spanish forest strategy includes climate change impact evaluation and adaptation as a basic criterion, and the National Action Plan against desertification refers to the PNACC as its main reference.

Whereas the before mentioned policies are all within the competence of the Ministry of Environment (MARM), sectoral integration of climate change adaptation in health policy was made in 2010 with the joint set-up of an Observatory on Health and Climate Change by the Ministries of Health (MSPS) and Environment

[15] Füssel (2007), p. 273.

(MARM). This can be regarded as an important achievement of the PNACC towards further integration of climate change adaptation in sector policies, as this measure of integration goes beyond the competences of the MARM and implies inter-departmental coordination between two different ministries. The observatory's function is to analyse, evaluate and monitor the effects of climate change on public health and the national health system. Among others, a data base on health and climate change is planned to be accessible in 2010, and a report on climate change impacts on health to be published in 2011.

Due to the decentralized political framework in Spain, the Autonomous Communities play a major role in the definition and implementation of environmental policy. Coordination between the national level and the 17 Autonomous Communities is therefore a central aim of the National Climate Change Adaptation Plan, and at the same time identified as a major challenge.[16] So far, the elaboration of regional climate change scenarios for all Autonomous Communities has been the main outcome of the PNACC related to multi-level coordination.

Whereas the first work programme of the PNACC laid little emphasis on the coordination challenge, the second work programme – besides the thematic priority areas – also sets up two basic pillars, one of them being to strengthen coordination between the administration at the national level and the autonomous administrations.[17] This is seen as crucial in order to avoid duplications and ensure complementarity of the PNACC and the plans, strategies and adaptation programmes of the Autonomous Communities. The Coordinating Commission for Climate Change Policy and its work group on impacts and adaptation is the institutional entity to ensure this task, promoting a two-way knowledge transfer between the levels of administration, regarded as an essential element to strengthen the PNACC and its second work programme.

The modular approach of the PNACC can be regarded as a further factor that favours effectiveness. As priority areas and actions are defined in work programmes, every new implementation step can build on previously gained knowledge, and a certain flexibility is ensured. Additionally, monitoring is another important component to ensure effectiveness of the plan. To improve monitoring, evaluation and dissemination of the activities carried out under the plan, the second work programme sets up the development of an indicator system of climate change impacts and adaptation for each of the sectors included in the plan. The indicator system is planned to combine data and include indicators of already existing climate change observation activities all over Spain, including those undertaken on the regional level by Autonomous Communities. Also, existing gaps in climate change monitoring are to be detected.

2.4.3. Efficiency

Being a broad and long-term policy framework for climate change adaptation, the PNACC cannot be adequately evaluated in terms of efficiency. As an overall framework for adaptation, the PNACC includes in its monitoring reports all activities carried out related to climate change adaptation, even when these

16 Swart et al. (2009)

17 The other pillar of the work programme is the promotion of Research, development and Innovation (R+D+i).

measures have not directly been part of its stated policy objectives. Therefore, it is not possible to relate inputs to outputs, meaning that outputs (e.g. sectoral policy measures) are not necessarily only the result of the inputs of the PNACC. Further, there is no information available on the overall budget of the PNACC, or on the budget that was assigned to individual components of the plan, like specific impacts and vulnerability assessments carried out.

2.4.4. Impacts

The evaluation of impacts of the adaptation plan needs to consider that national adaptation plans and strategies are generally rather the start of a policy process than its culmination.[18] The follow-up report of the first work programme[19] and the second work programme[20] describe all activities that have been carried out under the framework of the adaptation plan in Spain. The ambitious goal of the PNACC to annually review the work programmes and to publish an annual monitoring report one ongoing activities has not been fulfilled.

The impact and vulnerability assessments proposed in the first work programme in 2006 are still ongoing, except the elaboration of regional climate scenarios: these were developed for all Autonomous Communities in Spain and are available on the website of the State Meteorological Agency (AEMET)[21], apart from the published report "Generation of regional climate change scenarios for Spain".[22] Most recently, the study on impacts, vulnerability and adaptation climate change in respect of Spanish biodiversity was completed and published.[23]

Referring to its general objective to integrate adaptation to climate change into sector policies, the PNACC sees the implementation of the Water Framework Directive (WFD) as the adequate process to include the evaluation of climate change impacts into water resources planning. The PNACC states that although the term "climate" does not appear in the text of the WFD itself, impacts of climate change on water quality and availability need to be considered.

As a result, the evaluation of climate change impacts has been made obligatory for hydrological planning at the river basin level through the *Royal Decree 907/2007*. More concrete, the *Orden ARM/2656/2008* requires for each river basin plan to evaluate future climate change impacts on water resource availability on the basis of scenarios provided by the Ministry of Environment. In case own evaluations are not being carried out in the planning process, the *Orden* provides the concrete percentages to be applied corresponding to each basin in terms of reduced water availability corresponding to the year 2027.

Table 1: Reduction of water availability in river basins according to the *Orden ARM/2656/2008*

18 Biesbroek et al. (2009)

19 MARM (2006b)

20 MARM (2009)

21 http://www.aemet.es/es/elclima/cambio_climat/proyecciones

22 MARM (2009b)

23 Felicísimo et al. (2010)

River basin	*Reduction of water availability (in %) by 2027*
Mino-Sil	3
Cantábrico	2
Duero	6
Tajo	7
Guadiana	11
Guadalquivir	8
Segura	11
Júcar	9
Ebro	5

The PNACC has so far not resulted in any other significant sectoral adaptation policy output, which could be due to the fact that sectoral impact and vulnerability assessments have not yet been completed.

The second work programme was approved in 2009 for a 4-year period. In addition to continuing the studies on the priority areas included in the first work programme (water, biodiversity and coastal zones), with health, tourism, agriculture, forests and land/desertification, five new sectors were introduced in the programme. The programme outlines an agenda of activities for each of those sectors. Regarding water resources, the main new activities are a study on climate change impacts on groundwater resources (until 2012), a study on climate change impacts on water resources from snowfall in mountain regions (until 2012), cost-analysis of climate change impacts in certain pilot areas (not further specified), and a sectoral evaluation report on water resources (until 2012).

Dissemination activities of the main results and activities of the PNACC are, however, insufficient. There is e.g. no central (online) platform on adaptation and no clear dissemination strategy can be identified. The only dissemination activity so far is a leaflet on the Adaptation Plan dating from 2006, when the plan was approved, and the report on regional climate change scenarios. Also, it is not clear in how far the PNACC so far has provided assistance to evaluate climate change impacts to organizations outside the administration.

3. The AGUA Programme

3.1. Background

Spain hosts a total of 18 different river basins in its territory, of which eight are shared with other countries, three are located within the Spanish territory but shared between Autonomous Communities, and seven that are exclusively located within an Autonomous Community.

The composition and functions of river basin authorities are regulated by the water law of 1985 (which was modified in 1999).[24] According to the regulation, these basin authorities are responsible for water management in all river basins that are shared between different Autonomous Communities and depend on the Spanish Ministry for Environment (MARM). In river basins that are exclusively located within one Autonomous Community, the respective autonomous water administration is in charge. The shape of Spanish river basins was subject to some change up to 2007, due to the requirements of the Water Framework Directive (WFD) and devolution of competences in water management over internal basin districts to the Autonomous Community level.

Figure 3: River basins in Spain[25]

Water policy in Spain traditionally had a strong focus on supply augmentation through infrastructural projects in order to face water scarcity and growing demands. In this tradition, the National Hydrological Plan (NHP) of 2001 proposed the transfer of water from the Ebro river to dryer provinces as as a central

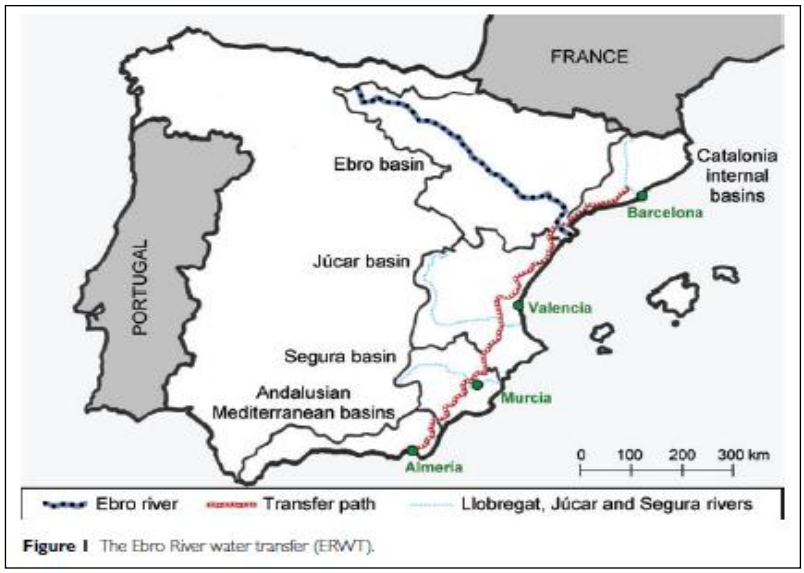
[24] The concept of water management at the river basin level is not new to Spain; in fact, already in 1926 basin authorities (*Confederaciones Hidrográficas*) were created in the Ebro and the Segura basins, making Spain one of the first countries to apply this concept.

[25] Source: http://iagua.es/2007/11/el-nuevo-mapa-del-agua-en-espana-organismos-de-cuenca-demarcaciones-hidrograficas-y-autoridades-competentes/

measure. It was planned to transfer 820hm^3 of water up to 750km to the Júcar, Segura and Mediterranean basins of Andalusia (then named the Sur basins), and additionally 200hm^3 were planned to be transferred to the Metropolitan area of Barcelona, located in the internal basins of Catalonia.[26] The NHP 2001, especially due to the Ebro transfer, provoked strong disputes between the involved regions: the government of the Autonomous Community of Aragón[27] opposed the project claiming the area-of-origin rights and in Catalonia, the new government that came into power in 2003 also objected the project. On the other side, southern regions that would have profited from the transfer (provinces in Valencia, Murcia and Andalusia), argued that inter-community basins are under national jurisdiction and water transfers between basins are projects of national interest.[28]

But the dispute over the Ebro transfer was not only a matter of regional governments. Many civil society initiatives, non-governmental organizations and the scientific community were strongly involved in criticizing the plan.[29] Additionally to the strong opposition to the transfer within Spain, the European Union was reluctant to fund the project, as compliance with objectives of the Water Framework Directive was not ensured.[30] The reports – both in opposition and in favour – on the NHP 2001 that were prepared by various experts and organizations, such as scientists, NGOs and the European Commission, can be accessed on the website of the Ministry for Environment.[31]

Figure 4: The Ebro transfer as planned in the NHP 2001[32]



26 Albiac et al. (2006)

27 Aragón has a share of more than 50% of the Ebro basin.

28 Garrido and Llamas (2009)

29 Font and Subirats (2010)

30 When the NHP 2001 was adopted, there had been no legislation in place to implement the WFD in Spain.

31 http://www.mma.es/secciones/agua/informes.htm

32 Source: Muñoz et al. (2010)

Coming into power in 2004, the socialist government under Zapatero finally cancelled the Ebro transfer in 2005, and presented the AGUA programme instead (AGUA stands for *Actuaciones para la Gestión y la Utilización del Agua* - Actions for Water Management and Utilization). Technically, the AGUA programme is a modification of the National Hydrological Plan (NHP) 2001, by *Law 11/2005*.

The AGUA Programme introduced new objectives of Spanish water policy based on demand management measures, economic instruments, as well as water reuse and desalination. Thereby, the policy also refers to the requirements of the European Water Framework Directive (WFD). The AGUA programme has therefore been described as a paradigm shift in Spanish water policy.[33]

In 2005, the government also initiated a process to reform the Spanish water law, incorporating the principles of the AGUA programme into national legislation. However, this process was finally cancelled by the government, due to "a lack of time" until the elections in 2008.[34] This reform intended – among other – to regulate public water banks as included in the AGUA programme and to introduce a water levy in order to increase cost-recovery. Although being re-elected, the socialist government did not continue the reform process of the water law and much of the government's commitment to implement the new water policy principles was not kept up in its second legislative period starting in 2008. The integration of the Ministry of Environment and the Ministry of Agriculture into the new Ministry of Environment and Rural and Marine Affairs (MARM), together with the nomination of the former Minister of Agriculture as the head of the MARM is seen as a setback to the policy initiated in the first legislative period under the former Minister of Environment.[35] Due to this fact, a range of components of the AGUA programme has not been transformed into regulation and implementation is lacking. The lack of institutional collaboration and the missing legal and administrative reforms in the water sector impeded the full implementation of the AGUA programme, which according to Estevan corresponded in its original design to a new water culture that was necessary in Spain to overcome the old water paradigm exclusively based on supply infrastructure.

Estevan provides a detailed analysis on the process of the AGUA programme, starting as an innovative policy giving preference to water saving, efficiency and reuse, and with desalination only as a measure of last resort, depending on the local necessities. As a main problem he identifies that the AGUA programme was in the political and public debate expected to substitute the quantitative water supplies of the Ebro water transfer, without revising those calculation. The initially preferred water demand and reuse measures did not receive significant political support in regions that would have been supplied by the Ebro transfer. Instead of focusing on specific circumstances and solutions on the local level, regional governments kept requiring new supply measures, based on the volumetric demand that had been calculated to justify the Ebro transfer. This had forced the government, only a few months after launching the AGUA project, to present a global number of the water supply through desalination that corresponded to the planned Ebro

33 Downward and Taylor (2007)

34 *El País (*28.08.2007)

35 Font and Subirats (2010)

water transfer.

Assessing the AGUA programme it is therefore worth distinguishing between the original plans of the policy, and what actually has been implemented.

3.2. Actors

The Ministry of Environment and Rural and Marine Affairs (MARM)[36] is the ministry in charge of the AGUA programmes' implementation, together with the authorities of inter-community basins (*Confederaciones Hidrográficas*) and the autonomous basin agencies.

The AGUA programme was introduced by the socialist government led by Zapatero after coming into power through the 2004 general elections. As mentioned before, the AGUA programme substitutes the Ebro transfer that was planned in the National Hydrological Plan 2001, prepared under the conservative Aznar government, facing strong opposition.

Various environmental organizations, civil society initiatives and the scientific community played a key role in the process towards the cancellation of the Ebro transfer which resulted in the adoption of an alternative policy, the AGUA programme. The arguments leading to the cancellation of the Ebro transfer and to the development of alternatives by the government where largely based on the ideas that had been elaborated by the New Water Culture Foundation (FNCA)[37], a non-governmental organization formed by a wide range of scientists and experts in the field of water in Spain.[38] The Ministry for Environment also formed an Agreement with the University of Seville to evaluate the implementation of the new water policy in Spain, with special attention to the requirements of the Water Framework Directive. In 2008, shorty before the end of the first legislative period, around 20 reports were published by members of the new Water Culture Foundation evaluating progress and – more pronounced – the implementation deficits of the AGUA programme.

Additionally, the European Commission played an important role in the policy debate on the NHP 2001, as it refused co-funding for the Ebro transfer. Also, European funds were provided for implementing the AGUA programme, which contributed around a third of total investments.

3.3. Objectives and main mechanisms

The AGUA programme's main objectives are to improve water management, availability and quality in Spain, especially in the Mediterranean basins, to increase knowledge and awareness related to water, overcoming opposition to European policy objectives and to spread efficient and environmentally friendly technologies.

In order to achieve these objectives, the AGUA programme proposed various measures to be implemented until 2008:

- A reform of the basin authorities that incorporates the regional governments in the decision making

36 From 2004 to 2008 the Ministry for Environment (MMA)

37 *Fundación Nueva Cultura del Agua (FNCA)*

38 Arrojo (2008)

process and the control of water use and quality. Also citizen participation of all citizens in water management should be promoted.

- The creation of public water banks in each basin, in order to allow the reallocation of historical water rights based on new criteria such as equity, efficiency and sustainability.
- An adjustment of water prices in accordance with the real extraction and treatment costs (as required in the WFD).[39]
- Actions to improve water management and supply through a) the optimization of tank and distribution infrastructures, b) treatment and reuse and c) desalination.

The concept of the AGUA programme in its formulation was focused on specific local problems to be tackled, prioritizing water savings, efficiency and reuse, and to introduce new supply through desalination where other options are not sufficient to reduce water stress.[40]

The policy regards the Mediterranean basins as a priority and implemented first actions in 10 provinces in 5 river basins, namely the internal basins of Catalonia, the Ebro, Júcar, Segura and the Mediterranean basins of Andalusia. The *Urgent Actions of the AGUA Programme in the Mediterranean Basins* (AUPACM) aimed to increase water availability by 1.100 hm^3 per year. Investments are 3.900 million Euros, of which one third is contributed by European funds. This amount is invested mainly in infrastructure modernization and the construction of desalination plants.

For all water infrastructure programmes, a feasibility analysis has to be carried out, proving technical, economic and environmental viability. By this means, hydraulic works financed by the Ministry for Environment shall increase its economic, technical and environmental rationality and at the same time make decision making more transparent. This regulation can be directly linked to the cancelled Ebro transfer of the former NHP 2001, which had been widely criticized not only for its environmental impacts, but also for its negative economic performance.

3.4. Evaluation

3.4.1. Relevance

The AGUA programme explicitly highlights its relevance in respect to climate change and its impacts on water resources in Spain. The policy states that by 2050, temperatures are estimated to increase by 2,5°C, precipitation might decrease by 10% and soil moisture by 30%. The urgent actions of the policy are to improve the capacity to adapt to these "new situations". The development of water resources from alternative sources (i.e. desalination) is seen as the suitable measure to guarantee water supply

[39] However, there is no explication how water tariffs will be affected by the full-cost-recovery principle, and specifically desalinated water. On the one hand, cost-recovery is a main goal, but on the other hand the policy mentions that water costs will remain in all cases at a minimum level.

[40] Estevan (2008)

"independently from the climatic situation".

The use of desalination in Spain is also directly linked to conflicts: Replacing the highly conflictive transfer of Ebro water, it is a means to alleviate hydro-territorial conflicts between regions by pursuing "water autonomy" of the regions. Also, desalination is seen as a means to avoid conflicts and human security concerns due to possible water use restrictions. This was addressed in the environmental sustainability report on the Urgent Actions of the AGUA Programme in the Mediterranean Basins (AUPACM), prepared by the Environmental Ministry. Therein, the actions are evaluated in respect to effects on Nature and Biodiversity, Climate Change, Human Health, Resource Security and Quality and Sustainability. In all of these aspects, the AUPACM are compared to three alternatives: a business-as-usual alternative (i.e. no modification of the National Hydrological Plan 2001, including the Ebro transfer), an increase in supply alternative (i.e. increase of supply infrastructure including reservoirs and water transfers) and a demand restriction alternative (i.e. the implementation of the proposed demand side measures of the AUPACM without desalination projects). The assessment states that AUPACM has positive impacts on the "global sustainability of the system" and avoids social rejections that the demand restrictions alternatives could face. In this sense, human security is directly linked to water supply security.

3.4.2. Effectiveness

As Downward and Taylor already noted some years ago, the policy document of the AGUA programme "does not provide specific targets or set indicators (environmental or economic) by which the successes and failures of the programme can be assessed".[41] This is still the case today.

As mentioned before, the AGUA programme included water savings and efficiency among its principal objectives in its original design. The reality of implementation shows a strong focus on desalination, also forced by political pressures from regions mainly demanding new water supplies. Whereas early assessments of the programme describe it as a "paradigm shift" in Spanish water policy, ex-post assessments mostly regard the AGUA programme as a continuation of the "old" supply-based water policy in Spain, substituting transfers by desalination. According to Lopez-Gunn the policy's focus was "still on capital-intensive solutions, centred on supply management, which would ultimately benefit the traditional hydraulic policy community, with its strong preference for technical (capital-intensive) options".[42] Also Albiac and Murua state that with the AGUA programme, the traditional approach of increasing water supply was maintained.[43]

Cost-recovery

The Ministry for Environment proposed a modification of the water law (Art. 112) introducing a water levy which should be used for water protection measures. The plan was to pose a levy, a so-called "ecotax", depending on actual water consumption, at a rate between 0,001 €/m^3 and 0,0016 €/m^3, according to the

41 Downward and Taylor (2007)

42 Lopez-Gunn (2009)

43 Albiac and Murua (2009)

type of water use. The highest levy was to be applied for example for the irrigation of golf courses or for water supply for new urbanizations, whereas domestic use, irrigation and industrial uses where to be charged at a lower rate. Due to objections from the National Water Council, which claimed the levy would pose too high costs on the irrigation sector, the project was withdrawn by the government.[44]

Public water banks

The basic idea of public water banks is that basin authorities are authorized to make public offers to acquire water rights and assign these to other users at the same amount, which has to recover costs. The objective of the acquisition and assignment of water use rights through public water banks is a more equitable, efficient and sustainable use of water, and a "correction" of water deficits within river basins.

The creation of so-called centres for the exchange of water rights[45] was introduced to Spanish water policy through the revised water law of 1999, and the AGUA programme took up this mechanism to be introduced in all Spanish river basins as public water banks. Whereas the water law of 1999, and the revised water law of 2001 regulate transfers of water rights through water banks as an emergency measure – only to be applied during drought periods – the AGUA programme extended this concept to a water management mechanism not only for drought periods. However, this has not been implemented. Generally, in respect of the implementation and functioning of public water banks, there is surprisingly few documentation provided by the MARM. What is clear is that the goal to create a public water bank in each river basin has not been achieved, and that the creation of public water banks as included in the AGUA programme was never transformed into legislation. The reform of the water law foresaw the creation of public water banks in each river basin. The acquisition of water rights through the public water bank should also help to achieve a good ecological status of water bodies in the river basin district. Further, right holders of water from desalination and reuse plants were to participate in the water bank.[46]

Existing centres for the exchange of water use rights, however, remain functioning under the revised water law of 2001. In 2004, three centres for the exchange of water use rights were created in the Júcar, Segura and Guadiana basins, and in 2008, such as centre was created in the Guadalquivir basin. The trade of seasonal water rights during drought periods has with some success helped to avoid water rationing,[47] however, water trades – especially for longer periods – have under existing restrictions generally not been of much success.

Desalination

Desalination can be seen a contribution to increased adaptiveness to climate change, especially to drought

44 Ariño Ortiz and Sastre Beceiro (2010); *El País* (01.12.2004)

45 *Centros de intercambio de derechos de agua*

46 MMA (2007)

47 Fuentes (2011)

situations, as it is a part of diversifying available water resources and thereby ensuring water supply also in times of decreased precipitation rates and river flows.

In Catalonia, the desalination plant in El Prat, with a desalination capacity of 60hm^3 per year the biggest plant in Europe, can provide up to 20% of the water demand of the metropolitan area of Barcelona. The amount of desalinated water that is actually produced in the plant depends on the respective necessity, meaning the availability of surface- and groundwater resources. The plant starts production when reservoir levels are below 80% of maximum capacity, the full production capacity of the plant of 180.000hm^3 per day is activated when reservoirs are below 60% capacity – which corresponds to a pre-alert status. The water produces by the plant is exclusively used for human consumption.[48]

Desalination also plays an important role in respect of hydro-territorial conflicts: Compared to an inter-basin water transfer, which requires huge infrastructure works over a wide territory, the construction of a desalination plant only requires to reach an agreement with the municipality where is plant is to be constructed.[49] Territorial conflicts can thereby be alleviated, as it is the case with the before mentioned Ebro transfer.

But the desalination option itself has been also the centre of a conflictive debate in some regions. In fact, the government is forced to defend its desalination plans against criticism from two sides: on the hand, the farmers' lobby in southern regions where desalination is also used for irrigation claims that desalinated water was not affordable and therefore is not a viable option to address water stress.

Substituting large-scale water transfers by desalination in Spain has received general initial support from environmental organizations. However, the mismanagement of groundwater resources, the lack of effective water pricing mechanisms and the use of desalinated water to increase irrigation has generated criticism from environmental organizations, as it impedes the use of desalination as a measure of last resort but rather contributes to the paradigm of pure supply augmentation. The negative environmental impacts on the marine environment and greenhouse gas emissions are also criticized. Therefore, more profound environmental impact assessments of desalination plants, and the use of renewable energy for the plants' operation is demanded.[50] To reduce greenhouse gas emissions from desalination, in the desalination plant in El Prat in Catalonia, e.g. 30% of the energy is provided from renewable sources.[51]

A strong focus on desalination in water management can bear some dangers, especially when not regarded as a measure of last resort. “Overcoming water scarcity” through the opening of a new commodity frontier could in certain cases be a disincentive for to water saving. Additionally, the new “water independence” of scarce regions through desalination can turn into an energy dependence of those regions, as the desalination process is highly energy-intensive.

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48 Personal communication by the Catalan Water Agency

49 Personal communication by the Catalan Water Agency

50 WWF (2007)

51 Personal communication by the Catalan Water Agency

3.4.3. Efficiency

A thorough analysis of the AGUA programme's efficiency would require specific assessments taking into account inputs and outputs on the regional or even local level. A global assessment contrasting the overall financial inputs with the planned or actual overall additional water availability would certainly fall short of significance, regarding the different circumstances of implementation in the different river basins. Further, an efficiency assessment cannot be made for the planned measures of the programme.

3.4.4. Impacts

Demand-side and market mechanisms of the AGUA programme like the implementation of public water banks in all river basins or full cost-recovery were not implemented.

The main impact of the AGUA programme is therefore an increased desalination capacity, which has reached 2.745.341m^3 per day in Spain in 2009, with the highest share in the Mediterranean regions and on the Spanish islands.[52] An intended side-impact was also to promote the Spanish industry that provides technology for desalination and water reuse technology.[53]

Eventually, the impacts of the AGUA programme depend on the specific circumstances of regional implementation. Used for domestic water supply as a measure of last resort, and for the diversification of available water resources, desalination is a key strategic resource in periods of drought. In Catalonia e.g., where desalination is a key strategic resource in periods of drought. Further, in adequate circumstances, it can contribute to the ecological status of water bodies by enabling environmental river flows and reducing unsustainable groundwater abstractions. This requires sound management practices based on an integrated approach. The internal basin district of Catalonia serves here as an example of successful integration of desalination into river basin planning. However, if desalination is used as an additional water supply source to "definitely overcome water scarcity" and even creates new demands in semi-arid regions, it does not contribute to the sustainability of the water management model. Such problems can be observed in some southern provinces in Spain.

The analysis of the AGUA programme provides important lessons on the difficulties in implementing new water policies in Spain. What started as an innovative and holistic policy initiative ended up to be rather an investment programme for desalination. The lack of broad political support and consensus is identified as a main constraint for implementation of demand management policies, and it becomes clear how opposing political interest can undermine coherent policy making.

Overall, Garrido and Llamas[54] characterise Spanish water policy between 2004 and 2008 – the time of the AGUA programme – by four general trends:

- a devolution of significant competences in water policy to the Autonomous Communities
- a failure to develop sufficient desalination capacity in the Mediterranean coast to substitute the Ebro

52 MARM (2010)

53 Lopez-Gunn (2009)

54 Garrido and Llamas (2010)

transfer

- an increasing use of water markets and water banks
- the recognition that the implementation of the WFD would entail enormous difficulties because of the serious deterioration of many water bodies.[55]

[55] Garrido and Llamas (2010)

4. Drought Management Plans

4.1. Background

As in other semi-arid countries, droughts are a common feature of the Spanish climate. Llamas points out, that "when this physical fact is forgotten, economic and social tensions ensue."[56] Indeed, droughts have in Spain been traditionally regarded as emergency situations, and their economic losses and social impacts where emphasised by policy makers. Extremely costly infrastructural emergency measures to ensure water supply have therefore been the common response to drought in Spain.[57]

Regarding drought as the "touchstone" for the quality of water policy, one can conclude that the traditional approach in facing drought in Spain had failed: In 1995, during one of the most extreme drought situations that Spain suffered, around eight million people suffered from water restrictions in urban areas, although the government had spent around 600 million Euro in emergency measures during the drought period 1991 to 1995. Also, conflicts over water erupted in this period, not only between Spanish regions (mainly on the Tagus-Segura water transfer), but also towards Portugal.[58]

In addition to the "emergency" or "disaster" approach to drought, characterized by a rather improvised responses and huge infrastructure investments with public funds, the inability to timely predict droughts has been a main feature of policy failure regarding droughts in Spain.

The failure of traditional approaches in drought policy, and additional challenges in the light of climate change – a projected increase in the frequency and severity of droughts – made the need for a policy shift evident. The Law 10/2001 of the National Hydrological Plan 2001 introduced new regulations for drought management in Spain, including:

- The establishment of a global hydrological indicator system for inter-community basins by the Ministry for Environment in order to forecast drought situations, and as a reference for the basin authorities to formally declare alert situations at put into force the drought management plan.
- The elaboration of drought management plans – complementary to the river basin plan – by the inter-community basin authorities, including exploitation rules and measures to be applied in drought periods.
- The set-up of drought emergency plans by all public water administrations in charge of water supply for a population above 20,000, that take into account the drought management plan for the respective river basin.

The NHP 2001 required the adoption of drought management plans until 2003. With significant delay the plans were finally adopted in March 2007. The high complexity of preparing the plans is given as an explanation for the delay. Even though only obligatory for inter-community basins, the article explicitly

56 Llamas (2000), p. 254

57 Llamas (2000)

58 Llamas (2000)

stresses that measures can be adopted by Autonomous Communities that are in charge of internal basins.

4.2. Actors

The river basin authorities (*Confederaciones Hidrográficas*) are the institutions in charge of developing and implementing DMPs in inter-community river basins. As mentioned in chapter 3.1., these authorities depend on the Spanish Ministry for Environment and Marine and Rural Affairs (MARM). In internal river basins, the water agencies of the respective Autonomous Community can implement DMPs according to the NHP 2001, they are, however, not obliged to do so. Stakeholders are involved in the policy through a public participation process that is mandatory in the development of the DMPs.

The Spanish Ministry for Environment and Marine and Rural Affairs (MARM) exercises a control an coordination function in drought management policy. It provides for the Global Hydrological Indicator System according to which the drought status in the river basins is determined and monitored. Further, the Ministry has established guidelines on which the development of DMPs though the river basin authorities is based on.

4.3. Objectives and main mechanisms

The main objective of drought management plans (DMPs)[59] in Spain is to minimize environmental, economic and social impacts caused by drought situations.

Specific objectives of the DMPs are to guarantee the availability of water that is required to "sustain population life and health", to avoid or minimize negative drought effects on the ecological status of water bodies, to minimize the negative effects on public water supply and on economic activities, according to the prioritization of uses established by water policies and river basin management plans.

A guidance document for elaborating drought management plans was prepared by the Ministry for Environment and sets out the components to be included in each plan: a diagnosis, a programme of measures and a follow-up system.

The diagnosis is to be carried out through the identification of territorial and environmental elements, the analysis of historical droughts and a characterization of drought, indicators, thresholds and drought phases are defined. These indicators constitute the base for specific drought mitigation measures in each phase. The guidance document, however, does not explicitly refer to climate change.

The programme of measures sets up general and specific mitigation measures in each are of the river basin for each drought status, to be adopted gradually depending on the drought threshold.

Figure 6: Drought thresholds and corresponding types of drought mitigation measure in Spanish DMPs

[59] In Spanish, the DMPs are called *Planes Especiales de Sequía (PES)* – "Special Drought Plans"; however, as the Spanish government itself refers to those plans as DMPs in English, the term is also used in this report.

TYPES OF MITIGATION MEASURES							
Indicator	1-0.5	0.5-0.4	0.4-0.3	0.3-0.2	0.2-0.15	0.15-0.1	0.1-0
Status	Normal	Pre-alert		Alert		Emergency	
Objective	Planning	Information-control		Conservation		Restrictions	
Type of measure	Strategic			Tactics		Emergency	

Main measures in drought situations include the set-up of exploitation rules, savings and use restrictions, the joint management of surface water and groundwater, the reuse of treated wastewaters in agriculture, and market instruments. Strategic measures are defined as long-term infrastructural and institutional measures. These measures are part of general water planning and are to be applied also without the occurrence of drought. In an alert situation, so-called tactical measures come into force. They are defined as short-term measures and can include changes in groundwater and reservoir water exploitation, water saving campaigns, a temporary modification of water charges, and the activation of public water banks.[60]

Once the emergency threshold is passed, planned emergency measures are adopted, that can include water imports, temporary aquifer overexploitation, water restrictions or a temporary reduction of environmental flows. Further, a follow-up system that analyses the implementation of measures and develops corrective measures in case objectives are not achieved, is part of the drought management plans.

4.4. Evaluation

4.4.1. Relevance

Drought management plans can be considered of high relevance for a pro-active response to drought impacts. The European Commission regards drought management plans as "a powerful tool to alleviate the impacts of drought and reflect a positive shift from a 'crisis response' to a 'risk management' approach".[61] As droughts are projected to increase in frequency and severity in Spain due to climate change, preparedness and a planned management of drought is a key factor of adaptation. Even though the guidance document by the MARM for elaborating DMPs does not explicitly refer to climate change, the policy measure itself is highly relevant in respect of a changing climate. Ensuring human security is an implicit goal of the policy, as it aims to "sustain population life and health".

The drought management plans set up the rules for water restrictions in emergency situations and can play an important role in avoiding or alleviating conflicts between water users during an alert situation. Public

60 In respect of public water banks, see also the chapter on the AGUA programme in this report.

61 European Commission (2007), p. 46

participation, as required in the elaboration of the DMPs in all river basins, ensures a more transparent decision making, in which potentially affected users are involved. Thereby, decisions that are to be taken in drought situations are known in advance to stakeholders, what can reduce the potential for conflict.

4.4.2. Effectiveness

As the drought management plan in a river basin enters into force when a certain threshold is reached, the establishment of the Global Hydrological Indicators System by the Ministry for Environment is a key component for the effectiveness of the policy. The implementation of drought management measures at the river basin level provides the opportunity to directly address the needs and problems of the natural environment and the stakeholders.[62]

Also, to reach the objective of water supply security for domestic use during drought situations, the above mentioned complementary drought emergency plans in municipalities with more than 20.000 inhabitants are a key factor that determines effectiveness.

The MARM states that due to a planned management and the implemented measures right from the beginning of drought period of 2008, water supply restrictions for the population could be avoided.[63]

Iglesias criticises that drought management still is not sufficiently integrated into long-term water management strategies and partially ignores the importance of managing demand and increasing efficiency. Further, there is a need to better analyse the capacity of different natural systems and social groups to anticipate, cope with , resist and recover from drought, rather than focusing on the probability of drought occurrence.[64]

4.4.3. Efficiency

Efficiency cannot be assessed in absolute terms or numbers, however, drought management plans can generally be regarded as an efficient policy measure. Even though the elaboration of each drought management plan is a complex process, requiring time and resources e.g. for data compilation, the benefit of having a drought management plan in place is clearly prevailing the costs involved.

In Spain, the investments by the government in emergency measures during the last two most severe drought periods have been substantial, with around 600 million Euros between 1991 to 1995 (Llamas 2000), and almost 700 million Euros between 2004 and 2008.[65] Ideally, through the planned management of droughts, these public costs for short-term or even improvised emergency measures during drought periods – like infrastructure works or the import of drinking water – can be significantly reduced or avoided.

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62 Iglesias (2010)

63 Estrela and Vargas (2008)

64 Iglesias (2010)

65 MARM (2009)

4.4.4. Impacts

Impacts of drought management plans in place can hardly be measured. As drought is a complex phenomenon with diffuse and varying impacts depending on the time and place it occurs, there is no means to evaluate concretely what would have happened in previous droughts with a drought management plan in place; or what could have happened in recent drought periods without having set up drought management plans set up. However, it cannot be doubted that a planned process managing drought can avoid improvised and costly emergency measures and create coherence and transparency in decisions, as the drought management measures are agreed upon and set up in the management plan beforehand. This can also reduce conflicts during drought periods on which measures to apply.

The experience and capacity that the Spanish government build in recent years in elaborating drought management plans considerably influenced the European process on drought policy development. Spanish experts contributed in the Water Scarcity and Droughts Expert Network of the European Union, which launched the Drought Management Plan Report[66] that gives general guidelines for the development of DMP in accordance with the objectives of the Water Framework Directive. The Drought Management Plan Report builds largely on the Spanish model, and like in the Spanish DMPs, the guidelines declare the following components as crucial for a drought management plan:

- indicators and thresholds establishing onset, ending, and severity levels of the exceptional circumstances;
- measures to be taken in each drought phase in order to prevent deterioration of water status and to mitigate negative drought effects;
- an organizational framework to deal with drought and subsequent revision and updating of the existing drought management plan.

Through its experience in changing from an emergency approach to establishing a planned management approach in order to face droughts, Spain has gained a capacity that can be regarded as a reference not only for other semi-arid countries in Europe, but for all Mediterranean countries.

66 European Commission (2007)

5. Conclusions and Recommendations

All three assessed policies in this report are all of high relevance in respect of climate change and water resources in Spain, and they all have brought important changes and certain innovations to Spanish policy making in recent years. At the same time, the assessment has revealed certain weaknesses of each policy, mainly in the respective implementation process.

One strength of the PNACC is its structured approach to increase the knowledge base on climate change impacts in Spain, providing a framework for assessing climate change vulnerability and adaptation options in certain environmental systems and socio-economic sectors. The plan identifies a total of 15 different sectors and systems to be addressed due to their potential vulnerability to climate change. Activities are carried out in a flexible and step-wide implementation process, based on work programmes that prioritise areas. The importance of water resources in climate change adaptation as a cross-cutting issues is taken into account by the policy, which regards water as a priority area. Concrete legislation to take climate change into account in river basin planning has already been passed.

The design and implementation of activities is to be built on the obtained results, based on an annual review of the work programmes and activities carried out. The development of an indicator system on climate change impacts and adaptation has been initiated under the second work programme in order to improve the systematic monitoring, evaluation and dissemination of the results obtained under the PNACC.

Further, the second work programme lays additional emphasis on the need to better coordinate and mainstream climate change adaptation at multiple governance levels and in the different sector policies. With the Coordination Commission of Climate Change Policies and its working group on climate change impacts and adaptation, an institution is in place that includes representatives from different policy sectors at the central, regional and local level.

Implementation and communication are among the main weaknesses of the PNACC: Many of the actions proposed in the two work programmes have not been finalized in time, and results are therefore not yet available. In general, there is a need to develop a clear and effective dissemination strategy in order to successfully provide assistance also to all relevant sectors in Spain that are facing the need to adapt to climate change impacts, including private actors as stated among the objectives of the plan.

The AGUA programme has been – in its original design – a key policy in the transition of Spanish water policy towards more sustainability. Water management based on large-scale infrastructure projects was changed towards demand side measures and, above all, desalination. Desalination is regarded as a key instrument to achieve supply security in regions at the Mediterranean coast that are facing water stress. The policy, by cancelling the Ebro transfer, also has played an important role related to hydro-territorial conflicts in Spain. On the other hand, criticism arises against the desalination solution. Concerns on environmental impacts are more and more pronounced, and the cost of desalinated water compared to groundwater pumping has led to reluctance by farmers to use water from desalination. In some regions, the investments

in desalination are already seen as mistaken. This shows that desalination can also be the trigger for new conflicts.

A range of innovative policy instruments proposed in the policy have not been implemented, although the implementation period was set up until 2008. The unsuccessful reform of the Spanish water law is identified as one reason. Therein, e.g. a reform of the river basin authorities and the creation of public water banks in each basin were envisaged, however the reform process was cancelled in 2007. The substitution of the Minister of Environment through the former Minister for Agriculture, and the integration of the two Ministries, lowered high-level political commitment for a new water management paradigm and is a clear sign that the transition of water policy in Spain has nor been straightforward.

The analysis of the AGUA programme has demonstrated that long-term political commitment is a key determinant for the implementation of innovative and sustainable water policies. A lack of broad political support has impeded the implementation of planned demand measures and economic principles and has resulted in a situation, where one supply-option, inter-basin water transfers, were substituted by another, desalination.

The analysis further shows that desalination is certainly not the sole solution to water-stressed basins in Spain; as a measure of last resort it can, however, be a viable measure to diversify existing water sources and thereby ensure water supply for human needs in times of drought. It is stressed that the desalination option needs to be embedded into an integrated approach to water management, in which the mutual impacts of supply- and demand side strategies are considered, and both surface- and groundwater resources are addressed. Increasing desalination capacity without at the same time addressing water pricing and regulating groundwater abstractions has in some areas lead to counterproductive results in terms of effectiveness and efficiency. The implementation of the Water Framework Directive in Spain, that is already significantly delayed, is now the opportunity to introduce demand side policies and economic instruments, that where already foreseen in the AGUA programme, but not implemented. More effective groundwater management and the recovery of water supply costs is one of the main tasks to be tackled.

The implementation of Drought Management Plans (DMPs) in Spanish river basins constitutes a shift in drought management from an emergency approach to a planned and pro-active management of droughts. Thereby, DMPs have the potential to avoid or alleviate conflicts on water allocation in drought situations, as measures to be applied and exploitation rules are set up according to defined drought thresholds. Through information and public participation in the elaboration and application of drought management plans, the applied measures are more likely to be accepted by affected water users and the general public, reducing the level of conflict between different interests during drought periods.

Drought management plans are elaborated and implemented on the river basin level, yet the Ministry for Environment and Rural and Marine Affairs (MARM) exercises control and monitoring functions by providing the global hydrological indicator system based on which all drought management measures need to be carried out. Further, the Ministry gives guidance for the development of drought management plans at the

river basin level.

The guidance document, however, does not explicitly refer to climate change impacts to be taken into account in the development of the DMPs. The implementation of basin management plans under the WFD can be the opportunity to further include assessments and scenarios on climate change impacts into drought planning in Spanish river basins in the future. Also, there is a need to better integrate drought management strategies into long-term water management, considering the role of sustainable water use and demand management to increase resilience to drought.

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List of Abbreviations

AEMET State Meteorology Agency (*Agencia Estatal de Meteorología*)

AGUA Actions for Water Management and Utilization (*Actuaciones para la Gestión y la Utilización de Agua*)

AUPACM Urgent Actions of the AGUA Programme in the Mediterranean Basins (*Actuaciones urgentes del Programa AGUA en las cuencas mediterraneas*)

DMP Drought Management Plan (*PES - Plan Especial de Sequía*)

MARM Ministry of Environment and Rural and Marine Affairs (*Ministerio de Medio Ambiente y Medio Rural y Marino, since 2008*)

MMA Ministry of Environment (*Ministerio de Medio Ambiente, until 2008)*

MSPS Ministry of Health, Social Policy and Equality (*Ministerio de Sanidad, Política Social e Igualdad*)

NAS National Adaptation Strategy

NHP National Hydrological Plan (*PHN – Plan Hidrológico Nacional*)

OECC Spanish Climate Change Office (*Oficina Española de Cambio Climático*)

PNACC National Climate Change Adaptation Plan (*Plan Nacional de Adaptación al Cambio Climático*)

UNFCCC United Nations Framework Convention on Climate Change

WFD Water Framework Directive

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Abstract This report analyzes two agricultural policies related to climate change adaptation, hydro-climatic hazards and human security from Turkey. First section gives a brief explanation of the climate change policy related context in the country. This is followed by the first case study on Law on Agricultural Insurance. This policy provides state supported economic back-up plan in case hydro-climatic hazards risk the income and thus well-being of rural livelihoods. Despite the added value of the legislation on agricultural insurance, exclusion of droughts from this insurance scheme is a major shortcoming. The second policy analyzed is the Turkish National Strategy and Action Plan for Combating Agricultural Drought. This policy is the backbone of adaptation to agricultural drought in Turkey. Despite being a comprehensive, cross-cutting and participatory policy, this policy is critiqued for not incorporating gender considerations in drought management. The report ends with conclusions and some recommendations.

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1. Introduction: Country context and policies related to hydro-climatic conflicts/climate change adaptation/security

The Fourth Assessment Report of IPCC states that the already hot and semi-arid climate of southern Europe is expected to become warmer and drier and this will threaten its waterways, agricultural production and timber harvest. Moreover, today's 100-year droughts are expected to return every 50 years (or less) in southern and southeastern Europe.[1] As a part of the southern belt of Mediterranean Europe, Turkey is expected to face the anticipated impacts of climate change, mostly negatively.[2]

Acknowledging the increasing frequency of drought events in Mediterranean, Iglesias et al. observe that recurrent drought episodes in the region further increase the complexity of water scarcity management.[3] In line with the research of Iglesias et al., Türkeş et al. observe that some marked and long-term changes in precipitation in Turkey occurred particularly after the early 1970s in addition to the well-known characteristic seasonal and year-to-year variability.[4] These authors argue that the decreasing trends in winter precipitation density and precipitation total series are of critical importance in explaining changes to the drought characteristics and vulnerability of Turkey.

Turkey extends into 36° - 42° N and 26° - 45° E covering an area of about 783,562 square km. A transcontinental country, Turkey is located in the Mediterranean macroclimate zone that lies between the temperate and subtropical zones of the western parts of the Asian continent, allowing the country to have widely diverse regional and/or seasonal variations, ranging from extremely harsh conditions to very hot, dry summers. Southern and western parts of the country lie under the influence of the Mediterranean climate with hot and dry summers and cool and rainy winters. The climate on the Black Sea coast is colder and rainier. Northeast Anatolia has the characteristics of a continental climate: winters are long and severe and summers are short and cold. The Central Anatolian plateau is under the influence of a steppe climate with arid and hot summers and cold winters.[2]

As an Annex-I party to the United Nations Framework Convention on Climate Change and a relatively recent party to its Kyoto Protocol, Turkey has a peculiar position in the climate change negotiations. However, despite being a party to Kyoto Protocol, Turkey is not listed in the Annex-B of Kyoto Protocol among the countries that are obliged to take quantified emission reductions. Thus more than mitigation itself, climate change adaptation is a high priority issue for Turkey given the recent observable changes that have already taken place in regional climates and its relatively low levels of institutional adaptive capacity. Turkey's perspective on funding adaptation activities is summarized below:[5]

> *"... Turkey is of the view that the funds for adaptation should be provided to Parties on the basis of certain criteria including vulnerability to the adverse effects of climate change, level of associated risks and the technical and financial capacity of the Parties to adapt to climate change. Generation of new, adequate,*

[1] IPCC, 2007
[2] MOEF, 2007
[3] Iglesias et al., 2007
[4] Türkeş et al., 2009
[5] "Turkey's Views on the Fulfillment of the Bali Action Plan and the Components of the Agreed Outcome", submitted to UNFCCC on 24 April 2009.

predictable and sustainable financial resources should be based on the principles of "equity" and "common but differentiated responsibilities" and respective capabilities. Turkey is of the opinion that there is a need for an international, multi-optional insurance mechanism in compensating losses and damages that arise from climate induced extreme events such as droughts, desertification, floods, frost and landslides, as indicated in the Bali Action Plan... "

Along these lines, most of the submissions of Turkey to UNFCCC focus on adaptation and access to adaptation funding. Turkey submitted its first national communication to UNFCCC in 2007. This report was the first structured attempt to report on the state of climate change and adaptation policy in Turkey. These efforts were later continued with the Climate Change Action Plan, Climate Change Strategy Plan and currently on-going studies of National Adaptation Strategy and Second National Communication to UNFCCC.

Overall coordination of climate change related actions in Turkey has been assigned to 'The Coordination Board on Climate Change - CBCC), which was established in 2001 to work as an advisory group reporting to Council of Ministers and underwent a number of revisions since then. At present, the overall coordination responsibility of this board is designated to the Ministry of Environment and Forestry. The board is composed of all relevant ministries and institutions including Ministries of Environment and Forestry, Agriculture and Rural Affairs, Foreign Affairs, Finance, Public Works and Settlement, Transport and Communication, Industry and Trade, Energy and Natural Resources, Health, Treasury and State Planning Organization as well as the Union of Chambers and Exchanges (TOBB) and Association of Turkish Industrialists and Businessmen (TUSIAD) as non governmental organizations. The main role of this Board is to establish and coordinate policies and measures towards climate change. Technical work of the Board is executed through a number of working groups, which includes, among other specific topics, land use and land use change, adaptation, training and awareness raising, education, financing, energy, greenhouse gas inventory and policy and strategy development.[6]

Sectors dependent on natural resources in Turkey, especially water, are increasingly under stress due to climate change and climatic variability. Recently a number of state and international organizations triggered initiatives started addressing climate change impacts in economic growth strategies and national development policies. Nuran Talu[7] (UNEP National Adaptation Expert and Coordinator of the project preparing Turkey's national adaptation programme of action) observes that notably, the current Ninth Development Plan (2007- 2013) and the various Annual Programmes drawn up under this Plan contain principles and targets related to reduce agricultural vulnerability to climate change adaptation, some of which are accompanied by legislative and institutional initiatives to promote integrated water resource management, alternative crop production systems, and sustainable forest management.

However, as Talu warns, a country's vulnerability and adaptive capacity, with respect to climate change, varies according to its demographic and socioeconomic trends, resources, institutional capacity, and infrastructure and other characteristics.[7] Given the diversity within the country, understanding Turkey's vulnerability is particularly important before identifying potential strategies for climate change adaptation. Within the scope of First National Communication of Turkey to UNFCCC (MOEF, 2007) pilot level vulnerability studies were carried out in a number of river basins (ie. Gediz-Büyük Menderes Basin in the Aegean region; Seyhan Basin in the Mediterranean Region). Moreover a recent participatory vulnerability assessment initiative carried out by UNDP in 11 provinces across Turkey to ensure representability of 7 geographical regions yielded some important results. Key findings of this assessment by Talu et al.[8] is reported as

[6] Düşünceli et al., 2010
[7] Talu, 2009
[8] Talu et al. 2010

follows:

> "As expected, farmers were overwhelmingly reported to be the most vulnerable and most exposed group to current climatic variability and future climate change. Any significant fluctuations in temperature or rainfall were said to have adverse effects on farmers' crop yields and hence incomes. Those households and communities practicing animal husbandry and fishing for their livelihoods were also found to be vulnerable.
>
> In fact, it was generally agreed that adverse impacts on those relying on animal husbandry would likely be more severe than on farmers, rendering them less resilient in the face of future change. This is due to the fact that farmers tend be more flexible and are able to adapt themselves to new conditions for the next harvest, either by changing crops or adjusting the planting cycle, Hence, they have a range of options at their disposal. In contrast, after a severe climatic event or disaster, pastoralists tend to actually leave the sector or take up an alternate type of employment. Some even migrate to urban areas if circumstances remain persistently unfavourable for generating income.
>
> Urban areas and populations face different challenges from the same climate events than rural populations. Urban areas are particularly vulnerable to erratic precipitation regimes as sudden and heavy rains often overload a city's infrastructure and lead to flash flooding in the streets, destroy sewer and water infrastructure, and inundate low-lying houses and businesses. On the other extreme, in times of drought, the lack of rain over extended periods results in the over-exploitation of water resources and induces chronic water shortages. This further aggravates an existing problem of inefficient water distribution systems in Turkish cities (water losses in urban distribution system currently average around 48%)."

However despite recent efforts and strong emphasis on adaptation by public institutions, there still is a lack of comprehensive assessment of local level vulnerabilities and adaptation options in Turkey. Talu observes that at the broadest level, anticipatory, planned adaptation is essential for Turkey. In this regard, the recently prepared National Climate Change Strategy Document (MOEF, 2010) identifies short, medium and long-term goals for adaptation to climate change.[9] Among these goals, there is a strong emphasis on the urgency of the implementation of National Agricultural Drought Strategy and Action Plan, preparation of regional flood plans, disaster risk management, development and dissemination of climate resilient agricultural practices, need for vulnerability assessments across the country and long-term goal for establishment of agricultural basins and basin-based production patterns. Having a labour force of 21 million out of a total population of 72,5 million, it is estimated that approximately 25% of the labour force in Turkey is employed in agricultural sector.[10] Agriculture is an important sector in Turkey although its share has diminished over time as a result of the transformation into an industry and service sectors-based economy. Agricultural sector's contribution to GDP stands at 7.6% with Turkey being the 8th biggest agricultural economy in the world with 57 billion USD production value.[11]

The significance of agriculture in Turkey's political economy gives a particular importance to the interactions between human security, climate change adaptation, water and agricultural policies. İkkaracan and Tunalı's research report that:

> "[the] share of agricultural employment in Turkey decreased from 85 percent in 1950 to 36 percent in 2000. Despite significant technological progress, total agricultural employment remained in the 8-9 million range during much of this period. The pace of transformation hastened upon implementation of the [World Bank-funded] Agricultural Reform Implementation Project in 2001. This process placed some two million additional

[9] ibid.
[10] TURKSTAT, 2009
[11] TARSIM, 2010

inhabitants in the "surplus labor" category as the share of agricultural employment fell to under 25 percent by the end of 2008."[12]

This had significant impacts on the rural-urban migration patterns, which shaped both rural and urban transformation in Turkey. During the preparatory meetings towards 5th World Water Forum, a series of stakeholder meetings were organized within Turkey regarding the themes covered in the Forum. Migration came out as one of the recurring issues during these meetings with some feedbacks from stakeholder consultations reported in the publication "Regional Document: In and Around Turkey" which is presented below:

> "The prevention of migration needs to be emphasized. Agriculture and agro-industry can be regarded as important sectors in mitigating migration by providing various employment possibilities. Within this framework, farmers should be trained under the coordination of all related sectors, and a bridge should be formed between farmers and research institutes.
> (Message of the meeting on Snow Hydrology, Erzurum)
>
> Migration may also be prevented by providing sufficient and satisfactory revenues to farmers. (Messages of the meetings on Snow Hydrology, Erzurum, and Water Management and Drought, Ankara)"[13]

It will not be incorrect to mention that despite the fact that rural-urban migration has been a big demographic concern in Turkey since 1960's, there are relatively few studies and analyses regarding environmentally induced migration. An example of such research is given in the work of Zeynep Kadirbeyoğlu who has worked on drought-induced internal migration in Southeastern province of Şanlıurfa, Turkey.[14] Kadirbeyoğlu reports the case of farmers in Suruç district of Şanlıurfa, who were engaged in farming crops such as cotton, wheat, barley and lentils have exploited the groundwater through unregulated boreholes extensively in a timeframe of 25-30 years. Topped with decrease in rainfall of about 60% in the region over the past decade, Kadirbeyoğlu argues that some families left for big metropolitan centers while some others left sowing their lands and became seasonal agricultural workers or sharecroppers in other plantations. She finds out that drought did not only undermine agriculture but also caused a ripple effect in other sectors thus depleting income-creating opportunities. This environment and agricultural policy induced migration issues stand as a great human security challenge in Turkey.

In addition to these, an important hydro-security issue for Turkey is its relation with its neighbours regarding its transboundary waters, Euphrates and Tigris being the most important among them. Aydın and Ereker state that official security conceptualization of the country is still dominated by traditional 'hard security' issues.[15] However, these authors also conclude that in Turkey, as the upstream country of the Euphrates-Tigris Basin, economic, cultural, environmental and humanitarian issues have started to factor into the hydro-security analysis alongside traditional hard security conceptualization with regards the riparian countries of Syria and Iraq. Yet the focus of this analysis will mainly be on national agriculture and water management as a decisive factor in providing human security. Thus, transboundary water concerns and conflict-cooperation nexus in Turkey will not be covered in this report. A brief summary of policies initially considered for assessment in this study is listed in **Table 1**.

[12] İlkkaracan and Tunalı, 2010
[13] SHW, 2009:12
[14] Kadirbeyoğlu, 2010
[15] Aydın and Ereker, 2009

Policy Name	National Climate Change Strategy Document (2010-2020)	Turkish National Strategy and Action Plan on Combating Agricultural Drought	Law on Agricultural Insurance	National Rural Development Strategy
Date	03/05/2010	02.03.2008	14.06.2005 (with decree on implementation signed on 29.12.2009)	2006
Agencies in charge	Ministry of Environment and Forestry and Coordination Board on Climate Change	Ministry of Agriculture and Rural Affairs and relevant province level branches of the ministry, as well as Ministry of Interior, Ministry of Environment and Forestry and Ministry of Energy and Natural Resources	Ministry of Agriculture and Rural Affairs, Agricultural Insurance Pool Enterprise	Ministry of Agriculture and Rural Affairs and State Planning Organization
Legal framework	Decree of High Planning Council no: 2010/8 dated 03/05/2010	Agreed by the Decree of Council of Ministers on Rules and Procedures of Combat Against Agricultural Drought and Drought Management Works on 09.07.2007 with no: 2007/12477. Bylaw regarding these rules and procedures were published in the Official Gazette and entered into force on 02.03.2008 with no: 26804.	Law on Agricultural Insurance no. 5363, Decree of Council of Ministers on Risks, Products, Regions and Premium Levels to be covered by Agricultural Insurance Pool no: 2009/15688	Approved by High Planning Council on 25/1/with no: 2006/1 and entered into force by being published in the Official Gazette on 4/2/2006 with no: 26070
Policy level	National	National, sub-national (province level coordination)	National	National
Budget	National budget, external aid, private sector contribution	Budget of relevant ministries	50% of the premiums under the scheme will be covered by national budget	National Budget with support from EU Instrument for Pre-Accession Assistance
Main objectives	Main objective of this policy is to draw the climate change policies of Turkey for a 10-year period taking into consideration its special circumstances as an Annex-1 country, recognized by UNFCCC Decision 26/CP.7, and common but differentiated responsibilities. This strategy gives an insight into short term (1-3 years), medium term (5-8 years) and long term (10 years) policies of Turkey under mitigation, adaptation, technology, financing and capacity building.	The main objective of this policy is to define the rules and procedures regarding the authority, responsibility and tasks of relevant ministries, universities, governorships, local authorities and NGO's under the coordination of Ministry of Agriculture and Rural Affairs regarding mitigating the potential impacts of agricultural drought in Turkey and to take the necessary measures.	Main objective of the Law and the Decree is to compensate the damages faced by producers due to risks as mentioned in the law and to define the rules and procedures of agricultural insurance.	This policy's aims at (a) increasing the contribution of rural regions to national economy and decreasing the urban-rural development gap by increasing the life standards of rural population; (b) Reaching a population structure in line with sustainable development objectives through stabilizing the migration patterns; (c) Minimizing the socio-economic and environmental problems that may arise in restucturing of agriculture; (d) protection of environment and natural resourses, their nourishment and sustainable development; (e) Approaching to EU by economic and social means and harmonisation of the national legislation with EU Acquis.

Table 1. Summaries of national policies considered for assessment for this study

The main objective of this analysis is to evaluate the national policies on climate change adaptation, water resources and agriculture in order to provide a basis for a more human-centred approach to security (ie. human security). In line with this objective, two national agricultural policies as listed in **Table 1** (in second and third column respectively) will be analyzed, as agriculture is among the sectors most vulnerable to climate change. It is deemed crucial to look into legislation on agriculture, framing vulnerabilities and proposing coping strategies in order to understand the legal safety nets established to protect the population from severe socio-economical impacts of climate change and variability. In the following section, two cases are presented with the first one being Law on Agricultural Insurance, established to compensate for the losses of agriculture-related population from climatic hazards among others. The second case presented in this analysis is the National Strategy and Action Plan on Combating Agricultural Drought, aiming at establishing a blueprint and strategy to cope with the impacts of climate change (specifically drought) on agriculture in Turkey.

2. Case Study 1: Law on Agricultural Insurance

2.1. Description

2.1.1. Brief background

Wreford et al. suggest that "[t]he insurance sector (risk sharing) is likely to play a key role in future [climate change] adaptation decisions, whether through traditional indemnity-based insurance, or through other options that may be more suitable for climate based insurance, such as index-based schemes, weather derivatives or catastrophe bonds".[16] State supported public-private agricultural insurance schemes were first introduced in Turkey in 2005 with "Law on Agricultural Insurance" (no: 5363). Previously, agricultural producers were dependent on "Law on Aid to Be Provided to Farmers Affected by Natural Disasters" (no: 2090), published on 20.6.1977. This law (no. 2090), which is still in force, considers compensating farmers in the case of fire, earthquake, landslide, storm, flood, overflow, drought, hail, pests and diseases. However, it only does so if at least 40% of the agricultural product of the producer was completely damaged by these fore-mentioned disasters. Moreover, aid provided to producers under this law cannot exceed the worth of 70% of the damaged area under this law.

Preparation of Law on Agricultural Insurance (no: 5363) and its ratification was foreseen in the 8th 5-year Development Plan (2001-2005) prepared by the State Planning Organization (2000). Due to the transformation of Turkish agriculture towards contract farming in key crops as well as the increasing importance of climate change matters in Turkey since its accession to UNFCCC in 2004, this law was ratified.[17] The ratified Law on Agricultural Insurance established a non-profit enterprise (Agricultural Insurance Pool Enterprise, TARSIM) with 23 insurance companies as partners and is linked to the Ministry of Agriculture and Rural Affairs and State Treasury.

2.1.2. Actors responsible

The Law on Agricultural Insurance (no. 5363) brings a new dimension into risk reduction in agriculture, especially for hydro-climatic shocks, by establishing an insurance pool to handle risks associated with these shocks. As regards the implementation of this Law, a private-public partnership has been established, under the name of Agricultural Insurance Pool Enterprise

[16] Wreford et al., 2010
[17] see Aydın, 2010

(TARSIM), with participation insurance and reassurance companies, relevant ministerial bodies and chambers of agriculture. The Board of this enterprise consists of two members from the Ministry of Agriculture and Rural Affairs and Undersecretary of Treasury each, one member from the Association of the Insurance and Reinsurance Companies of Turkey, and another member from the Union of the Agricultural Chambers of Turkey and Agricultural Insurance Pool Enterprise (TARSIM). Farmers' perspectives are included in decision-making process through the member in the Board from Union of Agricultural Chambers, which is the main sectoral body in which all agricultural producers are members. In accordance with the Section 3, Article 12 of the Law (no. 5363), fields of coverage of the insurance pool are determined by the decrees of the Council of Ministers. Farmers, who have not insured their crops/livestock under this insurance pool, are no longer entitled to receive state aid according to the provisions of Law on Aid to be provided to Farmers Affected by Natural Disasters (no. 2090).

2.1.3. Main mechanisms, e.g. funding, scope, administrative procedures, duration

Altınözlü and İçer observe that for establishing a successful and permanent insurance program, there is a need for absolute and clear information about risk structure that can be insured.[18] Therefore, to estimate the damage where the meteorological risks occur, the frequency of these risks and how much damage they cause on agricultural crops; long-term meteorological data must be available for every different agro climatic geographical location. This calls for a stronger collaboration between agencies that deal with hydro-climatic risks, such as State Meteorological Services and Agricultural Insurance Pool Enterprise (TARSIM). Compared to agricultural insurance's penetration levels of 45% in USA and 23% in EU, Turkey only has 3.7% of its agricultural land covered under an agricultural insurance scheme, which makes it more vulnerable to damages in agricultural sector. In the first year of its implementation in 2007, 218.938 insurance contracts were made by TARSIM, which can be read as a significant success. Most recent data demonstrate that total value of assets insured stands at 2.9 billion Turkish Liras (roughly 1.5 billion Euros).[19]

TARSIM involves 5 types of insurance policies, namely crop insurance, greenhouse insurance, livestock life insurance, water products insurance and poultry insurance. All the risks and products covered under state guarantee and as operationalized in TARSIM is agreed upon by the decision of Council of Ministers, and tariffs for annual premiums are proposed to this body by the Ministry of Agriculture and Rural Affairs and TARSIM board. Since its initiation in 2006, TARSIM has offered agricultural insurance with 50% subsidy from the government regardless of the region, crop or risk type. This insurance scheme covers risks like hail, storm, fire, cyclone, landslide, earthquake and most importantly floods and flash floods.[14] Especially the last two hydro-climatic hazards are important as they were included for compensation starting from 2010 in the face of impacts of changing climate patterns as presented in the annual report of TARSIM. From 2011 onwards, insurance against frost in flowering periods of fruits is also included in the insurance scheme in line with the calls from the producers. Moreover as premiums have increased parallel to this enlargement in insurance scheme's scope, Ministry of Agriculture and Rural Affairs has announced an increased grant support of 2/3's of the premiums specifically for frost hazards. This shows how increasing frequency and impact of particular climate extremes are shaping the policy.

Pricing of crop insurance involves an interdisciplinary process including data from meteorology, insurance statistics, damage statistics, agricultural data, topography, location and phenological information. Using these data, TARSIM has identified 23 different risk zones and 15 different crop sensitivities. Altınözlü and İçer argue that it is indispensable to have an online, easily accessible

[18] Altınözlü and İçer, 2010
[19] TARSIM, 2010

database of meteorological data available to producers, which TARSIM currently does not have.[20] However a recent decision of Council of Ministers (no: 2011/1244) published in Official Gazette dated 13 January 2011 (no: 27814) on insurance coverage for 2011 agricultural year, establishes a link between State Meteorological Services and TARSIM in delegating the former to provide daily/monthly meteorological data free of charge to the latter in order to ensure a fair premium for the climatic risks incurred. In case this turns out to be a database of the kind that is mentioned above, it might help the farmers with their crop selection and harvest time decisions as well as strengthen the base for agricultural insurance scheme.

2.2. Evaluation of Law on Agricultural Insurance in Turkey

Linnerooth-Bayer and Vári observed the Turkish Catastrophe Insurance Pool with a focus on earthquake as an innovative policy measure, which is the first national disaster insurance scheme to be operational in a developing country.[21] Thus a similar assessment could also be done for the Agricultural Insurance Pool, despite that it is not compulsory as with the previous one and there are similar arrangements in a number of other developing countries. This policy is particularly relevant for concerns on adaptation to climate change, distributive justice and burden sharing. Activities and outputs (establishment of a privately administered public insurance pool, private-public partnership, inclusion of various hydro-climatic risks in its focus) of the legislation are consistent with the overall goals in attainment of the objectives of the legislation. High penetration rates from the first year of the policy show optimism towards effectiveness of the policy in reaching its objectives. It is deemed as an effective policy in line with the main goal of the Law on Agricultural Insurance, which is compensating the losses of producers arising from extreme weather events. This policy is deemed effective in reducing the primary (ie. decrease in production and thus loss of income) and secondary impacts (ie. increase in food prices) of extreme climate events on agriculture.

As far as efficiency is concerned, this agricultural insurance policy can be considered as cost effective as it provides a burden sharing mechanism through state subsidies (50% of the premiums being paid by government) as well as through contributions from the private sector. In an interview with a government official from Directorate-General for Agricultural Reform, who has been active in preparation of National Strategy and Action Plan on Combating Agricultural Drought, respondent has presented his discontent with the relevance of this legislation in line with the objectives set at the forementioned plan and his disbelief in reaching the desired objectives in the near future. However the respondent also presented his belief that the plan is fully implementable and cost-effective. Furthermore, the respondent added his partial affirmation of the ministerial decree on implementation of the Law on Agricultural Insurance is as regards its relevance, efficiency and effectiveness. Effectiveness of this policy can only be seen in the long-run by having studies correlating increased weather risks and increased protection of the agricultural produces by this insurance scheme before these risks.

It is not yet clear whether this scheme can extensively reach small-scale producers. There is no information in the annual report of TARSIM on the relation between insured enterprises and their respective land holding size. Once dominating the Turkish agriculture, resource base of small-scale producers according to Aydın is being eroded due to market deregulation and liberalization at work since the 1980s.[22] He concludes that small farmers in Turkey have been becoming increasingly helpless as a result of the concentration of agricultural commodity chains in the hands of transnational corporations, which are capable of pushing large numbers of small farmers out of

[20] Altınözlü and İçer, 2010
[21] Linnerooth-Bayer and Vári (2006)
[22] Aydın, 2010

agriculture. Thus it is important to provide necessary means for these groups to receive insurance as an adaptive strategy in equal footing with large agribusiness in order to enable them to compete in the neoliberal market conditions.

TARSIM has received increasing attention from the producers in its first 3 years with number of policies increasing from 218.938 to 306.770 between 2007-2009, with 93% of the policies being in crop production. Between 2008 and 2009, premiums produced under TARSIM increased by 22,5%. Moreover in accordance with the growth in premiums and insurance policy holders, amount of compensation payments have increased between 2007 and 2009. Official statistics show that main compensation payments were done for hail and frost events. In 2008, 77% of the payments were delivered for hail while 15% were delivered for frost. In 2009, the amount for hail decreased to 37% while payments for losses from frost increased to 54%. This gives a significant credit to TARSIM as regards its impact in Turkish agriculture thanks to intense awareness raising campaign associated with it. However there is no published data on the impact of particular extreme weather events, crops impacted from that particular event and their geographical distribution.

In Turkey, 72.4% of agricultural output is from crop production.[23] Yet one of the most striking bottlenecks associated with this insurance scheme is its indifference to drought, which is named as the biggest threat on agricultural systems in Turkey. Hurriyet Newspaper reports that despite increasing calls from the producers for inclusion of droughts under the risks covered, the TARSIM board is reluctant if not resistant to include drought in the scheme stating that despite its theoretical possibility, the company is not strong enough to insure drought risks.[24] Another bottleneck associated with TARSIM is farmer's discontent with its coverage of particular crops, fruits and vegetables. Recently some media sources reported comments such as "*TARSIM produces gains for the insurance industry only, not for the farmers*"[25].

Linnerooth-Bayer and Vári observe two emerging issues in relevance to extreme weather and burden sharing as (i) contribution by the non-risk community and (ii) poverty of the at-risk community.[26] These authors furthermore observe that the public-private disaster insurance schemes combine responsibility on the part of at-risk community with that of the non-risk community. It is important to acknowledge that the human security of the most vulnerable is at stake in times of a hydro-climatic disaster especially in agriculture. Thus it is questionable whether insurance schemes will be able to provide a safety net against deleterious impacts of such events, providing compensation and protection to communities exposed to those most vulnerable groups, small-scale farmers.

Mills suggest that the future role of insurance in helping society to cope with climate change is [still] uncertain.[27] According to Mills, insurers may take an active role and become more proactive players in improving the science and crafting responses. Otherwise, insurers may retreat from foreseen risks, thereby shifting a much bigger burden to governments and individuals. This is arguably at the heart of the human security concern to protect the individual from a coming threat in government's best capacity. It can be further argued that the Law on Agricultural Insurance aims to provide human security for the agricultural producers and dependents, which both have to cope with impacts of a changing climate as well as impacts of neoliberal globalisation on agriculture.

[23] TURKSTAT, 2009
[24] Hurriyet Newspaper (07/06/2010): http://www.hurriyet.com.tr/ekonomi/14948884.asp (last accessed on 07/01/2011)
[25] Güneş TV website (23/03/2010): http://www.gunestv.com/haber.php?theKey=5257 (last accessed on 03/03/2011)
[26] Linnerooth-Bayer and Vári, 2006
[27] Mills, 2005

O'Brien and Leichenko argue that communities, sectors or regions at the intersection of these two global changes (climate change and globalization) happen to be under "double exposure" to risks.[28] Removal of production based agricultural subsidies in favour of direct income support during IMF-led structural adjustment in Turkey has left many small-scale producers destitute.[29] Increasing climatic variability and change could furthermore place an additional stress for these communities who might not have assets to insure their products. At this point, it is a significant effort that the government contributes to 50% of the premium through grants. However, no data is readily available, for example, regarding the farm size of the beneficiaries of insurance payments or distribution of land ownership in relation to insured areas.

Agrawal and Perrin suggest that resorting to exchange or promoting exchange-based adaptation (ie. crop insurance) to address climate risks, however, needs to be treated with some caution given the highly unequal access to markets across different social groups, especially those who are in marginalized situations.[30] Adaptation practices taken by particular households and communities are more or less likely depending on their social and economic endowments, social networks and access to resources and power. Agrawal and Perrin argue on this point that the poor are more likely to migrate in response to crop failure while the rich more likely to rely on storage and exchange. In conclusion it can be said that in order to ensure equity and justice in adaptation, agricultural insurance schemes as a strong tool among other human security enhancing measures should be carefully crafted to consider differential vulnerabilities of different social groups and varying scales of agricultural activity and not solely left as free market interventions.

3. Case Study 2: Turkish National Strategy and Action Plan on Combating Agricultural Drought

3.1. Description

3.1.1. Brief background

Turkey, being a country with 1.3% of its surface covered with water bodies, receives an annual rainfall amount of 501 billion m^3. 37% (186 billion m^3) of this rainfall turns into surface runoff and 95 billion m^3 of this amount is economically usable.[31] Despite the common wisdom that Turkey is a water-rich country, per capita renewable water potential in Turkey stands at about 3500 m^3, with 8200 m^3 being the world average according to World Resources Institute.[32] 8.5 million ha of the agricultural land in Turkey is technically and economically feasible to irrigate and as of 2005, 58% of this amount was under irrigation.

Türkeş et al. observe that decreasing trends in winter precipitation density and precipitation total series are of critical importance in explaining changes to the drought characteristics and vulnerability of Turkey.[33] These authors also argue that it is possible to see a change in seasonal distribution of dry sequences and an extension in their duration. This calls for invoking the precautionary principle and taking necessary actions in the face of increasing occurrences of drought risk. Drought can be defined as temporary lack of water, which is, at least partly, caused by

[28] O'Brien and Leichenko, 2000
[29] Aydın, 2010
[30] Agrawal and Perrin, 2009
[31] MARA, 2008
[32] World Resources Institute, The Environmental Information Portal (most recent data available for 2007) http://earthtrends.wri.org/searchable_db/index.php?action=select_countries&theme=2&variable_ID=694 (last accessed on 07/01/2011)
[33] Türkeş et al., 2009

abnormal climate conditions and is damaging to an activity, group, or the environment.[34]

Kadıoğlu defines the agricultural droughts as antecedent to hydrological droughts and subsequent to meteorological droughts.[35] On this note, Kallis[36] states that drought impacts are very hard to assess because (i) identifying/assessing the hazard itself is difficult and (ii) droughts have no visible infrastructural damages but instead have diffuse, indirect impacts.[30] Thus there is a need for comprehensive planning and cross-sectoral analysis with collaboration of all relevant stakeholders (ie. Water and agriculture authorities, local governors, water users, agricultural extension officials, irrigation unions, chambers of agriculture, etc.) in order to avoid primary (ie. decrease in production and thus loss of income) and secondary impacts (ie. increase in food prices). This is specifically relevant to enhance human security in a country like Turkey, which has been one of the countries that experiences energy scarcity, less than self-sufficiency in food production, and an unequal distribution of water throughout the country.[37]

The National Strategy and Action Plan on Combating Agricultural Drought (NSAPCAD) was first proposed in the Special Experts Commission Report prepared for the 9th Development Plan by State Planning Organization.[38] Proposals towards preparation of the national drought action plan were specifically given more attention in the aftermath of 2007 drought in Turkey. A drought with similar intensity was last seen in 1935. Turkish Union of Agricultural Chambers report the total economic loss due to drought in this year as 5.078.205.617 TRY (approx. 2.5 billion Euros). While Aegean region have experienced 43% less rainfall, Marmara region saw %34, Central Anatolia %22, Mediterranean region %13 and Black Sea region have faced a rainfall decrease of %5 during 2007. This has triggered the existing initiatives to move beyond crisis management as a post-disaster relief condition towards long-term drought risk management and coping strategy building.[39] In a study carried out by Dellal and McCarl on the impacts of climate change on Turkish agriculture, the authors found by using climate projections of HadCM3 (Hadley Center Coupled Model) in Turkey that by 2050 there is a possibility of a 2-13% decline in productivity throughout Turkey in five key crops (wheat, barley, corn, sunflower and cotton).[40] These crops cover approx. 80% of the area sown. During the severe drought in 2007, imports of agricultural products increased by up to 60%, with serious economic consequences. WWF Germany's report on drought impacts in the Mediterranean countries state that regarding the 2007 drought in Turkey:[41]

> "In Southeastern Anatolia Region, production losses are estimated to be 90% for wheat and grain, and 60% for red lentil. Again, 90% loss in grain production has already by now impacted on the starting conditions for the next season. Droughts in the region do also affect livestock production. Moreover drought affected meadows and thus fodder production. Moreover, breeding is hampered due to fall in grain, wheat and bait production. Some farmers had to sell their livestock under these circumstances."[42]

Studies towards NSAPCAD were initiated with the ministerial decree on "Rules and procedures on works regarding combating agricultural drought and drought management" with no 2007/12477 which entered into force on 07/08/2007. The first outcome of this decree was the Turkish National Action Plan on Combating Agricultural Drought (NAPCAD) released in 2007. In 2008, this action plan was revised. With strategic amendments, it was transformed into the National Strategy and

[34] Kallis, 2008
[35] Kadıoğlu, 2008
[36] Kallis, 2008
[37] Kapur et al., 2009
[38] SPO, 2006
[39] Press release by Turkish Union of Agricultural Chambers: http://www.tzob.org.tr/tzob_web/basin_bulten/2007/09_08_2007.htm (last accessed on 07/01/2011)
[40] Dellal and McCarl, 2010
[41] WWF, 2008
[42] WWF, 2008:13

Action Plan for Combating Agricultural Drought (NSAPCAD). Coordination of this decree and its implementation is given to the Ministry of Agriculture and Rural Affairs. NSAPCAD and the relevant legislation leading to it were prepared in this context and mainly aim to monitor agricultural droughts at regional and provincial scale, carry out risk assessments and take relevant measures in order to mitigate the impacts of droughts through the established Agricultural Drought Management Coordination Board and its provincial bodies.

3.1.2. Actors responsible

Coordination of NSAPCAD and monitoring of its implementation is given to the Ministry of Agriculture and Rural Affairs by ministerial decree 2007/12477 stated above. Implementation of strategy and action plan at the national level is steered by the Agricultural Drought Management Coordination Board. This plan also established coordination boards at provincial scales. The National board meets at least once annually. Among its tasks are the following:

a. Developing an action plan for combating agricultural drought,
b. Ensuring coordination in combat against agricultural drought between institutions,
c. Evaluating the reports from Risk Assessment Committee and take action in accordance with the action plan in provinces facing agricultural drought,
d. Monitoring the implementation of this action plan and evaluating the outcomes,
e. Proposing relevant legal and legislative changes to counter the drought risks and to prepare drafts and propose new policies.

NSAPCAD established a Risk Assessment Committee; a Monitoring, Early Warning and Forecasting Committee; Data flow units (meteorological, hydrological); Working Groups on a diverse set of issues that will involve experts in these particular issues; and provincial agricultural drought management units. Provincial agricultural drought management unit comprises representatives from municipalities, universities, provincial special administration, provincial directorates of relevant ministries, provincial directorate of health, president of the chamber of agriculture, representatives from irrigation unions, water and producer cooperatives and other NGO representatives as seen appropriate by the governor of the province. The Governor or an appointed deputy governor chairs meetings of these units. These provincial units report to the Agricultural Drought Management Coordination Board, which established a secretariat under the Ministry of Agriculture and Rural Affairs and monitors the reports from provincial units and takes decisions accordingly.

NSAPCAD foresees responsibilities for State Hydraulic Works, Turkish State Meteorological Service, Ministry of Environment and Forestry, General Directorate of Electrical Power Resources - Survey and Development Administration, Irrigation Unions, Municipalities, Local Administrations, Farmer Unions, Bank of Agriculture, Ministry of Health, Ministry of Finance, Turkish Statistical Institute, State Planning Organization, Provincial Special Administration Units, universities and private sector. The timeframe defined in NSARCAD is between 2008-2012 thus currently responsibilities identified for the institutions listed above are ongoing tasks. For example, the plan suggests for period 2009-2010 that agricultural insurance schemes shall be extended to cover drought risk as well. However as stated in Case Study 1 above, this has not been realized yet. The workflow of NSAPCAD coordination is given in **Figure 1**.

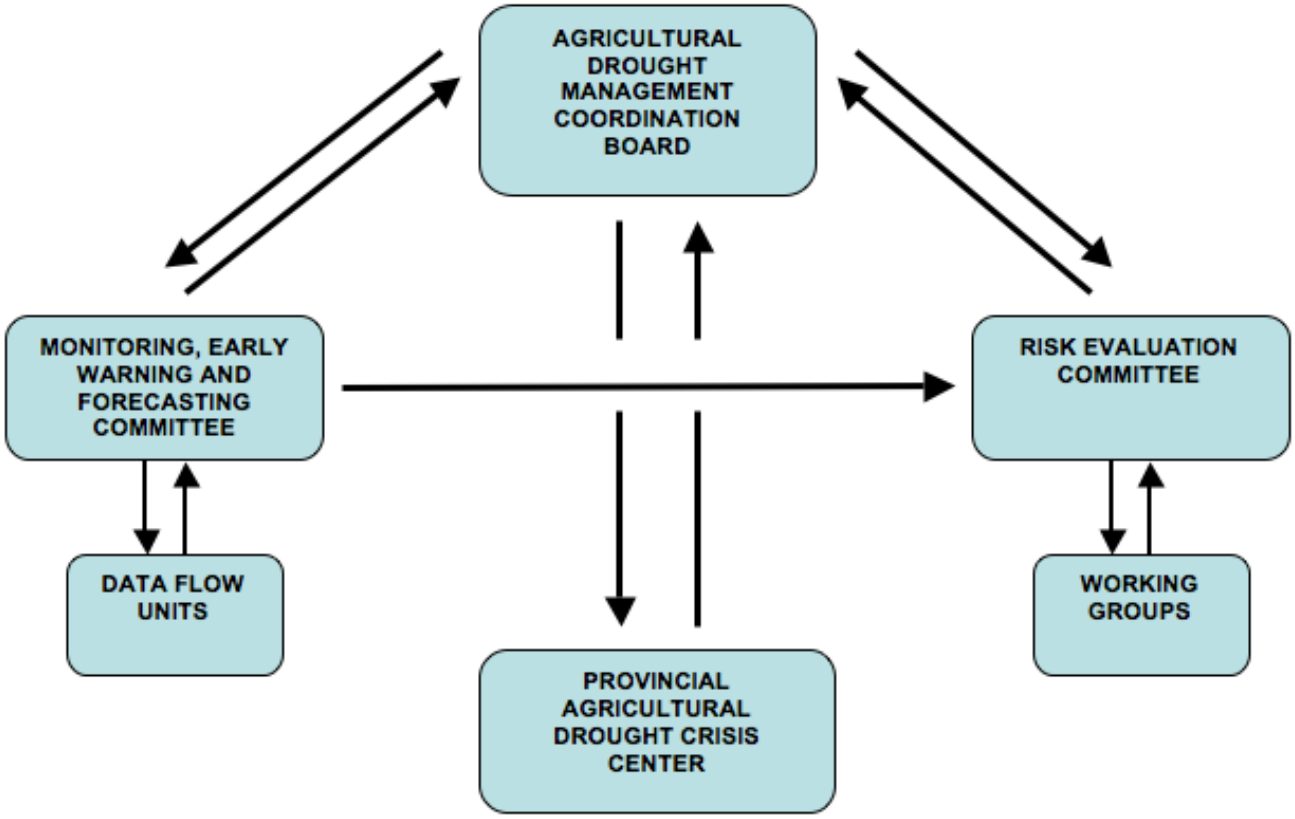

Figure 1. Workflow of National Strategy and Action Plan on Combating Agricultural Drought Coordination (adapted from MARA[43])

3.1.3. Main mechanisms, e.g. funding, scope, administrative procedures, duration

The first outcome of this policy measure was the Turkish National Strategy and Action Plan on Combating Agricultural Drought published in 2008 for the period 2008-2012. This action plan covers various measures both in urban and rural areas, in dry and irrigated agriculture, on water management, investments, agricultural subsidies, seed and crop diversity, irrigation techniques, pest control, economic and social subsidies/incentives, pasture use plans, land use plans, imposition of restrictions and implementation of emergency measures.

This policy is the first of its kind in the management of agricultural drought risks with a holistic approach in Turkey. The policy is decentralized and made participatory through provincial agricultural drought management units/crisis centers even though overall coordination will be borne by Agricultural Drought Management Coordination Board at the national level. It is important to follow up the implications of this action plan as it is presented in detail under each 5 topic and sub-topics given above.

The main objective of NSAPCAD is to provide a comprehensive and inclusive policy that takes into consideration the demand and supply management as well as the views of all relevant stakeholders, in a shift from crisis management to long-term strategy for coping with droughts that will minimize the socio-economic impacts. Thus this policy document suggests that the primary path to get to this comprehensive policy is to develop the institutional capacity. The Plan suggests that it will ensure

[43] MARA, 2007

the participation of all stakeholders with emphasis on NGO's and other agricultural bodies. Moreover it maintains an aim to include long-term drought strategy measures in the annual budgets of relevant institutions.

NSAPCAD is structured under 5 crosscutting themes, which are:

1. Drought risk forecasting and management
2. Provision of sustainable water supply
3. Effective management of agricultural water demand
4. Acceleration of R&D activities and increase in public awareness, training and information dissemination measures
5. Enhancement of institutional capacity

Priorities are defined for each of these five themes. The first theme under this policy suggests a crisis management scheme to be established in coordination with agricultural drought forecasting. The second theme, provision of sustainable water supply, calls for increase in water-retaining capacity, modernization of water transmission channels and investment in maintenance and renewal of water depots, encouragement of reuse of treated wastewater in agriculture and industries, effective management of groundwater resources. The third theme on the effective management of water demand similarly relies upon modernization of water distribution network, establishment of agricultural basins as regards defining the most suitable crops by taking existing water resources into consideration.

According to WWF, Turkey has the highest percentage of ineffective surface/flood irrigation with 94% of irrigation done in this way in comparison with 3 other Mediterranean countries; Greece, Morocco and Spain.[44] The fourth theme in NSAPCAD in this regard focuses on increasing R&D studies in agricultural extension, crop and irrigation technologies. Moreover, this theme calls for an increase in awareness raising among farmers. The last theme on the institutional capacity for managing agricultural droughts calls for the preparation of relevant legislation and for enforcement of measures for combating stubble burning and other non-forest fires. Kadıoğlu argues that despite these efforts, Turkey's approach is still on the side of *ex-post* solutions and there is a need for rearranging public institutions to bring meteorological institutions (Turkish State Meteorological Services) together with their hydrological counterparts (State Hydraulics Works), the latter also being the coordinator of adaptation working group under Coordination Board on Climate Change.[45]

Although there is no specific financial resource is announced for NSAPCAD, the plan foresees inclusion of relevant expenses to operationalize the plan in the annual budgets of participating state institutions. Moreover provincial agricultural drought crisis centers and monitoring committees are established across the country, reporting annually to the central government. At the legal end, NSAPCAD is makes direct links and references to a number of legislation. Some of these can be listed as:

- Law on Agriculture no. 5488
- Law on Aid to Be Provided to Farmers Affected by Natural Disasters no. 2090
- Law on Aquatic Products no. 1380
- Law on Environment no. 2872
- Law of Ministry of Environment and Forestry no. 4856
- Law of Provincial Administration no. 5442
- Law on Soil Protection and Land Use no. 5403

[44] WWF, 2008
[45] Kadıoğlu, 2008

- Law on Agricultural Insurance no. 5363
- Law on Pastures no. 4342
- Law of Provincial Speacial Administrations no. 5197
- Law of Metropolitan Municipalities no. 5216
- Law of Municipalities no. 5215

3.2. Evaluation of National Strategy and Action Plan on Combating Agricultural Drought

The National Strategy and Action Plan on Combating Agricultural Drought (NSAPCD) is relevant for the purposes of adaptation to climate change as Turkey's First National Communication and IPCC's 4th Assessment Report clearly state that droughts will be more frequent in this part of the Mediterranean.[46] It focuses on agricultural drought with considerations of future climate change, inefficient use of water resources and faulty agricultural practices. The first steps of the strategy have given its results, as provincial units are established and meeting on a regular basis. However, no published results regarding the success of outcomes of the strategy and its components exist to date. This strategy calls for development of Provincial Drought Action Plans by the provincial units, which will ensure the local acceptance and sustainability of national scale plans and make them coherent with overall measures. A number of cities (İzmir, Bursa, İstanbul, Muğla, Konya, Ankara, Amasya, Antalya, Diyarbakır, Muş, Çanakkale, Denizli etc.) have already prepared their provincial action plans.

Within the scope of NSAPCAD, some state support for responding and adapting to agricultural drought have been brought to life. An example is the provision of credits having a 5-year payback with 0% interest rate for farmers who want to shift to pressurized irrigation systems, thus increasing water use efficiency. Moreover, the state has provided 50% grant support for pressurized irrigation systems within the scope of rural development schemes. Together with these two state supports, more than 150.000 ha of additional land are now irrigated by pressurized systems, which show the effectiveness of the policy measure. In addition to this, following the drought in 2007 and 2008, the state paid an approximate sum of 406 million euros in compensating drought-stricken farmers. Credit debt payments were postponed for one additional year as well during this time for the farmers who have lost their harvest due to drought.

One of the recent outcomes of NSAPCAD is the establishment of a Drought Test Center in December 2010 in the province of Konya, which is known as the breadbasket of Turkey. NSAPCAD, in its initial form as National Action Plan as released in 2007, was proposing innovative funding sources for financing the activities of this plan. One of these was the establishment of an Agricultural Drought Disaster Fund to be financed through a progressive CO_2 tax. However, probably due to discontent from other governmental authorities, this measure was later removed from the revised NSAPCAD. Bearing these in mind, it can be said that there is a need for medium-to-long term data analysis and assessment of this policy to understand the efficiency of the plan and the impacts it has created in the local environment and social structure of agricultural communities.

Although not mentioned explicitly in the final version of NSAPCAD, in a presentation delivered during the 5th World Water Forum in Istanbul by State Hydraulics Works officials mentioned that under the proposed field of action on Drought Risk Forecasting and Management "internal migration to be induced by drought will be managed".[47] Thus this strategy perceives migration as one of the possible outcomes of drought in Turkey. However, there exists no specific measure on

[46] MOEF, 2007; IPCC, 2007

[47] This presentation was delivered during the session on drought management by Mr. Fikret Kasalak, Mr. Erkan Eminoğlu and Ms. Ayşegul Yılmaz on 16 March 2009 during 5th World Water Forum in Istanbul, Turkey. Presentation in Turkish can be accessed here: http://bit.ly/fJDNIH

how this will be done in the action plan. In addition to these, this plan calls for a socially holistic approach that will provide participation of citizens, NGOs and relevant institutions.

4. Conclusions and Recommendations

This report presents policy analyses of two case studies from Turkey regarding interaction between agriculture and climate change adaptation, human security and vulnerability. The first national policy analyzed is the Law on Agricultural Insurance. This legislation was ratified in the parliament on 14/06/2006 (with no: 5363) and put into implementation since 2007. The Law on Agricultural Insurance establishes a non-profit enterprise (Agricultural Insurance Pool Enterprise, TARSIM) with 23 insurance companies as partners, which is linked to Ministry of Agriculture and Rural Affairs and State Treasury as a product of public-private partnership. The second policy analyzed in this report is the National Strategy and Action Plan on Combating Agricultural Drought, which was initiated with the ministerial decree on "Rules and procedures on works regarding combating agricultural drought and drought management" with no 2007/12477 entering into force on 07/08/2007. Concluding remarks and some recommendations are presented for each of these policies in the following sub-sections.

4.1. Conclusions and recommendations for Law on Agricultural Insurance

Resorting to exchange or promoting exchange-based adaptation (ie. crop insurance) to address climate risks is important. However this needs to be considered critically since market-based instruments seldom reach the most marginalized social groups, especially those who are in most marginalized conditions.[48] One of the major issues given consideration in this analysis is the risk of maladaptation by the farmers solely depending on the insurance. Exclusion of drought, which is pronounced as the most pressing foreseen impact of climate change in agricultural basins of Turkey, from this insurance scheme is another main bottleneck associated with the implementation of the scheme to contribute to human security.

Success of agricultural subsidy and support programs has been difficult to determine as government programs seldom address climate-related risks independently of other risks to agriculture.[49] From the farmers' perspective, crop insurance is a fallback measure to compensate for loss after other adaptive management strategies fail. Although agricultural insurance policy in Turkish case does not make any explicit reference to human security, it is among the key adaptation strategies to climate change and its use is promoted in order to sustain the welfare of rural populations with their agricultural production. Yet since the insurance scheme is still in its infancy and its penetration in the sector is rather low, there are enough reasons to ask for further improvements in the scheme also targeting at small-scale producers.

One major issue to be taken carefully is the risk of maladaptation by farmers solely depending on the insurance. Barnett and O'Neill describe that maladaptation occurs when particular adaptation decisions increase vulnerability of some sectors or communities.[50] In their explanation they define 5 types of maladaptation as: adaptations (i) increasing GHG emissions, (ii) disproportionately burdening the most vulnerable, (iii) with high opportunity costs, (iv) reduce incentive to adapt, and (iv) path dependency (ibid). As far as agricultural insurance schemes are concerned, the main trouble might be associated risk to reduce the incentives to adapt. Insurance schemes are helpful especially in short-term economic recovery following a hazard; however, unless necessary physical

[48] Agarwal and Perrin, 2009
[49] Smit and Skinner, 2002
[50] Barnett and O'Neill, 2010

adaptations are taken they might turn out to be maladaptive in the long run if they are the only measure with making producers dependent on the direct payments as well as seriously threatening food security by increasing prices.

There is a need to mainstream agricultural insurance for not only medium and large agricultural landowners but also for small-scale farmers as well. In order to do this, inclusion of microinsurance schemes among TARSIM's products might be an option. In their discussion about a pilot implementation of microinsurance in Malawi, Suarez and Linnerooth-Bayer comment that in contrast to post-disaster aid, the index-based system [using hydro-climatic indices and relevant premiums before the sowing season to help farmers' decision making] provides farmers an an incentive to change cultivation practices to become more resistant to drought.[51] As these authors argue, since index-based insurance does not lead to maladaptation by reducing incentives to adapt, it can lead to fewer losses from drought and other forms of weather variability while improving the agricultural turnover during a normal season. Building on this case from Malawi, Linnerooth-Bayer and Mechler[52] further argue that the implementation of a index-based insurance mechanism coupled with agricultural loans might be useful for small-scale farmers as long as it is supported by a strong national subsidy or technical assistance.

> "In the event of a severe drought (as measured by the rainfall index), the borrower pays only a fraction of the [agricultural] loan due, and the rest is paid by the insurer directly to the bank. Without this insurance, banks rarely loan to high-risk, low-income farmers, which means they cannot obtain needed credit to invest in the seeds and other inputs necessary for higher-yield crops. Moreover, because of the physical trigger, there is no moral hazard; on the contrary, farmers will have an incentive to reduce potential losses, for example, by diversifying their crops. [However] unless supported by technical assistance, national subsidies (cross-subsidies, as in India), or international donors, these schemes are out of reach for very low-income smallholder farmers."

Furthermore Wreford et al. observe that

> "[w]hile insurance is likely to be an important mechanism in distributing risk and may create incentives for adaptation, subscribing to private insurance may not in itself necessarily lead to an adaptation of activity. In addition, as climate risks increase, insurance costs will also increase and may prove to be too costly for some actors, leaving them highly vulnerable to climate change. Insurance is in most cases a private decision rather than a public policy, and in some cases public intervention may be necessary to facilitate the sharing of climate risks between the insurance sector and the state."[53]

As a final note, it can be argued that Law on Agricultural Insurance (and thus, TARSIM) is an innovative and useful policy tool in order to enhance human security and well-being of agriculture dependent communities. It provides a significant state supported economic back-up plan in case more frequently occurring hydro-climatic hazards risk the income and thus well-being of rural livelihoods. However, one of the biggest hydro-climatic threats, droughts, are yet to be included in the scheme. Moreover extension of TARSIM with disaster risk microinsurance and coupled loan & insurance schemes to reach the most vulnerable and further awareness campaigns on these products will improve its efficiency and efficacy. Linneroth-Bayer and Mechler argue that risk perception and the lack of an insurance culture are two reasons, among others, that limit demand for even affordable insurance.[52] On this note, analyses similar to that of Akçaöz and Özkan[54] on risk strategies of Turkish farmers should be taken into consideration. Results of these authors showed that government policy and agricultural policy for the risk averse farmers, input costs and crop

[51] Suarez and Linnerooth-Bayer, 2010
[52] Linnerooth-Bayer and Mechler, 2006
[53] Wreford et al., 2010
[54] Akçaöz and Özkan, 2005

prices for the risk-seeking farmers, and input costs for the risk neutral farmers are the most important risk sources. Thus these different factors should be considered carefully in designing and revising a comprehensive agricultural insurance scheme that is aware of differential vulnerabilities across agricultural communities.

4.2. Conclusions and recommendations for Turkish National Strategy and Action Plan on Combating Agricultural Drought

The second national policy analyzed in this report is Turkish National Strategy and Action Plan on Combating Agricultural Drought. Despite previous planning attempts on droughts, National Strategy and Action Plan on Combating Agricultural Drought (NSAPCAD) was taken into the public agenda seriously for the first time in the aftermath of 2007 drought in Turkey. Turkish Union of Agricultural Chambers report the total economic loss due to drought in this year as 5.078.205.617 TRY (approx. 2.5 billion Euros).

An anticipatory case can be seen in EU's Drought Management Plan (DMP), which is directly linked to Water Framework Directive (WFD) criteria and objectives. According to European Community's internal regulation these plans should be prepared in advance before they are needed, based on relevant country specific legislation and after careful studies are carried out concerning the characterization of the drought in the basin, its effect and the mitigation measures. Turkey, as a EU accession country and one of the most vulnerable countries to the impacts of climate change in the Mediterranean basin, have initiated this process in 2007 as it was foreseen in the 9th Development Plan for the period 2007-2013. The National Strategy and Action Plan on Combating Agricultural Drought covers a time period of 2008-2012 for implementation thus it is compatible with the development plans and it might be considered that this plan will be revised in the period following 2013.

Despite the achievements of NSAPCAD presented in section 3.2, the physical infrastructure in Turkey to assess the drought impacts on local scales is very limited. NSAPCAD also foresees extension of meteorological stations as well as GIS-based crop yield monitoring systems to predetermine the impacts of a potential drought. In this regard, General Directorate of Agricultural Research under Ministry of Agriculture and Rural Affairs has started a project in 2009, named "Yield Forecasting and Drought Monitoring System", in collaboration with Istanbul Technical University. Annual budget of this project was 3.576.000 Turkish Liras (approx. 1.8 million euros) in 2010.

The 9th Development Plan (2007-2013), which led to the production of NSAPCD, has five development axes. These five axes are namely (i) increasing competitiveness, (ii) improving human development and social solidarity, (iii) increasing employment, (iv) improving quality and efficiency of public services, and (v) ensuring regional development. This development plan, in its subsection on the intersection of climate change impacts with agricultural production suggests that agricultural employment will be negatively impacted from climate change thus there is a need for further research on internal agricultural migration phenomenon. However this is not explicitly mentioned in NSAPCD, which is a shortcoming of the plan as regards its attention on communities in agriculture.

Despite being a comprehensive, cross-cutting and participatory policy, NSAPCAD has some bottlenecks. One of the identified bottlenecks is its indifference to gender considerations in drought management. Human security according to Ursula Oswald Spring is a HUGE (human, gender and environmental security) challenge[55]. Wisner et al. on the other hand argue that if gender relations

[55] Oswald Spring, 2009

are empirically important elements in disaster impact and policy, then the individual rather than the household would be the unit of study and the main focus.[56] Human security is a people-centered understanding rather than a nation-state or sector specific consideration. However, most of the measures foreseen in the NSAPCAD do not pay attention to particular social groups but focus on agriculture as a sector in general. In this regard, there is a need for elaboration of more people-centered approaches in long-term drought management as well as integration of gender-sensitive drought coping measures in the strategy and action plan.

Nora Sequeira argues that gender analysis can play a key role in improving the relevance, effectiveness and efficiency of local level risk management for a number of reasons:[57]

- Gender relations have an important influence on the development processes that configure the evolution of hazards and vulnerabilities in local level risk scenarios.

- In contrast to infrequently occurring large-scale events, the kind of disaster loss associated with small-scale disasters (ie. drought) regularly affects the lives and livelihoods of highly vulnerable groups and thus becomes one of their development priorities to manage and reduce.

- Vulnerable women and men have greater possibilities of influencing decision making processes related to risk management at the local level, in contrast to such processes at the national, regional and international scales.

One of the main shortcomings of human-centered drought management in Turkey is the failure to acknowledge drought as a natural disaster. In its current legal status, drought is kept separately from other natural disasters (ie. earthquakes, floods, flashfloods, landslides, forest fires). Even though the current government has prepared a draft for a new Law of Natural Disasters in 2006 (to replace the current law in force which dates back to 1959), this draft also does not consider drought as a natural disaster. It should be considered to include droughts under the relevant legislation on natural disasters and place drought risk management works under this scheme.

As a final note, it can be said that both agricultural insurance schemes and agricultural drought strategy and action plans serve to enhance the human security of the population dependent on agriculture as their primary means of income as well as provide security to the rest of the society by avoiding food prices to peak in the times of hydro-climatic shocks. Even though these policies do not make explicit references to security, they form an important part of human security enhancing measures. Critical appraisal and revision of these two policies (agricultural insurance schemes and agricultural drought strategy and action plan) in accordance with the 7 main components of human security (economic, food, health, environmental, community, personal and political securities) has the possibility of improving and increasing the resilience of these policies in the face of increasing hydro-climatic risks in the future[58].

[56] Wisner et al., 2004
[57] Sequeira, 2001
[58] UNDP, 1994

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Analysis of UN level policies relevant to Climate Change, Water and Security

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Abstract: The UN system has a number of mechanisms aimed at managing the individual challenges presented by climate change, water management and security. However, initiatives which address the nexus of these three issues are only just emerging. Three UN mechanisms, each dealing with one or more aspects of this nexus, have been selected for further study in this report. The first covers UN mechanisms for funding adaptation to climate change; this is followed by a case study on the high-level Environment and Security Initiative (ENVSEC); and the third focuses on the UN Peacebuilding Commission (PBC). Each case study presents the background and objectives of the policy or initiative and an overview of the major actors involved. This is followed by a brief description of the main mechanisms used to develop and implement projects. Finally, the case studies evaluate their subject on the basis of OECD criteria for relevance, effectiveness, efficiency and impact.

Contents

1. Introduction

In 1992, in Rio de Janeiro, members of the United Nations produced the United Nations Framework Convention on Climate Change (UNFCCC), an international environmental treaty whose objective is to stabilize greenhouse gas emissions to prevent a harmful degree of climate change.[1] The convention came into force in 1994 and had 192 parties by 2009. The treaty contains certain updates, called Protocols, to set mandatory emissions limits. The principal update is the Kyoto Protocol, which came into force in 2005. Under the Kyoto Protocol, the UNFCCC also set up an Adaptation Fund to assist developing countries adapt to the consequences of climate change. The Adaptation Fund is evaluated in one of the case studies annexed.

Although the UNFCCC was at the time, and still is, an important mechanism through which the UN acknowledged and tried to address the possible consequences of climate change, the convention makes no direct link to security.

Addressing this gap in 2007, the UN Security Council held its first debate on the impact of climate change on security in New York. Despite some disagreement over the issue among members, the meeting acknowledged global warming as an issue relevant to the Security Council's mandate of maintaining international peace. The foreign secretary from Britain, which held the rotating presidency of the council at the time, remarked that "this is an issue which threatens the peace and security of the whole planet - this has to be the right place to debate it."[2] Among the effects discussed at the meeting were large-scale migration, flooding, disease, famine, drought, crop failure and intensified competition for natural resources. Due to the vast and global nature of these threats, the British foreign secretary added that this is "not a matter of narrow national security" but about our "collective security in a fragile and increasingly interdependent world."[3]

The move to view climate change as a security matter received mixed reactions from UN member states. European countries praised the initiative but some developing countries criticized the Security Council for encroaching on an economic and sustainable development issue whose discussion belongs in the General Assembly.[4] China, for example, held that this is an issue properly dealt with by the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. In China's (and other developing countries') view, the differentiated responsibilities set out in the Convention should be respected.[5]

Despite this resistance, the majority view prevailed. In 2009, the General Assembly of the UN adopted a draft resolution on "Climate change and its possible security implications" (A/63/281). The resolution encourages U.N. bodies to "strengthen their efforts to combat climate change and to avoid intensifying potential security risks."[6] It also requests that the U.N. Secretary General submit a report on the security implications of climate change. This was the first time in history that the U.N. established a direct link between climate change and international security in a resolution.[7]

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[1] UNFCCC. "Essential Background," available online at: http://unfccc.int/essential_background/items/2877.php.

[2] Clark, Andrew, (2007): "Climate change threatens security, UK tells UN," *The Guardian*, April 18, 2007. Available online at: http://www.guardian.co.uk/environment/2007/apr/18/greenpolitics.climatechange

[3] Andrew, 2007.

[4] Andrew, 2007.

[5] Security Council, 5663rd Meeting, (2007): "Security Council Holds First-Ever Debate On Impact Of Climate Change: On Peace, Security, Hearing," Department of Public Information, News and Media Division, New York, available online at: http://www.un.org/News/Press/docs/2007/sc9000.doc.htm

[6] Security Council, 5663rd Meeting.

[7] Security Council, 5663rd Meeting.

The Environment and Security Initiative (ENVSEC), a partnership between certain UN bodies and other international organizations is partially a result of this growing concern among Security Council members about the security implications of climate change. Efforts by the Peacebuilding Commission to integrate these concerns into their activities are further evidence of this. Both of these initiatives are evaluated in the following case studies.

2. Case Study 1: UN Funding Schemes relevant to Climate Change Adaptation

The onset of climate change impacts will require an estimated USD 28 to 67 billion annually for climate adaptation in developing countries by 2030.[8] Such adaptation efforts, and the necessary financing, will likely be important components of preserving and perhaps enhancing human security in areas most affected by climate change through droughts, floods, contaminated water supplies, reduced food security, and other threats to stability.

The UN has devised multiple funding schemes for financing climate change adaptation initiatives in developing countries. Though there is little information available on how adaptation funding thus far has influenced security or conflict, the funding mechanisms described below are relevant to understanding the resources available for potentially addressing these issues. Here we assess four of these schemes funding adaptation. In addition, we evaluate the GEF's International Waters Focal Area, which funds projects addressing transboundary waters and is thus related to CLICO's research objectives.

- **UNFCCC Adaptation Fund** began disbursing funds to its first projects in 2010 and is the adaptation financing mechanism of the Kyoto Protocol. It targets all developing countries, but in order to avoid overlap with the Least Developed Countries Fund (LDCF) it may prioritise small island developing States (SIDS).

- **Global Environment Facility (GEF) Strategic Priority on Adaptation Fund (SPA)** was a pilot project mandated by the UNFCCC in order for the GEF to demonstrate how adaptation funding programmes can successfully "translated" into projects.[9] It required that any local adaptation projects also generate global environmental benefits. All funds were distributed by 2009 and it is now closed.

- **GEF Least Developed Countries Fund (LDCF)** utilises a two-step approach to financing by assisting Least Developed Countries (LDCs) in developing National Adaptation Programmes of Action (NAPAs) and then funding the implementation of these NAPAs.

- **United Nations/GEF Special Climate Change Fund (SCCF)** began approving funding for projects in 2006, and has more of a focus on management, education, policy, and capacity building initiatives, as opposed to the Adaptation Fund and the LDCF which also contribute to infrastructural changes and other "hard" projects. Any funded projects must meet an "additionality" requirement such that project do not contribute solely to "development."

- **Global Environment Fund's Focal Area on International Waters (GEF – IW)** has been a focal area of the GEF since its establishment in 1991, and has seen a huge number of projects, and a very significant amount of funding, supporting various aspects and stages in improved management of transboundary water resources. Its results include various international cooperation agreements for individual transboundary basins, and foundational, demonstration, or Strategic Action Programme implementation projects within particular basins.

Although several of these funding sources have similar structure and goals, which could result in redundancy of funding sources, they seek to be complementary. None of them are explicitly focused on security issues related to climate adaptation, but, as illustrated below, enhancing human

[8] UNFCCC, 2007, p. 8. This figure includes the adaptation financing needs of all non-Annex I countries.

[9] GEF, 2010a, p. 18

security and local-scale resilience are significant and widespread priorities for the developing countries seeking funding under these programmes.

2.1 UNFCCC Adaptation Fund

2.1.1 Background

The Adaptation Fund was established by the Parties to the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC) in 2001 to finance concrete adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol.[10] The Fund is financed with 2% of the Certified Emission Reductions (CERs) issued for projects of the Clean Development Mechanism (CDM) and other sources of funding (donors and investing undisbursed funds). Total amount of funds available as of October 31, 2010 is about USD 190 million.[11] Estimates of potential resources available for the Adaptation Fund over 2010 - 2012 range from approximately USD 300-400 million.[12]

The Adaptation Fund is dedicated to funding projects in countries that are most vulnerable to the impacts of climate change in order to help them in meeting the costs of adaptation.

2.1.2 Evaluation

Relevance

No reference is made to human security or conflict in the Fund's guidelines. Nevertheless, the Adaptation Fund is relevant to this analysis because it seeks to enable developing countries to "address the adverse impacts of and risks posed by climate change". [13] This includes the impacts and risks related to security and water issues. Important criteria for receiving funding include level of vulnerability and urgency as well as increasing risks from delay of action.[14] These criteria are likely to be sufficiently met by projects that seek to reduce security concerns by addressing water availability issues. Though the call for proposals has only recently started (since the AFB's ninth meeting in March 2010), many of the 15 initial proposals concern water issues or require considering the availability of water.

The first Adaptation Fund project to receive funding illustrates the relevance of the Adaptation Fund to issues of water, climate and human security. Located in Senegal, the project is titled "Adaptation to coastal erosion in vulnerable areas" and focuses on the increased likelihood of flooding along Senegalese coasts, which would affect rice-growing, saline contamination of estuaries, and destruction of surrounding ecosystems, natural resources and infrastructure, including human settlements.[15]

Other funding proposals put forth in 2010 included the following topics:

- disaster risk management for different zones
- food security through water availability

[10] UNFCCC, 2001

[11] Adaptation Fund, 2010a, p. 2

[12] Adaptation Fund, 2010a, p. 8

[13] Adaptation Fund, 2009, p.7

[14] Adaptation Fund, 2009, p.9

[15] Centre de Suivi Ecologique, 2010, p. 1-2

- resilience of rural communities to floods and droughts
- flood and flash flood management
- climate resilience through integrated water management
- climate adaption in costal zones
- reducing risks based on flooding and droughts

Effectiveness

Given that the Adaptation Fund has only recently begun financing projects, it is premature to assess its overall effectiveness, although one could argue that its slow start is a strike against its effectiveness. The AFB estimates that the fund will make available up to USD 434 million by the end of 2012. It is illustrative to compare this to the estimated USD 28 to 67 billion needed annually for climate adaptation in developing countries by 2030.[16]

Fifteen proposals have been submitted as of the AFB's 12th Meeting in December 2010, requesting a total of over USD 95 million.[17] As of October 2010, USD 55 million has been approved for disbursement to Senegal, Honduras, Guatemala, Madagascar, Mongolia, Nicaragua, Pakistan and the Solomon Islands.[18]

Efficiency

One way of determining the efficiency of the Adaptation Fund is assessing its consistency with national strategies and other international funding sources. The AFB is still in the process of determining its initial funding priorities, which will ultimately affect its efficiency in these regards. However, the decision to create the Adaptation Fund under the UNFCCC requires that "The Adaptation Fund shall be guided by the following principles… (g) No duplication with other sources of funding for adaptation in the use of the Adaptation Fund."[19]

One of the considerations for prioritising proposals for funding currently under consideration by the AFB is "non-duplication of funding sources," meaning that projects not eligible for funding from other sources would be given higher priority under the Adaptation Fund, particularly if they are "strongly complementary" with projects funded by other sources.[20]

A similar prioritisation criterion under consideration is "host country" – if this criterion were to be utilized, small island developing States (SIDS) would receive priority for funding since certain sectors in least developed countries (LDCs) can receive funds from the Least Developed Countries Fund (LDCF – discussed below).

The administrative budget for the Adaptation Fund is estimated to be USD 6 million from 2010-2012, or about 2% of the total estimated available funds over that time period.[21] This is a small

[16] UNFCCC, 2007, p.8; This figure includes the financing needs of all non-Annex I countries.

[17] Adaptation Fund, 2010c, p. 1

[18] Adaptation Fund, 2010a, p. 5

[19] UNFCCC, 2006, p. 28

[20] Adaptation Fund, 2010b, p. 6

[21] Adaptation Fund, 2010a, p. 9

portion, which speaks well to the administrative efficiency of the Fund. However, if the Adaptation Fund grows significantly larger and must process more applications and monitor more projects, the administrative budget could grow.

It is difficult to know yet whether the Adaptation Fund will be cost effective in its funding of projects, and this assessment is largely dependent on a project-by-project analysis, which is yet to be undertaken.

Impact

Several of the Adaptation Fund projects that have been approved thus far are highly relevant to the nexus of water and security concerns, but their overall impact is not yet clear. For example, "Reduction of Risks and Vulnerability Based on Flooding and Droughts in the Estero Real River Watershed", a proposal submitted by Nicaragua, requests funding for rain- and surface water storage infrastructure, introducing water-efficient agricultural practices, building institutional capacity for managing watersheds, and monitoring of land use, water availability and soil quality.[22]

"Reducing risks and vulnerabilities from Glacier Lake Outburst Floods (GLOF) in Northern Pakistan" requests funding for developing policy recommendations and institutional capacity for preventing GLOF events, demonstrating community-based risk management in Northern Pakistan, and strengthening knowledge for policy makers and communities.[23]

"Addressing Climate Change Risks on Water Resources in Honduras" requests funding for incorporating climate change risk in water resource management under the National Water Authority, protecting Tecucigalpa City's water supplies, and stakeholder outreach.[24]

"Ecosystem Based Adaptation Approach to Maintaining Water Security in Critical Water Catchments in Mongolia" requests funding for implementing a water resource planning system in the Altai Mountains to reduce vulnerability of communities, protection of ecosystems as a means for enhancing water security, and building institutional capacity for managing watersheds.[25]

Some of these projects may now be going through the initial stages of implementation, but it is too early to tell their ultimate impact on their areas of focus. The project assessment process is currently being finalised by the AFB. The Adaptation Fund utilises a "results based management" framework, and has developed documents to assist project proponents in ensuring that they produce results frameworks useful to monitoring the effects of the project.[26]

It is important to note that the sustainability of the Adaptation Fund's impact is uncertain. The Adaptation Fund may be at risk of expiration with the Kyoto Protocol as of 2012. Furthermore, because its financing stream is dependent largely of number of CERs purchased, the success of the Adaptation Fund is also dependent on countries mitigation ambitions. While CERs can still be created and purchased under the Clean Development Mechanism even in the event that the Kyoto Protocol is not renewed for a second commitment period, the supply and demand of CERs would then depend on the development of a new international agreement with binding emissions reduction targets or ambitious regional mitigation schemes that accept CERs.

[22] Adaptation Fund, 2010d, p. 4-5

[23] Adaptation Fund, 2010e, p. 3-4

[24] Adaptation Fund, 2010f, p. 4-5

[25] Adaptation Fund, 2010g, p. 4-5

[26] See Adaptation Fund, 2010h

The will of UNFCCC Parties to fulfil any of these three options, (1) agree on a second Kyoto Protocol commitment period, (2) develop a new international agreement which incorporates the Adaptation Fund and CDM or (3) develop robust regional mitigation schemes that utilise CERs, is highly uncertain at this point in time. Therefore, the sustainability of the Adaptation Fund is questionable.

Another option is to expand the financing role of direct donors, that is UNFCCC Parties that submit funds directly to the Adaptation Fund, which has been undertaken by Germany, Sweden and Spain and other industrialised countries in 2010. Direct donations currently comprise 37% of the funds in the Adaptation Fund.[27]

2.2 UNFCCC/GEF Trust Fund - Strategic Priority on Adaptation

2.2.1 Background

The UNFCCC/GEF Trust Fund - Climate Change Focal Area funds both adaptation and mitigation measures. Within the Trust Fund, the Strategic Priority on Adaptation (SPA) was created as a pilot project and was allocated a lump sum of USD 50 million. The SPA has supported pilot and demonstration projects that show how adaptation planning and assessment can be translated into projects and can be integrated into national policy and sustainable development planning. All of the USD 50 million was allocated to 22 projects by October 2008.[28] By October 2010, a full evaluation of the pilot was prepared. In order to be approved for funding, SPA projects not only had to address climate adaptation, but also provide global environmental benefits (e.g. biodiversity, land degradation, international waters).

2.2.2 Evaluation

Relevance

Though the SPA does not have a mandate to prioritise concerns of human security or conflict, its overall objective is to reduce vulnerability and to increase adaptive capacity to the adverse effects of climate change in any of the GEF focal areas. SPA supports projects that address local adaptation needs but that generate global environmental benefits. The SPA operational guidelines stipulate that any project with a focus on development sectors, including water and infrastructure, must access funding through the Least Developed Country Fund (LDCF), the Special Climate Change Fund (SCCF) (both discussed below) and the Adaptation Fund (discussed above).[29]

The GEF focal areas are biological diversity, climate change, international waters, land degradation, ozone layer depletion, and persistent organic pollutants (POPs).[30] The most relevant focal areas to the CLICO assessment are climate change and international waters, which includes marine areas, lakes, wetlands, mangroves, estuaries, and coral reefs, but these kinds of projects only accounted for about 13% of all funding distributed.[31]

[27] Adaptation Fund, 2010a, p. 4

[28] GEF, 2008, p. 3-4

[29] GEF, 2005, p. 3

[30] GEF, 2005, p. 2-5

[31] GEF, 2005, p. 4; GEF, 2008, p. 5

Effectiveness

GEF estimates that the SPA, which distributed USD 50 million to 22 adaptation projects, could lead to additional total leverage of USD 730 million in co-financing.[32] By building institutions, technical capacity, pilot demonstration of adaptation measures, and knowledge management, the SPA was able to make funded projects springboards for further investment and development.

Though the SPA projects did represent a range of geographic areas and economic sectors, many of the projects were located in Asia and Latin America (about 50%).[33] The original expectation was that many of the projects would occur in Africa (which ultimately accounted for 18% of the projects), where vulnerability is more widespread. Yet capacity for fulfilling programme requirements and carrying out complex projects plays a role in determining where projects are funded.

Efficiency

The ability of the SPA to leverage additional investment and co-financing is a good indicator that it is a promising strategy for directing official development assistance (ODA).

One of the criticisms of the handling of the SPA was that it was not allocated sufficient resources for monitoring projects past the approval stage, nor for coordinating across administrators or generally ensuring funding guidelines were met. This highlights the important balance of administrative efficiency and ensuring that adaptation funds are administered in a consistent, coordinated and effective manner, thus requiring sufficient funding for this purpose.

Impact

In its review of the SPA, the GEF concluded that all projects were consistent with the goals of reducing vulnerability and increasing adaptive capacity.

It is important to note that most of the projects funded by SPA were able to provide significant co-financing, such that the SPA only supplied 6% of total funds needed by approved projects.[34] While this is a good sign that the SPA funding programme design was suitable for leveraging additional funding, this model could be problematic moving forward, particularly for most vulnerable countries. As discussed above, the least developed and highly impacted countries are not likely to provide a hospitable atmosphere for additional private investment, and their local or federal governments may not have sufficient funds to supply co-financing.

This becomes particularly relevant when considering the need for adaptation in areas of higher security risk. Areas of reduced security become particularly ill-suited to attracting private investment, such that co-financing may become impossible. In order for adaptation funding schemes to accommodate regions experiencing reduced security as a result of climate change, co-financing may have to play a smaller role.

[32] GEF, 2010a, p. 7

[33] GEF, 2008, p. 5

[34] GEF, 2010a, p. 27

2.3 GEF Least Developed Countries Fund

2.3.1 Background

The Least Developed Countries Fund (LDCF) was created in 2001 to support the needs of the 48 Least Developed Countries (LDCs), which are especially vulnerable to the adverse impacts of climate. This includes preparing and implementing National Adaptation Programmes of Action (NAPAs) to identify urgent and immediate needs of LDCs to adapt to climate change. The LDCF's main objective is to integrate adaptation measures into the development activities of each LDC. The "first step" for LDCs under the LDCF is the NAPA preparation (48 NAPAs). The "second step" is the NAPA implementation, which includes; mobilization of resources to finance concrete projects on the ground for the implementation of NAPAs; NAPA project preparation, submission and implementation; and project monitoring and evaluation.

In addition it is funding a number of adaptation projects in LDCs, with several of them addressing coastal areas, drought or other water related hazards. Human security and conflict are not explicitly mentioned.

As of June 2010, it has mobilised voluntary pledges totalling USD 224 million.[35]

2.3.2 Evaluation

Relevance

The LDCF first funded the development of adaptation policies in the form of NAPAs, and is now also funding their implementation. The LDCF does not have a mandate to prioritise concerns over human security or conflict. However, in NAPA priority action projects the most addressed adaptation needs were food security, terrestrial ecosystems, and water resources, areas which are highly relevant to CLICO.[36] For example, the most mature LDCF project is taking place in Bhutan, and is titled "Reduce climate change induced risks and vulnerabilities from glacial lake outbursts in Punakha- Wangdi and Chamkhar Valleys".

Effectiveness

The LDCF has facilitated the development of 48 LDC NAPAs. Thirty-three countries have submitted their first NAPA implementation projects and 32 of these project proposals have been approved. Projects are currently being implemented in Bangladesh, Bhutan, Burkina Faso, Cambodia, Cape Verde, Eritrea, Niger, and Samoa. The NAPAs of many of these countries include reducing the risk or security impacts of water-related issues, including flooding, food security and water management, and droughts.

The LDCF has been successful thus far in amassing sufficient funds for supporting relevant projects. However, USD 200 million is a very small proportion of the total sums required for achieving the adaptation goals of LDCs. Though contributions to the LDCF are considered official development aid, voluntary pledges are not ideal for ensuring a consistent and long term financing stream. The LDCF is dependent on decisions about replenishment of the GEF and decisions made by the Parties of the UNFCCC.

[35] GEF, 2010, LDCF

[36] GEF, 2009, p. 3

Efficiency

Similarly to the SPA, the LDCF has previously suffered from insufficient staffing. Recently additional staff have been added, which the Secretariat hopes will avoid future delays in implementing NAPAs.[37] While the most recent review of the LDCF acknowledges that the programme has experienced a difficult establishment phase, it appears to be improving in its movement towards funding the implementation of NAPAs.[38]

GEF is also currently striving to distinguish the LDCF from other adaptation funding mechanisms, in an attempt to make the funding processes cooperative rather than competitive.[39]

Impact

The impact of the LDCF has been widespread. Furthermore, many of these impacts are highly relevant to CLICO. For example, in Benin, the NAPA focuses on food security through water management, reduction in the availability of water resources and heading off the negative impacts of increasing violent and intense rains leading to increased flooding and erosion.

Bhutan's foci include climate-induced disasters (such as landslides and floods), dependency on hydropower resources, human and economic devastation through natural disaster, glacial retreat, flash floods, and increased GLOF risks.

Burkina Faso's NAPA looks at the effect of the reduction in annual rainfall, particularly with regard to the vulnerability of communities to local levels of food production.

Cambodia focuses on adaptation to climate change-induced fluctuations in water resource availability and building better information systems for predicting and managing floods and drought events.

Cape Verde looks at decreases in rainfall, access to fresh water resources, seasonal water shortages, storms, floods, droughts and a shorter rainy season, and the need for integrated water resource management.

Comoros focuses on the combined impacts of the shortening of the rainy season from six months to two or three months and sea-level rise at about 4 mm a year. Their increasingly prolonged dry seasons require enhanced water resource management.

Samoa is concerned about increased flooding, which leads to stagnant water, and thus increases in mosquito populations that transmit diseases, including filariasis, dengue fever, typhoid, and diarrhea. Extreme rainfall also leads to overflow of sewage systems and the spread of pathogens. Simultaneously, increased drought jeopardises access to safe drinking water.

Zambia is focused on the impacts of droughts and floods on crop failure, as well as outbreaks of human and animal diseases, displacement of human populations, and destruction of property and infrastructure.

Projects implemented to address these challenges are likely to assist in addressing human security concerns, such as spread of disease, water security and food security.

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[37] GEF, 2010c, p. v

[38] GEF, 2010c, p. vi

[39] GEF, 2010c, p. vi

2.4 United Nations/GEF Special Climate Change Fund (SCCF)

2.4.1 Background

The Special Climate Change Fund was established under the UNFCCC in 2001, with the aim of financing activities, programmes and measures, relating to climate change, that are complementary to those funded by other funding mechanisms for the implementation of the Convention. Activities in the following areas receive funding:

- Adaptation;
- Transfer of technologies;
- Energy, transport, industry, agriculture, forestry, and waste management; and
- Activities to assist developing countries whose economies are highly dependent on income generated from the production, processing, and export or on consumption of fossil fuels and associated energy-intensive products in diversifying their economies.

Adaptation to climate change is the top priority of the fund. Within the programme for adaptation, the fund aims to "support capacity building, including institutional capacity, to make project preparatory work, constituency building, and awareness-raising more informed of the likely implications of and changes brought on by climate change."[40] As can be seen from this aim, rather than focussing on "hard", infrastructure projects, the fund's focus is predominantly on preparatory and information activities, as well as capacity building.

Activities will be implemented in the following areas: water resources management, land management, agriculture, health, infrastructure development, fragile ecosystems (including mountain ecosystems), and integrated coastal zone management. A key requirement is that activities focus on 'additional costs' imposed by climate change on the development baseline. Activities which are considered as part of the development baseline can thus not be considered for funding. Examples of activities that cannot be funded are improvement of public health and education systems, infrastructure for rural development, and water sanitation. "Funding is provided only to address impacts of climate change on a vulnerable socio-economic sector that are above and beyond the baseline."[41] The case for 'additionality' has to be made.

Project funding varies between USD 0.72–13.13 million, but is typically between USD 1–4 million. Of the projects reviewed, approximately half were thematically relevant for the CLICO project; many of these involve the implementation of management approaches such as Integrated Coastal Zone Management and Integrated Water Resources Management. Examples of relevant projects include *Adaptation to Climate Change through Effective Water Governance in Ecuador*, *Coping with Drought and Climate Change* (separate projects in Ethiopia, Mozambique, and Zambia), *Integrating Climate Change in Development Planning and Disaster Prevention to Increase Resilience of Agricultural and Water Sectors in Morocco*, and *Mainstreaming Adaptation to Climate Change Into Water Resources Management and Rural Development in China*.

As of October 8, 2010, the total amount of pledged funding is USD 149 million.

[40] Climate Funds Update, 2011.

[41] Climate Funds Update, 2011.

2.4.2 Evaluation

Relevance

With a majority of the funding addressing adaptation issues, and a significant amount of these resources targeting, for example, water resources management and coastal zone management, this funding stream is relevant for addressing water issues and reducing the potential for related conflicts in vulnerable areas. Due to the overall architecture of the UN funding that addresses adaptation, this funding stream focuses on preparatory and information activities, as well as capacity building; the transfer of specific, locally relevant knowledge to different stakeholder communities, ranging from policy makers over natural resources managers to the broad public, can be seen as the main result of this funding mechanism.

Effectiveness

There is little available information to evaluate precisely the effectiveness and the impact of this funding mechanism. In view of the themes addressed, the projects seem to be in line with the aims, and as such the objectives are likely to be achieved (at least regarding the individual projects).

Efficiency

Due to most projects having started within the last couple of years, it is as yet difficult to gauge the efficiency of this funding mechanism. The GEF itself considers the project portfolio "quite new to measure results"[42]. Thematically there seems to be a good cover between the programme's objectives and the individual projects being supported, which would be in favour of efficiency in resource use. However, as mentioned above, the significant transaction costs and bureaucracy have come under fire; in addition, the lack of clear guidance would pose a significant hurdle for resource- and capacity-poor countries, including LDCs and SIDS.

Impact

On the basis of the available funding figures, however, there seems to be a lag between available resources and resources committed to projects, with nearly a third of available resources of the Programme for Adaptation still being available for allocation (in October 2010). At the same time, the GEF evaluates the demand for SCCF adaptation resources as remaining high and significantly exceeding current supply in the SCCF, and concludes that "a significant increase in donor contributions is therefore urgently needed".[43] This discrepancy between high demand and still unallocated resources could be related to common criticism of UN schemes for their complexity and red tape. This criticism forms part of a larger array of relatively widespread criticism of certain characteristics of this funding mechanism, which negatively affect its impact, including *inter alia*:[44]

1. The GEF would have disproportionately funded projects in countries that have relatively low rates of poverty, with rules and structures making funding access difficult and time-consuming;

[42] GEF, 2011b.

[43] GEF, 2010d, p. 10.

[44] Ayers and Huq, 2008; Climate Funds Update, 2011.

2. Unclear guidance and high transaction costs attached to GEF funding mechanisms, with implementing agencies such as the UNDP, the UNEP and the World Bank adding further bureaucracy to the process.

3. Although funding through the GEF is not formally conditional, requirements attached to funding include burdensome reporting and co-financing criteria.

4. Distinguishing 'additional' costs of climate change impacts from baseline development needs is extremely complex.

5. Many countries cannot afford to meet the baseline development costs so the offer of funding for the additional cost is futile.

6. There is an emphasis on supporting projects rather than programmatic approaches.

2.5 GEF International Waters programme

2.5.1 Background

The GEF International Waters programme (GEF – IW) is one of the seven thematic Focal Areas of GEF, and has been implemented for nearly two decades. Its main objective is to fund initiatives that will improve management of and reduce stress on transboundary water systems, with the aim of preventing conflicts and supporting sustainable resource use. It aims to reduce cross-border tensions due to issues with water allocation and quality, by helping countries to collectively manage their transboundary waters. GEF – IW has supported regional collaborative efforts for 22 transboundary surface water basins, 16 large marine ecosystems, and five cross-border groundwater systems. Over 17 years it has provided USD 1.1 billion in grants, with USD 4.7 billion in co-financing for 183 projects.[45]

2.5.2 Evaluation

Relevance

Most GEF – IW efforts (with the exception of marine ecosystem efforts, predominantly focusing on unsustainable exploitation of fisheries and protection of fisheries habitats) are directly relevant for CLICO purposes in that they increase sustainability and resilience by focusing on, for example, transboundary water pollution, overextraction of groundwater resources, and balancing competing uses of water resources. The recently initiated 5-year phase (2010 – 2014) has explicitly taken up climatic variability and change in its objectives as a "new transboundary concern for action".[46] In the GEF's own understanding, its IW activities have a clear conflict-avoiding dimension in its support of the environment and its resources: "States must act together to restore and protect the functioning of these systems **before depletion and degradation lead to destabilization of communities, sub-national regions, and States**."[47] The 4 proposed objectives for GEF5 (2010 – 2014) include two CLICO-relevant points: *"Catalyze multi-state cooperation to balance conflicting water uses in transboundary surface and groundwater basins while considering climatic variability*

[45] GEF, 2009b. Totals as of June 2009.

[46] GEF, 2011b.

[47] GEF, 2011b.

and change", and *"Support foundational capacity building, portfolio learning, and targeted research needs for ecosystem-based, joint management of transboundary water systems."*

In the previous phase (2006 – 2010), one of the four strategic programmes was: *(iii) balancing overuse and conflicting uses of water resources in surface and groundwater basins that are transboundary in nature.* Two operational programmes implement GEF initiatives of this kind: a waterbody-based operational programme and an integrated land and water multiple focal area operational programme. This focus is directly related to conflicts over water availability and distribution, both within countries, among different users/stakeholders, as among different riparians. Conflict prevention and improved security are seen by the GEF as possible, if secondary, results of these initiatives. The GEF 2005 Evaluation of the International Waters Focal Area states that: "The IW Focal Area is also contributing to the enhancement of regional security, another role that can only increase in importance with time."[48]

Effectiveness

The objective of achieving effective international cooperation and increased sustainability in a certain transboundary basin is both highly ambitious and a complex, multi-step process. The complexity of the different steps required, and the dependency on other factors (e.g. donor funding reductions due to financial problems, regional stability affected by regional or intra-national conflicts due to other factors) imply that the efforts can run into many obstacles that can endanger the results. The achievement of concrete, on-the-ground results (e.g. improvements in water use efficiency or in water quality, which reduce the potential for conflicts) depends on a long process that may include catalysing collaboration among states through trust- and confidence-building processes, use foundational processes to leverage political commitment to collective action, scale up to generate innovative policy, legal and institutional reforms, implement pilot demonstrations which make clear the potential of certain measures, and pass on to more full-blown implementation of on-the-ground actions. This whole process may take over 10 years and successive projects to achieve results.

However, the complexity corresponds with the extremely high potential for impact that these forms of transboundary collaboration can have. Possible results include increased sustainability, increased resilience to climatic variability, development of trust and governance structures between neighbouring countries, and reduction of conflict potential, both regarding the physical environment and the political climate between neighbour states. The dimensions through which impact is generated also vary, including the political level (e.g. trust- and confidence-building, establishment of interministerial committees), the policy and measures level (e.g. uptake of best-practice), capacity building, as well as improvements regarding sustainability and natural resources.

Efficiency

There is little information available on the efficiency of the International Waters Focal Area. An indirect, external and positive evaluation of the efficiency of investments in the focal area could be seen in the increasing success the area has had in leveraging collateral funding, including investments. Whereas in 2005 the leveraging ratio was 1:2, the latest figures are 1:3.12.

[48] GEF Monitoring and Evaluation Unit, 2004.

In general, and as has also been stated for other GEF schemes in this Case Study, criticism is often leveled at the GEF for the complexity of the application process, its reporting and co-financing requirements, and the bureaucracy involved in dealing with GEF and the implementing agencies.

Impact

Evaluation of the International Waters Focal Area of the GEF has mainly been performed by GEF itself, albeit incorporating independent consultants. The GEF 2005 Evaluation of the International Waters Focal Area declares that "GEF support has extended to almost every GEF-eligible large catchment and large marine ecosystem", and that "impressive achievements can be observed on new legal regimes, basin and sea agreements, treaties and conventions." These include "new policy tools such as the legal regime for avoiding the transfer of opportunistic species in ships' ballast water" and several conventions on international water bodies, such as the Caspian Sea Convention, the Dnipro Basin Agreement, the Protocol for Sustainable Development of the Lake Victoria Basin, and the Lake Ohrid Treaty. Foundational, demonstration, or Strategic Action Programme implementation projects have also been reviewed positively; however, the GEF recognizes that progress in these processes "is often difficult to assess" due to their being a "gradual process of stepwise change toward shared goals".[49]

Impact is constrained by lack of funding. Semi-external evaluations (Overall Performance Studies 3 and 4) see outcomes of the IW as robust, with targets exceeded, and IW having proved to be "an effective agent for policy, legal and institutional reforms and for enabling on-the-ground demonstrations". However, there was concern that reduced funding would not allow for scaling up on-the-ground actions from "demonstration mode".[50]

2.6 Conclusions and recommendations

The UN and GEF adaptation funds have no explicit reference to conflict, conflict potential, or security in their documentation. This probably reflects broad perceptions in the international adaptation community, which are nonetheless subject to change over time, and related to the mainstreaming of securitisation discourses in other policy areas. For example, UNFCCC Executive Secretary Christiana Figueres recently delivered a speech on the implications of climate change for security.[51] The case of the GEF – International Waters is different, with a growing recognition of the possible relationship between degradation of natural resources and local, regional, or even state conflict (as well as a growing mainstreaming of climate variability and change as additional challenges to the transboundary management of resources). The link between sustainability, potential conflict, and extreme climatic events is also gaining prominence, as can be seen in the Focal Area's new objectives.

In general, and in spite of the political component to such an evaluative statement, it can be said that the funding made available for adaptation and for improved management of transboundary water resources is currently significantly lower than is estimate to be necessary for developing countries. Currently, these funding schemes can provide several billion USD on an annual basis, but

[49] GEF Monitoring and Evaluation Unit, 2004.

[50] GEF 2011b.

[51] UNFCCC, 2011.

this is likely insufficient by an order of magnitude if these funding levels were to continue into the long term. Furthermore, much of this funding is dependent on co-financing, which is problematic for regions experiencing decreased security as a result of climate change.

The different UN adaptation funds are evolving such that they become more complementary, and thereby address different aspects of the adaptation process. There are, however, significant issues with the sustainability of these funding efforts, particularly with regard to post-Kyoto adaptation funding. There have been discussions of including the Adaptation Fund in any post-2012 agreement, but these issues have not been settled under the UNFCCC.

All funding schemes suffer from significant financial and logistical requirements for applying to funds and managing funded projects, which are limiting factors for many countries and regions that would benefit from such schemes. As a result, projects are not geographically or sectorally distributed according to need or vulnerability, but rather capacity for supporting adaptation projects. Reporting and accounting requirements, as well as co-financing requirements and methodological issues associated with additionality, are often criticised as bottlenecks for project development.

The Least Developed Countries Fund (LDCF) has been in place for nearly a decade now. The differentiation in two phases, in which one phase targets NAPA preparation, and the second addresses on-the-ground implementation, seems effective. The elaboration of a NAPA ensures an approach that is more integrated, focussing jointly on many adaptation issues of a country, thus helping to address the significant problem of adaptation efforts undermining each other. The use of a national perspective in the NAPAs, although being potentially problematic due to its centralised nature, seems valuable in that it helps ensure the existence of national focal points, rather than piecemeal local approaches lacking coordination or a wider perspective.

The Strategic Priority on Adaptation Fund (SPA), was only a pilot project, and as such is of interest due to the lessons that can be learned from its implementation. The experience gathered in mainstreaming adaptation efforts into other policy areas would seem very valuable for current adaptation efforts, and as such the approach's design, as well as the possible lessons-learned, seem commendable.

The Adaptation Fund and the LCDF are more focused on long term development, infrastructure and capacity building as a strategy for enhancing resilience to climate change impacts. Water or security issues are often implicated in the funded projects, either directly or indirectly.

In contrast, the Special Climate Change Fund is more dedicated to near term action in building preparedness for climate impacts. The transfer of information and knowledge, including management approaches, will in all probability increase resiliency, as well as efficiency, in the management of water resources and coastal zones. Although thematically the projects seem promising, the Fund has come under criticism for supporting projects, rather than programmatic approaches, which could limit the impact of its actions.

Several general recommendations can be elicited for adaptation funding streams (not necessarily limited to the UN level, but also applicable for more regional or national efforts). The system of requirements for receiving funding, even though in service of clarity and accountability, can be too big a hurdle and thus hinder innovation and implementation. This is particularly the case for LDCs or other regions lacking in local capacity. Funding for adaptation requires clear guidelines and strong guidance.

Regarding co-financing requirements, these should not only take into consideration donor requirements, but also the issue of local capacity for acquiring funding. It is also possible that

additional or private funding requirements of adaptation schemes that support conflict reduction could be problematic when considering areas in which conflict has already become violent, i.e. those areas that are most in need of conflict reduction support.

The GEF – IW represents a huge source of practical experience in the varied approaches implemented, as well as the methodological developments that have proved their value on the ground. A particular project in which the different aspects of, and the different steps in, the process of achieving common transboundary governance of water resources are relevant – which in turn increases sustainability, preparedness, and reduces conflict potential – can profit immensely from the GEF – IW experience. The very long-term nature of these efforts, however, should also be mirrored in the funding arrangements over time. A programme of this nature should also be designed so as to react flexibly to the realities and the capacities on the ground, both in project design as in the systems of requirements.

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3. Case Study 2: The Environment and Security Initiative (ENVSEC)

3.1 Background

The Environment and Security Initiative (ENVSEC) is a partnership between the Organisation for Security and Co-operation in Europe (OSCE), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the North Atlantic Treaty Association (NATO), the Regional Environmental Centre for Central and Eastern Europe (REC) and the United Nations Economic Commission for Europe (UNECE).

The joint initiative developed out of a shared understanding between the founding partners (OSCE, UNDP and UNEP) that environmental degradation and natural resource scarcity could potentially lead to conflict and exacerbate human insecurity.[52] Similarly, the partners agree that increased conflict itself can then lead to greater resource scarcity. With this idea in mind, the initiative's objective is to reduce the likelihood that environmental changes will increase threats to human security.[53]

Interest in the link between environmental change and human security is not new. Research has been growing in academic and civil society circles since the 1990s. A coordinated integrated approach combining the environmental, economic, social and political aspects of the problem, however, was still missing at the international level. According to the ENVSEC partners, the initiative was an attempt to fill that gap. Since each of the participating organizations has a distinct area of expertise, ranging from the military to the economic and developmental, their concept was to combine their particular experience and expertise to come up with an integrated approach to the nexus between environmental problems and human security. The mandate of each partner is specialized but complementary.[54]

As recently defined by its Management Board, ENVSEC's main objective is "to contribute to the reduction of environment and security risks and strengthen cooperation among and within countries."[55] Its projects are designed with the intention of reducing tensions between countries and communities and to advance actions that can simultaneously promote peace and environmental protection. In a sense, said Marco Keiner, chair of ENVSEC in 2009, the initiative can be considered "war prevention."[56] The reasoning behind this view is that "when environmental quality worsens in a region, tensions can occur, which can lead to conflict," as Keiner notes.[57]

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[52] ENVSEC (2010). "The Environment and Security Initiative: An international partnership for managing conflict and risk," brochure. Available online at: http://www.envsec.org/publications.php

[53] ENVSEC (2011). "What is the Environment and Security Initiative about?" Retreived Jan, 24, 2011. Available online at: http://www.envsec.org/about.php

[54] Stiefel, Matthias (2009). "Strategic Review of the ENVSEC Initiative," Geneva, p. 7.

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[56] Farquharson, Vanessa (2009). "It ain't easy turning swords into ploughshares; Transboundary approaches to Conservation," *The National Post,* Toronto. Retreived Jan, 24, 2011. Available online at: http://www.globaltvedmonton.com/topics/kennedy/Sense+Sustainability+easy+turning+swords+into+ploughshares/1278799/story.html

[57] Farquharson.

To meet this broad, main objective, the ENVSEC Secretariat has defined a more specific set of goals. These are to:

a) "identify environment and conflict hotspots by carrying out desk and field assessments,
b) present the results of the assessments in graphically rich maps, reports and web sites and draw the attention of politicians and people to situations and hot spots where risks are high,
c) help societies to deal with priority issues by raising awareness, building capacities and strengthening institutions, and
d) support concrete action and catalyse specific solutions for the identified security-relevant environmental problems on the ground."[58]

To implement projects that meet these goals, ENVSEC has identified certain factors that are potential sources of human insecurity. Among these are health risks and involuntary migration that may be caused by pressures on water scarcity, inequitable access to land and water resources and the pollution of shared resources bases. In addition, some of the potential sources of conflict identified by ENVSEC are inequitable access to natural resources, transboundary movement of hazardous materials and pollution, and large deposits of obsolete pesticides. Climate change is seen as a threat in the sense that it is expected to exacerbate these environmental pressures and make resource management more challenging, thus multiplying the threats to human security.[59]

3.2 Actors responsible

Each of ENVSEC's partner organizations has its own mandate in the partnership. The OSCE has a regional mandate and is responsible for field missions. UNEP and UNDP bring environmental expertise and a sustainable development view to the table. UNECE provides the legal frameworks of cooperation. The REC specializes in environmental efforts in the regions where ENVSEC operates. Finally, NATO facilitates scientific cooperation through its Science for Peace and Security Programme.[60]

A Management Board, which consists of representatives of the partner agencies, oversees the initiative. Activities are coordinated by a Secretariat, which consists of two bodies: (i) a coordination unit comprised of a Coordination Officer and Regional Desk Officers from the partner organizations, and (ii) an administrative unit hosted by the UNDP Regional Centre for Europe and the CIS.

The ENVSEC partnership between these actors is not a legal entity but a partnership governed by a memorandum of Understanding (MOU). The MOU spells out the respective roles and responsibilities of partner organizations, donors and partner staff seconded to the ENVSEC

[58] ENVSEC (2011). "What is Environment and Security Initiative about?"

[59] From a questionnaire answered by a representative from ENVSEC, December 21st, 2010.

[60] Swalley, David (2010). "The Environment and Security Initiative: A concurrence of strengths," OSCE Magazine. Available online at: http://www.envsec.org/news2010.php, p. 1.

secretariat. It also defines governance, guidelines and principles for financial and project management.[61]

3.3 Main Mechanisms

According to its Secretariat, the ENVSEC Initiative seeks to foster "national ownership" of environmental security projects.[62] To do so, the Initiative first compiles a list of environment and security issues that national governments and national civil organizations recommend. These issues are compared with those of neighbouring states to maximize transnational cooperation wherever possible. On the basis of the resulting regional assessment reports, the ENVSEC partners develop appropriate projects and work programmes to address the issue. The governments of the target countries have to approve all work programmes before these are published. According to ENVSEC, these mechanisms ensure that the projects actually "focus resources and expertise on the problems that are the most urgent for the people on the ground."[63] More recently, ENVSEC has begun working with more national ministries, civil society organizations and academics.

Currently, ENVSEC has about 50 projects in twenty different countries in its four core regions: Eastern Europe, South Eastern Europe, Southern Caucasus and Central Asia. Total funds in 2009 amounted to USD 34 million.[64]

The set of projects and activities is organized under the three main pillars that define the ENVSEC approach:

- In-depth vulnerability assessment, early warning and monitoring of environment and security risks
- Improving awareness on the interrelation between the environment and security, strengthening environmental policies, and improving the capacities and the roles of environmental institutions
- Providing technical expertise and mobilizing financial support for clean-up and remediation activities[65]

The issues to be targeted by these projects are identified in regional ENVSEC assessment and consultation meetings with stakeholders (the ENVSEC organizations, local NGO's, experts and governmental representatives). From these meetings, the stakeholders can create a map of "hot spots"—places where there are significant threats to human security due to environmental

[61] Stiefel, p. 8.

[62] Among the international organizations and institutes that are stakeholders in the ENVSEC initiative are: OSCE, UNEP, NATO, UNDP, Adelphi Research, the Caspian Environment Programme, the Institute for Environmental Security, UNECE, CIDA, the World Bank, the Canadian International Development Agency and the Austrian Development Agency. At the national level, stakeholders include national delegations to the OSCE, national chapters of the UNDP, foreign affairs ministries and environmental protection agencies of donor and recipient countries.

[63] Swalley, p. 1.

[64] Stiefel, p. 7.

[65] Stiefel, p. 7.

changes—and then come up with a work programme. These maps and work programmes are approved by the governments of the countries involved before they are official.[66]

Once the priorities of each work programme are established, each ENVSEC organization develops its own set of tasks to carry out. This process usually occurs in cooperation with independent experts, national and local authorities, and other stakeholders. Each partner organization then submits its proposals to the ENVSEC Secretariat, which reviews them and assures that they meet ENVSEC's objectives. This is also done in cooperation with the National Focal Points involved. Finally, the ENVSEC Management Board will decide if a proposed project is included in the ENVSEC portfolio. If approved, the activities of each organization are then combined and coordinated to become ENVSEC's regional work programme.[67]

Once the projects have gone through the design and approval process, the partner organizations implement, fund, and manage them. Each organization has its own procedure for implementing and evaluating activities. The ENVSEC secretariat helps by coordinating activities, raising awareness and sharing the information among stakeholders. Donors can regularly evaluate projects and offer recommendations to improve the ENVSEC portfolio.[68]

3.4 On the Interface between Environment and Human Security

Two approaches

The ENVSEC initiative "works to assess and address environmental problems which threaten...security, societal stability and peace, human health and/or sustainable livelihoods, within and across national borders."[69] This broad objective incorporates two related but distinct perspectives on the meaning of "security".[70]

According to one view on human security, environmental change can trigger "the possibility that groups within society will engage in violent conflict," especially as natural resources diminish.[71] This focus is considered fairly specific and associated with "more familiar security threats," such as warfare.[72] The second and more comprehensive perspective is that human security will be threatened by "the series of socio-economic impacts" that climate change will exacerbate.[73] Such impacts include increased poverty, disease and hunger, for example. Both approaches are equally valid but call for differing policy mechanisms to address or prevent them.

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[66] From a questionnaire answered by a representative from ENVSEC, December 21st, 2010.

[67] Ibid.

[68] Ibid.

[69] ENVSEC (2010). "What we are doing," retreived Jan, 24, 2011. Available online at: http://www.envsec.org/about.php

[70] Klare, Michael T. (2007). "Global Warming Battlefields: How Climate Change Threatens Security," *Current History*, p. 355.

[71] Detraz, Nicole and Betsill, Michele M. (2009). "Climate Change and Environmental Security: For Whom the Discourse Shifts," *International Studies Perspectives,* Colorado, p. 305.

[72] Ibid.

[73] De Ville, Géraud (2008). "Climate Change: Bad News for Environmental Security." *Environmenal Law Review,* p. 178.

Precisely because each of the ENVSEC member organizations has a distinct expertise and interest, the initiative is able to cover both aspects of the climate change and security nexus. NATO, for example, brings the military and scientific expertise required to address "familiar security threats" while UNDP, for example, complements with development and sustainability goals. Each of the partners has a similarly narrow role that complements the others to give ENVSEC a comprehensive approach to human security issues.

Although the term "climate change" is not explicitly addressed in its mission and objectives, the expected effects of climate change seem to fall into the category of "environmental problems" ENVSEC addresses. A review of the literature suggest that ENVSEC views climate change as a "threat multiplier" that will make socio-economic problems in these regions more extreme and more difficult to manage. In this sense, strengthening these countries' ability to cope with these issues also increases their ability to adapt to climate change.

3.4.1 Focus on familiar security threat

Some ENVSEC projects focus directly on mitigating or preventing violent environmental conflict between nations or groups. In the case of the water and climate change nexus, the causal link is clear: the effects of climate change can potentially diminish the availability of water in certain regions.[74] This puts added pressure on existing resources. When such resources are shared between two or more countries, the pressure on each nation to maximize its own access can lead to conflict (although the literature on the link between climate change and violent conflict shows a weak relationship).[75] Conflict can also ensue within the same country when the endangered resource is shared between ethnic, religious or otherwise differentiated groups.[76] Projects that improve management of shared water resources are a key effort to prevent conflict.

3.4.2 Focus on human wellbeing

The ENVSEC partners also specialize in the socio-economic aspects of the environmental change and human security nexus. In projects with this focus, the general well-being of humans is at the core of action, as opposed to the expectation of direct conflict between populations. The spread of disease, as well as more abstract concepts such as sustainable development and economic growth are typical narratives of these projects.

The key idea in these projects is that institutional arrangements in the developing world that are currently weak at providing public services will be even more challenged once climatic effects make a full impact. So although it may appear that these projects do not address the climate change link to human security, they actually do prepare governments or sectors to deal with those effects once they are present. By strengthening these institutional mechanisms, ENVSEC further mitigates threats to human security.

[74] Vörösmarty, Charles J. et al. (2000). "Vulnerability from Climate Change and Population Growth," *Science,* New Series, Vol. 289, No. 5477, pp. 284-288, p. 287.

[75] Nordås, Ragnhild and Gleditsch, Nils Petter (2007). "Climate change and conflict," *Political Geography,* no. 26, pp. 627-638, p. 631.

[76] Barnett, Jon (2001). "Security and Climate Change," Tyndall Centre for Climate Change Research, p. 4.

3.5 Climate Change and Human Security

As mentioned earlier, the objectives of the ENVSEC Initiative do not explicitly address the term "climate change." According to ENVSEC officials, however, all regional work programmes reflect climate change adaptation and mitigation concerns. This is especially being taken into account for future project objectives and budget allocations.[77] In existing projects, climate change concerns play a central role in risk management and early warning projects. The Initiative also supports OSCE, one of the partners, in its work of exploring future climate-security scenarios in Europe.[78]

The ENVSEC initiative seems to subscribe to the view of climate change as a "threat multiplier" rather than as a direct cause of conflict. According to this view, events that already threaten human well-being, such as natural disasters, will become extreme due to conflict change and potentially lead to conflict. Similarly, socio-economic challenges, such as "low state capacity, corruption, ethnic tensions, poverty, and inequality" will be exacerbated by the effects of climate change.[79]

3.6 Water resources and human security

ENVSEC projects that address water resource problems are shaped by the view that shared water resources, such as transboundary rivers, are particularly prone to unleash conflict—although not necessarily wars—between neighbouring states or between groups within a single state.[80] Disagreement over shared water resources also endangers human security to the extent that it stymies regional development.[81]

In the Southern Caucasus, for example, the Kura-Araks river basin is shared throughout a large part of the region, making cooperation essential to avoid conflict. Other projects address pollution from ageing industries and irrigation networks, which may also strain water resources and exacerbate regional tensions, in ENVSEC's view.[82]

To avoid such conflicts, one of ENVSEC's main goals is to help broker water management agreements between states that share water resources. In 2010, for example, ENVSEC successfully completed the 2-year project "Sustainable management of shared water resources in the upper Pripyat basin." The result of the project was a historic agreement to "improve the sustainable allocation of water from the Pripyat River," a major freshwater resource shared by Belarus and Ukraine.[83]

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[77] From a questionnaire answered by a representative from ENVSEC, December 21st, 2010.

[78] Ibid.

[79] Dabelko, Geoffrey D. (2009). "Planning for Climate Change: the security community's precautionary principle," *Climatic Change*, p. 15.

[80] Martino et. al (2005). "Environment and Security: Transforming risks into Cooperation in Central Asia," UNEP, UNDP, OSCE and NATO, p. 10.

[81] Smith, Dan and Vivekananda, Janani (2007). "A Climate of Conflict: The links between climate change, peace and war," International Alert, p. 13.

[82] Burnod-Requia, Karin (2004). "Rapid Environmental Assessment Of The Tisza River Basin," ENVSEC, p. 49. Available online at: http://www.envsec.org/publications.php#centasia

[83] ENVSEC (2010). "ENVSEC helps broker water management agreement." Available online at: www.envsec.org/docs/upper_pripyat_news.pdf

Another example comes from Central Asia, where ENVSEC is currently working on dam safety. Specifically the project helps Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan improve the legislation, institutions and regulatory mechanisms for dam safety. There are about 100 potentially unsafe dams on transboundary rivers in the region. Dam failure would endanger human lives, health, property and the environment. Aside from the immediate damage to human life, "the mere risk of an accident may lead to mistrust between upstream and downstream countries" and to potential conflict.[84] ENVSEC initiated work in 2004.

3.7 Evaluation

The following evaluation of the ENVSEC initiative applies the criteria contained in the DAC Principles for the Evaluation of Development Assistance developed by the OECD.

Relevance

ENVSEC is highly relevant to CLICO because it addresses the link between environmental change and human security, paying close attention to water-related issues. Although it doesn't explicitly address climate change, its understanding of environmental problems effectively takes into account its effects.

Regarding its relevance outside the CLICO project, an external evaluation conducted in October 2010 by the government of Finland concluded that ENVSEC projects remain relevant in the environment and security policy field and are reasonably effective. The reviewer found that overall, this is "a unique partnership with strong local ownership, stakeholder goodwill and great potential"[85]

Effectiveness

Since its creation, the ENVSEC initiative has been moderately effective in achieving its objectives. According to its own Strategic Review, it has been difficult for the partner organizations to overcome the environmental and security challenges in the regions where they work.[86] The types of environmental problems being addressed require a multi-disciplinary, multi-policy, multi-actor and multi-level approach. That means, they must combine several fields of expertise (from the technical to the political), work with several national and international actors and institutions, and coordinate action at the local, national and regional level. In countries where ENVSEC projects operate, these inherent difficulties of environment/security policy are exacerbated by the political and economic characteristics of conflict, post-conflict and transition settings. The result is decreased effectiveness in achieving goals.

That said, the cooperation between the partner organizations has contributed to ENVSEC's effectiveness. Since each partner approaches the link between environment and security somewhat

[84] ENVSEC (2010). "ENVSEC promotes transboundary cooperation on dam safety in Central Asia: A contribution to human security and confidence building." Available online at: www.envsec.org/docs/dam_safety_in_central_asia_for_website.pdf

[85] Gaia Consulting Oy, p. 3.

[86] Stiefel, p. 10.

differently, the group as a whole can respond to a wide range of challenges, from the military to the developmental.

In relation to climate change, it should be noted again that the linkages between climate change and security are not always explicit in the projects or in discussions with stakeholders. The integrated focus on water, agriculture, energy and environment, however, does constantly take into account the climate change dimension in its day to day functioning. It would, however, add to ENVSEC's effectiveness to make this topic explicit.

Following external recommendations, ENVSEC should also explicitly categorize the work it does on security: violent conflict on the one hand, and other aspects of human security and political fragility on the other hand to increase its effectiveness while working on these issues.[87] The expectation is that ENVSEC will develop a methodology to assess the security implications in its projects and evaluations and link these directly to its priorities. Security-related outcomes should also be better monitored and reported so that learning opportunities can be maximized.[88]

At the local level, the Initiative has been somewhat effective in creating local participation during the initial consultation and assessment stages. According to the Finnish evaluation, ENVSEC projects are able to address relevant environmental problems in the target countries precisely because of this close initial cooperation with local stakeholders. The approval received from key authorities also facilitates project management.[89] Past the initial assessment stage, however, local ownership of projects has been much harder to achieve.[90] Building up such cooperation is seen as one of the most critical factors in improving effectiveness.

Efficiency

ENVSEC has been moderately efficient so far. External reviewers have pointed out that the ENVSEC partners need an improved resource mobilization strategy. Namely, it has been recommended that the partners raise funds as an initiative, not as individual organizations.[91] Furthermore, the initiative has not efficiently used best practices or success stories to expand its donor base, nor has it created a structured relationship with major players like the World Bank or the European Commission.[92] The role its donors play in the governance of ENVSEC is not clearly defined.[93] Since the initiative has not been able to raise additional funds, its long-term sustainability is uncertain.[94] Nonetheless, the initiative still has the opportunity to keep improving. As independent consultants have noted, ENVSEC has the resources, institutional and administrative capacity, and the initial record of success that can be used to attract greater support.[95]

[87] Bouvier, Christophe (2010). „Chair's Summary for 2010," ENVSEC, p. 3.

[88] Stiefel, p. 14.

[89] Gaia Consulting Oy, p. 4.

[90] Stiefel, p. 15.

[91] Bouvier, p. 9.

[92] Stiefel, p. 18.

[93] Ibid.

[94] Gaia Consulting Oy, p. 33.

[95] Ibid.

Impact

The ENVSEC initiative has had a positive but limited impact through the projects it has implemented. According to assessments of said projects, the initiative raises awareness of the different environmental issues affecting given communities.[96] Since the projects also bring together the many stakeholders involved in an issue, the projects help "clarify the roles of different authorities" and thereby improve coordinated and timely responses.[97] At the same time, this practice increases regional cooperation while strengthening civil society and local ownership.

In Central Asia, to name one example, the ENVSEC project on dam safety has led to a forum for regional dialogue on dam safety issues among the five Central Asian countries. In a region where it has been challenging to establish information sharing systems, this marks a success.[98] The project has also increased awareness of how water resources could potentially become a source of conflict for these countries.

However, there are some shortcomings that limit ENVSEC's impact. According to its Strategic Review, it seems that many of ENVSEC's projects are not sustainable.[99] There isn't always a follow-up plan nor an assessment of the project once it is completed. This is partly because projects are not linked to development agencies beyond those that are part of the ENVSEC organizations themselves.[100]

Another factor that detracts from projects' impact is that there is a low level of local capacity training.[101] While projects focus quite well on the technical aspects of environmental and developmental problems, they don't focus enough on the social and institutional aspects that would make projects more sustainable, mainly the political realities of operating in post-conflict and transition countries.[102]

Finally, evaluators have noted that the initiative has low visibility and is "often not known to local and national stakeholders of the projects."[103] This factor further diminishes the impact any project may have.

[96] Gaya Consulting Oy, p. 12.

[97] Ibid.

[98] Ibid, p. 19.

[99] Stiefel, p. 16.

[100] Ibid.

[101] Ibid.

[102] Ibid.

[103] Gaia Consulting Oy, p. 4.

3.8 Conclusion

The Environment and Security Initiative is among the only comprehensive approaches to the link between environmental problems and human security. Its strategic advantage lies in the diverse areas of expertise and interest that each partner brings to the project mix. This flexibility also enables ENVSEC to create projects that combine both aspects of the environment and security nexus: the more familiar security approach and the more developmental. Although climate change is not an explicit factor in the initiative's mission or objectives, projects seem to take the effects of climate change into account anyway. In coming years, however, climate change should become an explicit agenda topic.

Despite being very relevant to these topics, the initiative still has room for improvement in terms of overall effectiveness and impact, as well as in managing costs more efficiently. To be fair, some of the organizational problems ENVSEC has encountered seem normal for an initiative that operates in such a large number of countries with differences in the state of their environment and institutional capacity to manage projects locally. ENVSEC is also quite young and has the initial success base to keep improving.

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4. Case Study 3: United Nations Peacebuilding

Natural resources are vital to livelihoods, exports and growth, but they can also drive or exacerbate tensions both among groups and communities and/or between states. It is estimated that 17 violent conflicts between 1990 and 2002 centred on the exploitation of natural resources.[104] The additional pressure of climate change on the environment and key natural resources such as water may have the potential to act as a conflict intensifier.[105] For this reason it is essential that strategies to build peace and prevent conflict take natural resources into account. Indeed, the natural environment and water in particular also function as a basis for positive strategies that aim to prevent conflict and build peace, such as the Nicosia joint wastewater management initiative between Greek and Turkish communities in Cyprus.[106]

This case study focuses on the work of the Peacebuilding Commission (PBC), created in 2006 to strengthen the work of the United Nations in peacebuilding. The three entities of the PBC, the Peacebuilding Fund (PBF) and the Peacebuilding Support Office (PBSO) form part of what is referred to as the UN peacebuilding architecture (PBA). The case study seeks to understand how current approaches within the PBA are integrating natural resource management (NRM) and are acknowledging how drivers such as climate change may increase the pressures on these resources in the peacebuilding strategies that it creates.

Since its first high-profile mention by the Secretary-General nearly two decades ago[107], the term 'peacebuilding' has grown in importance and is now a widely-used concept, both within the UN and beyond.[108] However, peacebuilding is a broad term and is hence understood in different ways by different UN agencies. This understanding ranges from military and security considerations; to economic recovery and growth. Although the broadness of the term brings an interesting range of constituencies to the table, it also risks camouflaging these differing opinions over what peacebuilding should be.[109]

Divisions over what constitutes an effective approach to peacebuilding stem mostly from the way in which the root cause of conflict is understood. The currently accepted wisdom is that the main focus of peacebuilding activities should be on basic security[110] and moving towards political stability.[111] Whilst a direct cause and effect relationship between the environment and the onset of conflict is not easily proven, it is clear that failure to respond to the environmental needs of war-

[104] UNDP (2005)

[105] European Commission (2008)

[106] Charalambous/ Bruggeman/ Lange (2011)

[107] In the landmark report 'An Agenda for Peace', Secretary General Boutros Boutros-Ghali defined post-conflict peacebuilding as 'action to identify and support structures which will tend to strengthen and solidify peace in order to avoid a relapse into conflict (UN, 1992).

[108] For the purposes of this study, the term 'peacebuilding' refers to post-conflict activities unless specifically mentioned otherwise.

[109] Barnett et al. (2007)

[110] See the report of the Secretary-General A/63/881 for what is currently considered as PB which goes beyond basic security

[111] See e.g. Tschirgi (2004)

torn societies such as access to water can complicate the already difficult task at hand, and in some cases exacerbate and prolong a conflict.[112] Environmental stress may be further increased by drivers such as climate change and population pressures.[113] It is thought that between one-third and one-half of all terminated conflicts tend to relapse into armed violence within five years[114] and that where conflict is related to natural resources, this is twice as likely.[115] For this reason, successful peacebuilding – and in particular peacebuilding which takes environmental factors into account – may be one effective way to prevent violent conflict. Furthermore, ignoring environmental pressures or the need for the management of critical assets such as land and water when building peace may not only worsen the situation, but can be a missed opportunity for reconciliation and reconstruction.[116]

In this way, it is essential that environmental issues, when relevant, are accounted for (along with the other key factors e.g. military, security, socio-economic and human rights) in any strategy to build sustainable peace. A coherent peacebuilding architecture should therefore see peacebuilding from a broader more, holistic perspective that goes beyond basic security to ensure that peacebuilding strategies provide more sustainable solutions for post-conflict societies. As the definition of peacebuilding in the Secretary General's report (A/63/881) exemplifies, there is increasing acceptance of a broader more sustainable perspective. However, this analysis seeks to examine to what extent this increased push for sustainability considers the importance of the environment and natural resources and the implications that climate change may have on their management.

4.1 Background

The PBC is an intergovernmental advisory body consisting of 31 Member States. It was created in 2005 upon the recommendation of the UN Secretary General's High-Level panel on Threats, Challenges and Change[117] through joint resolutions of the UN Security Council and General Assembly.[118] It was one of the few concrete proposals to make it through the 2005 UN reform process and as such may indicate the political importance placed on peacebuilding.[119] It began meeting in 2006 and is currently in its fifth session. Six countries are currently on the agenda of the PBC: Sierra Leone; Burundi; Sierra Leone; Guinea; Guinea-Bissau; the Central African Republic and Liberia. The Commission was established to assist States in the transition from the immediate post-conflict phase to a longer-term reconstruction and development.[120] The PBCs key role is to (1) bring together all of the relevant actors, including international donors, the international financial institutions, national governments, troop contributing countries; (2) marshal resources and (3) advise on and propose integrated strategies for post-conflict peacebuilding and recovery and

[112] Conca (2006); UN (2009); UN PBSO (2008)

[113] UN PBSO (2008) p1

[114] Call & Cousens (2007); Collier & Hoeffler (2004)

[115] See Call & Cousens (2007) and datasets from the Uppsala Conflict Data Program (UCDP) http://www.pcr.uu.se/research/ucdp/

[116] UN PBSO (2008) p1. See also Carius (2006) and OECD (2010).

[117] UN (2004a)

[118] Resolutions S/RES/1645 and A/RES/60/180

[119] IPI (2010)

[120] UN (2004a) Recommendations 82-85

where appropriate, highlight any gaps that threaten to undermine peace.[121] As mentioned earlier, the PBC is part of a three-pillar peacebuilding architecture that includes a secretariat (PBSO) and a multi-donor fund (PBF).

Within the UN system, the PBC is unprecedented in its organisation and mandate, which includes providing advice to the Security Council and the General Assembly on critical peacebuilding issues. The PBC is also mandated to engage with all relevant peacebuilding actors as well as with the World Bank and IMF, providing an access point for funds for Agenda Countries (AC). In this way the PBC makes an important contribution to the International Community's pursuit of a broader and better coordinated agenda for peace and provides a mechanism for coordinating peacebuilding activities. The PBC's work focuses on relevant peacebuilding priorities in the countries on its agenda, and these include environmental management and adaptation to climate change when appropriate. However, the PBC has tended to support actors who can help with security sector reform, governance and economic recovery activities with no consistent push for UNEP or other environmental actors to join discussions on a regular basis.

The first high-level UN acknowledgement of the impact of natural resources on peacebuilding was made by the Secretary General in his 2009 report 'Peacebuilding in the immediate aftermath of conflict' which makes brief mentions of NRM and shows initial signs that environmental considerations are registering in the planning of UN post-conflict peacebuilding efforts.[122] The 2010 edition of the same report dedicates two paragraphs to the role of natural resources and is noted as an area 'of increasing concern where greater efforts will be needed to deliver a more effective United Nations response.'[123] In this way, natural resources are slowly increasing their share in the peacebuilding agenda. Furthermore, the Secretary-General's 2010 report has now created a responsibility for the PBC and PBSO to report on NRM issues for the first time.[124]

4.2 Actors

As the PBC is not operational yet is mandated to lead coordination work rather than actual programming, PBC engagement in the AC is based on the priorities identified by the Commission's counterparts, Government, civil society and international partners. Although until now, UNEPs participation in such meetings has been on an ad-hoc basis, the high-level attention given to NRM by the Secretary-General's 2010 report has a substantial impact on UNEPs role. It may be expected that UNEP will become an increasingly important player within the peacebuilding landscape. Indeed, the PBSO has now approached UNEP for substantive guidance and has encouraged it to put forward proposals for funding by the PBF. This signifies a notable step forward for UNEPs work to increase awareness of the relationship between environment and conflict and, potentially, with regards to climate change.

UNEP has worked on the environmental impacts of conflict since the creation of a dedicated Post-Conflict Assessment Unit[125] in 1999. When the PBC was established six years later, UNEP

[121] Text from http://www.un.org/peace/peacebuilding/

[122] UN (2009).

[123] UN (2010), paragraph 44.

[124] UNEP and PBSO officials mentioned during interviews that terms such as 'environmental protection' and or references to climate change adaptation did not hold much weight in peacebuilding discussions and that 'natural resource management' was the only politically acceptable term that could be used in this context.

[125] Now known as the Post-Conflict and Disaster Management Branch (PCDMB)

implemented an internal initiative to connect the work of the Post-Conflict and Disaster Management Branch with that of the newly formed Commission. This was done by targeting the PBC where its activities focused on addressing the root causes of conflict and promoting sustainable peace. It was felt that both these activities would benefit from taking the environment and natural resources into consideration and a member of UNEP staff was seconded to the PBSO to work on these issues. According to UNEP staff members interviewed, the organization had become increasingly aware that the (mis-)management of natural resources has often acted as a driver of conflict and has also had an impact on the durability of peacebuilding. The environment had often not been considered in post-conflict needs assessments and peacebuilding strategies up to that point. Priorities tended instead to focus on governance, elections or security sector reform. Unit staff members note that there was a desire to ensure that with the establishment of the PBC in 2005, natural resource issues were not marginalised or left off the agenda as they had been in the past.[126] In this way, the increased cooperation between UNEP and different agents of the peacebuilding architecture is the integration of over a decade of expertise on environment and conflict, further improving inter-agency coherence across the UN system. UNEP now no longer has a member of staff working with the PBSO although, the Support Office continues to have internal 'focal points' for these issues. All in all however, the PBSO still mainly continues to rely upon expertise from other branches of the UN system e.g. UNEP and does not yet employ dedicated natural resource experts.

4.3 Main Mechanisms

The PBC engages with countries upon their request and with a referral from the UN Security Council, the General Assembly or the Secretary General. Once the PBC takes an AC on, it is tasked with bringing together all relevant actors. International donors, international financial institutions, national governments and troop contributing countries are to share experiences of conflict and peacebuilding from a general perspective. Other stakeholders are also regularly invited to participate in PBC country-specific meetings. In the case of environmental issues, the clear actor at UN level is the UN Environment Programme (UNEP). However, as mentioned above, until now, UNEPs participation in such meetings has been on an ad-hoc basis. It has thus been difficult to build environmental considerations into peacebuilding strategies in a consistent way.

Whilst UNEP can work with the PBC to ensure that environmental considerations are included at a high policy level and can help to ensure that sustainable NRM and where relevant, climate adaptation policies, are included in the country's integrated peacebuilding strategy (IPBS), it is at an operational level that actors must participate to ensure these policies are carried out. The PBSO provides substantive, administrative and logistical support to PBC ACs. The PBSO, along with the country offices of other UN organisations such as UNEP and UNDP, is responsible for working together with national, regional and local authorities and stakeholders to ensure that where environmental considerations are among the peacebuilding priorities, they are also being carried out on the ground.

PBC ACs are eligible for funding through the PBF. Funding consists of voluntary contributions from Member States, organisations and individuals. The PBF then allocates money through two funding facilities, the Immediate Response Facility (IRF) for more immediate peacebuilding emergencies and the Peacebuilding Recovery Facility (PRF) to support peace consolidation. Initiatives must respond to one or more of the following four criteria:

[126] Adapted from interviews with case study interviewees.

- Respond to imminent threats to the peace process and initiatives that support peace agreements and political dialogue
- Build or strengthen national capacities to promote coexistence and peaceful resolution of conflict
- Stimulate economic revitalisation to general peace dividends
- Reestablish essential administrative services

The PBF has not funded environmental activities as a priority. Among the few environmental activities funded, few, if any have been specifically aimed at climate change adaptation activities. However, as mentioned above, the PBSO is now working with UNEP to improve natural resource awareness within the PBF.

4.4 Evaluation

Relevance

The inclusion of environmental considerations in the PBCs work is still in its infancy. However, the PBC has only been operational since 2006 and has therefore yet to settle into the UN and the post-conflict/peacebuilding/development landscape. For this reason, although there is a clear move towards improved management of natural resources, it may be some time before this becomes a mainstream element of the PBCs work. However, like the Security Council and the UN General Assembly, the PBC is an inter-governmental organ and can therefore not be evaluated for its on the ground activities. Additionally, the way in which the PBC operates means that it addresses the needs of each AC on an individual basis, supported by the PBSO, but led by the AC requesting assistance. Thus, the AC would always need to be in agreement that environmental management or climate change adaptation should be included in their peacebuilding strategy. As such, it may be beyond the PBCs control that the environment does not become a key component of a peacebuilding strategy.
Nevertheless, there are some important efforts being made to move this environmental integration forward, notably the secondment of a member of UNEP staff to provide advice on NRM and its acknowledgement as an issue through the identification of 'focal points' within the PBSO.. Furthermore, although this work has been slow and time consuming, NRM issues are beginning to be recognised at the highest level by the Secretary-General.[127] His 2010 report has dramatically increased the visibility of environmental issues and UNEP is likely to become a more central actor in peacebuilding discussions in the future.

Notwithstanding these developments, a UNEP staff member interviewed noted that although environmental issues are gaining visibility, using peacebuilding strategies to avoid climate induced hydro-conflict or to build the capacity to adapt to climate change is not yet a politically viable topic. The initial task is to encourage groups to engage in NRM to capitalise on the interest in gaining

[127] The 2004 report of the UN Secretary-General's High-Level Panel on Threats, Challenges and Change highlighted the fundamental relationship between the environment, security, and social and economic development in the pursuit of global peace in the 21st century (UN, 2004a) while a historic debate at the UN Security Council in June 2007 concluded that poor management of "high-value" resources constituted a threat to peace. (UNSC, 2007). More recently, ex-UN Secretary-General Ban Ki-Moon stated that "the basic building blocks of peace and security for all peoples are economic and social security, anchored in sustainable development, [because they] allow us to address all the great issues – poverty, climate, environment and political stability – as parts of a whole." (Ban, 2008) Source: UNEP (2009).

economic benefits from natural resources.[128] Some mapping studies are nevertheless underway e.g. covering the Sahel region. These could add to increasing high-level awareness on climate change induced water scarcity and the implications for conflict. An interesting new initiative that could further help to push this forward at the international level is the UN-EU partnership on Natural Resources, Conflict and Peacebuilding which is designed to provide guidance, technical support and enhance policy development and programme coordination between key actors at the field level to improve natural resource management for conflict prevention and peacebuilding.[129]

Effectiveness

The PBC has so far not been particularly effective at bringing environmental considerations into peacebuilding strategies in ACs. This is mainly due to the fact that ACs decide on their priorities themselves. Although there is an increasing level of support and understanding of the relevance of natural resources (both in exacerbating and in mitigating conflict) at high level within the UN, it is beyond the PBCs mandate to push this agenda beyond what the ACs are willing to accept. Indeed, as mentioned above, due to the high-level of AC involvement, it may not always be possible to influence the full range of activities decided upon under a peacebuilding strategy. Nevertheless, the PBCs NRM work is complemented and supplemented by the work of partners such as UNEP and other international actors, who are addressing wider issues of NRM in conflict settings in programmes in Sierra Leone, Sudan and Afghanistan.

Nevertheless, the IPBS preparation process in Sierra Leone was seen by donor governments and UN agencies as a means of steering policy and institutional-reform agendas toward issues that, they felt, had been underemphasised in the past.[130] Natural Resource Management was included but was met with dissent from the Sierra Leonean side. Although it was agreed in discussions to include NRM, the lack of support meant that it was pushed out of the resulting 2007 document with the draft IPBS. There is an obvious tension between donors' wishes to encourage IPBSs to be nationally-owned and exercising a degree of control over country governments who do not wish to be watched over, especially where natural resources are concerned. This is exacerbated by the PBC/SOs lack of capacity and mandate to carry out monitoring activities.[131] In this way, despite high-level interest in sustainable natural resource management, the perennial struggle remains between the ideals of the 'hub' (the PBC) and the reality driven actions of its 'satellites' (local actors and UN country offices). As a relatively young institution, the PBC has needed some time to establish itself within the post-conflict community, fitting in between peacekeeping and development actors and will need to come to terms with how it is to position itself in matters of AC sovereignty.

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[128] Although the UN has extensive expertise in water management (Carius et al. 2004) its potential for conflict mitigation has yet to be systematically exploited by the PBC/SO.

[129] See: http://www.unep.org/conflictsanddisasters/Policy/EnvironmentalCooperationforPeacebuilding/UNEUPartnership/tabid/29405/Default.aspx

[130] Jenkins (2008) and case study interviewees.

[131] In Sierra Leone for example, after the Joint Vision strategy was created, little work has been carried out in follow-up making it difficult to ensure that the activities agreed upon were indeed implemented. However, as Jenkins (2008) and interviewees have noted, this is also in part due to country governments who have 'successfully resisted the inclusion of 'hard' (i.e. enforceable) benchmarks and indicators in their peacebuilding strategies making monitoring and follow-up difficult.

The high number of developing country members of the PBC enables parties from the global South to have a stronger voice than may be the case at other UN fora. This may not always work in to the advantage of including of environmental considerations into peacebuilding strategies. Indeed, Jenkins has noted that during proposals for the PBCs activities, the inclusion of an 'early-warning' system (for states in danger of breaking into violent conflict) was successfully resisted by the '(mainly) developing countries…motivated much by fears that such a capability would augment the power of the world's leading states as they were by considerations about how peacebuilding should be conceptualised.'[132] Thus, although UNEP may seek to enhance the integration of environmental concerns into peacebuilding strategies, its intervention may not always be seen in the most favourable light by states whose key priority is to assert their sovereignty. This is particularly relevant to valuable natural resources where there is a fear that sustainable resource use programmes as designed by international donors and actors from the global North may result in overall economic loss.

However, it is essential that the PBC is able to communicate to partners that peacebuilding strategies should, in the very least, attempt to ensure that environmental situations are not worsened by IPBSs. Increased pressures on local resources have knock-on effects where pastoral and tribal communities are displaced first by conflict, and then again by force in the name of, for example, economic growth, under the guise of achieving stability after conflict.[133] It is therefore crucial that the PBC pushes for strategies that address environmental and societal security needs at the same time as pursuing sustainable economic policies. Therefore, in order to build lasting peace, that avoids tensions and disputes in post-conflict regions being reignited, a threefold approach (taking social, economic and environmental factors into account) is what is needed.[134]

Efficiency

As with most UN bodies, the PBC has a high bureaucratic load and must adhere to matters of protocol. For this reason, it is not able to move initiatives through its system with particular speed, as has been seen with the slow progress of UNEP's capacity-building work with the PBC. On the other hand, the PBC has the potential to streamline and improve upon the piecemeal peacebuilding initiatives that were previously in place between UN Department for Peacekeeping Operations (DPKO) initiatives and development activities taking place under UNDP's umbrella. Indeed, it is now generally accepted as the 'go-to' agency for peacebuilding efforts and is increasingly encouraging other UN agencies to come together to act in a more efficient and joined-up manner.

Impact

One key activity of the PBC is to take the experiences from its inter-agency coordination work and to report back to the Security Council, the General Assembly and the Economic and Social Council in a series of 'Lessons learned'. These have the ability to bring examples of best practice directly to the community of peacebuilding agencies, both within the UN and beyond.[135] Increased attention on natural resources was visible in the Working Group on Lessons Learned 2008 report entitled 'Environment, Conflict and Peacebuilding,' which noted that the PBC could 'promote the need for environmental stress assessments and incorporate the relevant findings into the integrated

[132] Jenkins (2008) p5. See Addendum 2 (para 17) of UN (2005).

[133] Swain and Krampe (2011 forthcoming).

[134] See Swain, Kostić, and Krampe (2011 forthcoming)

[135] Jenkins (2008)

peacebuilding strategies developed with countries on its agenda.'[136] UNEPs publication of the report 'From Conflict to Peacebuilding' (2009) also pushes to deepen the understanding of lessons learned in relation to the environment, conflict, and peacebuilding nexus in future PBC meetings and other knowledge-sharing activities within the wide UN peacebuilding community.

As mentioned above, there is a slow trickle down impact of the work that UNEP is carrying out towards integrating environmental considerations in the PBC. This is done through ad-hoc meetings and through collaboration with the PBC in the UN-EU joint papers from the Environmental Cooperation for Peacebuilding partnership. Nevertheless, the PBC is still working to become accepted in its own right, which makes it difficult for these environmental issues to be pushed at meetings with ACs when defining peacebuilding strategies. It is essential that the PBC begins to make an impact in this area as ineffective or incomplete peacebuilding strategies may actually exacerbate a situation of conflict, increasing environmental insecurity in the long run.[137]

[136] PBC WGLL (2008)

[137] Swain and Krampe (2011 forthcoming)

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Other resources

- UN-EU Partnership on Environmental Cooperation for Peacebuilding

http://www.unep.org/conflictsanddisasters/Policy/EnvironmentalCooperationforPeacebuilding/UNEUPartnership/tabid/29405/Default.aspx

- Uppsala Conflict Data Program

http://www.pcr.uu.se/research/ucdp/

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Climate Change, Hydro-conflicts and Human Security

SEVENTH FRAMEWORK PROGRAMME

European policies regarding water policy, climate change and security in the MENA

Contract number: SSH-CT-2010-244443

Work Package: WP4

Partner responsible: Ecologic Institute

Deliverable author(s): Maria Berglund (case study 1) and Christoph Stefes (case study 2)

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Abstract: The following is a review of two European polices dealing with aspects of water policy, climate change and security at European Union (EU) level. The EU has a well-developed policy framework for addressing water and climate issues whilst security policy, due to the historical division of powers within the EU, remains less well developed. The review covers the Long Term Strategy for Water in the Mediterranean and the European Security Strategy. It begins by providing background information to the policy process, followed by a description of the actors involved, as well as the main mechanisms for carrying out the two policies. Finally, each policy is evaluated on the basis of OECD criteria for development assistance, according to relevance, effectiveness, efficiency and impact.

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Acronyms

CC	Climate Change
ENP	European Neighbourhood Policy
EUWI	European Union Water Initiative
IWRM	Integrated Water Resource Management
MDGs	Millennium Development Goals
MED EUWI	Mediterranean component of EUWI
SWM	Strategy for Water in the Mediterranean
TTWG	Thematic technical working groups
UfM	Union for the Mediterranean
WEG	Water Expert Group

1 Introduction

Since the first formal establishment of a European supranational community in 1951 through the European Coal and Steel Community, the European Union has evolved from a community focusing on internal cooperation to one with a strong focus on external relations. Both internally and externally, the Union is committed to strengthening environmental commitments and ensuring peace and security.

The European Union cooperates with its neighbours through its Directorate-General EuropeAid Development and Cooperation as well as through its European Neighbourhood Policy (ENP). DG EuropeAid is responsible for designing EU development polices and delivering aid through programmes and projects with a world-wide focus. On the other hand, the ENP seeks to enhance cooperation between its closest neighbours through bilateral policies between the EU and each partner country. Through bilateral action plans, the EU offers its neighbours privileged relationships and offer political support to carry out political and economic reforms.

Table 1 Policies linking water management, climate change and security at EU level

Type of Policy	Policy			
Focus on Water management	EU Water Framework Directive	EU Floods Directive	Strategy for Water in the Mediterranean	ACP-EU Water Facility
Focus on Climate Change Adaptation	White Paper on Adaptation to Climate Change			
Focus on Security	European Security Strategy		European Neighbourhood Policy	

Among the policies identified during the screening process, the European Security Strategy and the MED EU Water Initiative were considered the most appropriate for further analysis. The selection was based on the degree to which the policies in question address climate change adaptation, whether the policies covered all three policy fields (i.e. adaptation, water, and security), if the policy could be considered best practice, as well as the innovative nature of the policy.

The European Security Strategy (ESS) explicitly addresses climate change and has resulted in a number of high-level discussions and position papers focussed on integrating climate change into security policy at EU level. The ESS was also chosen because security policy is a non-environmental field, so it was considered innovative to see how climate change considerations are integrated into other sectoral policies. The Long Term Strategy for Water in the Mediterranean was chosen because its core themes seek to achieve equitable water allocation (human security and conflicts component), reduce the impacts of droughts and water scarcity (hydro-climatic events) and incorporate climate change considerations into water demand management (adaptation). Additionally, the Strategy was developed in conjunction with both EU Member States and Mediterranean countries, signalling good neighbourhood policy.

On the other hand, although the European Neighborhood Policy focuses on fostering democracy and cooperation and reducing conflicts in the region, it does not focus enough on environmental issues, and climate change adaptation is largely lacking from key documents. The EU Water Framework Directive (WFD), the EU Floods Directive and the White Paper on Adaptation to Climate Change focus solely on the European Union and do not promote activities in the MENA region. Additionally, the WFD gives no mention to climate change adaptation or human security issues. In addition, the Floods Directive has just been ratified and Member States are only at the beginning stages, which makes it difficult to judge its impact. The ACP-EU Water Facility is more of an organisation than a policy, and also does not cover climate change considerations enough to be considered for this work package.

In the following sections, the Long Term Strategy for Water in the Mediterranean and the European Security Strategy will be described, providing background information to the policy process, the actors involved, as well as the main mechanisms to carry out the two policies. Additionally, each policy will be evaluated using OECD criteria: relevance, effectiveness, efficiency and impact.

2 Case Study 1: Long Term Strategy for Water in the Mediterranean

The Mediterranean Basin, which covers twenty-two countries and territories, is characterized by a subtropical climate, i.e. warm to hot, dry summers and mild to cool, wet winters. Most of the yearly rainfall occurs in the winter months with a significantly dry period of little significant precipitation during the summer months. The considerable seasonal variability in temperatures and rainfall is expected to increase due to climate change: so far there has been a recorded increase in temperature of almost 2°C over the 20th century, coupled with decreases in rainfall of as much as 20% in some Mediterranean regions to the south (UNEP, 2009, p.23). Water resources in the whole region are increasingly scarce due to a combination of increased water demand due to demographic pressure, urbanisation, tourism need, and decreased water supply (EUWI, 2007). The number of "water-poor" people, those living in countries with less than 1000 m^3/capita/year of renewable water resources, is already around 180 million in region. Moreover, 60 million people in Malta, Libya, Palestinian Territories, Israel, Algeria and Tunisia are already facing water shortage (i.e. less than 500 m^3/capita/year) (UNEP, 2009, p. 37). Climate change is expected to further exacerbate already existing water stress in the region and recurrent, persistent droughts are also expected to increase significantly.

Water scarcity, especially with the potential for increased uncertainty in supply, is a considerable problem for a region with high vulnerability. Low water availability has limited development in the MENA region and negatively affected household incomes, education and nutrition (Wingqvist, 2010). Fulfilling basic needs such as food, work, shelter, health and water is challenged by water scarcity (Ibid). An uncertain water supply coupled with the climate change impacts could amplify existing challenges regarding poverty and ensuring livelihoods in North Africa and parts of the Middle East. Water governance in the Middle East is affected by the instable political situation, a lack of coherency among environmental and incompatible political interests (Ibid). Competition and unequal distribution of water resources among sectors (e.g. agriculture domestic use, tourism, energy) could lead to mass migrations and increase conflicts in these regions. In southern and south-eastern Europe, instability in water availability for key sectors could also negatively affect people's well-being (EUWI, 2007).

While the political frameworks of the Mediterranean countries differ, these countries share a number of similarities including environmental conditions and problems. In light of this, in 2008 at the Euro-Mediterranean Ministerial Conference on Water, the need to elaborate a long term Strategy for Water in the Mediterranean (SWM) was highlighted. The Water Expert Group (WEG)

with technical assistance by the European Union Water Initiative (EUWI) was mandated to develop the SWM to present at the 2010 Ministerial Conference on Water in Barcelona.

2.1 Description

2.1.1 Background

Given the significant water problems (water scarcity, droughts) in the region and the implications they have on livelihoods, it was decided at the 2008 Euro-Mediterranean Ministerial Conference on Water (22 December 2008, Dead Sea, Jordan) to elaborate a new long term Strategy for Water in the Mediterranean. The overall aim of the SWM is *agreeing on a common political, methodological, and financing framework to facilitate the implementation of regional policies in the water field*. To this end, the two main goals of the Strategy are: (1) the conservation of water quality including the prevention of further deterioration of water resources, and (2) achieving a balance between the quantity of water used and quantity of water available including mitigation and preventing the consequences of droughts and water scarcity. To achieve these goals, the ministers agreed to focus on four main themes: water governance; water and climate change adaptation; water demand management including non-conventional water resources; and water financing (see Table below for concrete objectives within each theme). Thus, the SWM seeks to address current water problems and future pressures in the face of climate change in order to improve water security in the region.

Table 2 Objectives of the Strategy for Water in the Mediterranean

Priority topic	Objectives
Water demand management and non conventional water resources	(1) Ensure water saving and achieve water efficiency to cope with water scarcity and droughts impacts, meet the needs of populations and the environment, and reduce water demand through a more efficient allocation of water resources; (2) Improve "inter-sectoral efficiency"; (3) Ensure good quality public water services that provide access to adequate and affordable water supply and sanitation, in particular for the poor (4) Reduce and prevent water pollution, expand the scope of water protection and avoid overexploitation of water resources (5) Set standards for and promote implementation of best agricultural practices, promote modernization of agricultural techniques, including irrigation systems; (6) Develop additional water resources volumes; (7) water savings of 25% by 2025.
Integrated CC into water resource management	(1) Provide an integrated and strategic regional approach to existing and emerging challenges, reversing the current spontaneous and fragmented practices followed in most cases; (2) Ensure effective measures, enhancing the resilience of water resources to droughts and reducing risk of floods, through improved integrated, decentralised and participatory management of water, ecosystems and natural resources; (3) Be based on enhanced scientific evidence and an enlarged knowledge-base regarding the evolution of the phenomena and their impacts.

Governance	(1) Ensure that water is managed as a primary/basic human need and that water supply and sanitation are essential social services. Public authorities must take adequate measures to make this effective and affordable; (2) Ensure sustainable water and sanitation service provision supported by appropriate regulatory frameworks and effective institutional settings; (3) Promote and strengthen decentralization to the most appropriate level ("principle of subsidiarity"). To apply the integrated approach to best effect, the local management level needs to be considered, i.e. catchment, sub-basin or basin, as appropriate; (4) Promote collaboration at transboundary and sub-regional level, building upon and contributing to regional integration and cooperation, taking into account economic, social and environmental problems, as a means for avoiding conflict and promoting peaceful co-operation.
Financing	(1) Develop financing strategies to improve the overall financing of the water sector through sustainable cost recovery policies; (2) Improve efficiencies to reduce the financing gap by reducing investment needs and operational costs. This includes efficiency in water resources allocation, use, investment planning and functioning of the sector related entities; (3) Mobilize additional revenues from tariffs for water services, public budgets, and ODA grants, as well as from repayable finance, such as external finance (e.g. concessional or commercial loans); (4) Encourage private investments in the water sector by promoting public-private partnership and strengthening public regulation of the sector; (5) Improve the supply, effectiveness and accessibility of bi- and multilateral finance at a regional, national and local level and improve the quality of subsequent projects and activities.

2.1.2 Actors responsible

In November 1995 the Euro-Mediterranean Partnership – also known as the Barcelona Process – was launched to develop a framework to manage bilateral and regional relations between European Union[1] and Mediterranean countries. Due to the proximity of Mediterranean countries to the EU, a framework for cooperation was considered advantageous to foster cultural and economic unity and to straighten out clashes and misunderstandings between and among European and Mediterranean countries. The Barcelona Declaration, which laid out the foundations of the regional relationship, comprised three baskets:

- Economic – to work for shared prosperity in the Mediterranean, including the Association Agreements on the bilateral level and an establishment of a free-trade area
- Political and Security – promotion of political values, good governance and democracy and defining a common area of peace and stability.
- Cultural – cultural exchange and strengthening civil society.

However, for the most part the Barcelona process was declared ineffective[2]; the political and security situation did not change much through the rest of the 1990s and early 2000s, largely due

[1] At the time this included the EU-15

[2] For example see Youngs and Schoefthaler, 2007.

to the impetus of the Middle East Peace Process. The main criticism was that the European Union played a too predominant role[3] in the Process and there was a lack of co-ownership.

In 2008 at the Paris Summit for the Mediterranean, regional level cooperation between European countries and the Mediterranean was re-launched as the Union for the Mediterranean (UfM). In order to avoid past problems and criticisms with the north-south relationship, the Euro-Mediterranean Partnership received an improved institutional architecture to increase co-ownership of the process[4]. The main focus of the original process remain (i.e. politics and security; economics and trade; socio-cultural) and have been expanded to include[5]:

- Justice and Interior Affairs
- De-pollution of the Mediterranean
- Maritime and land highways
- Civil protection
- Alternative energies: Mediterranean solar plan
- Higher education and research: Euro-Mediterranean University, and
- The Mediterranean business development initiative.

Continued conflicts between some UfM members (e.g. Arab-Israeli conflict) has delayed work and all ministerial meetings were blocked until the second half of 2009.

Complementary to the Euro-Mediterranean Partnership, which covers multiple thematic areas, the European Union Water Initiative (EUWI) was launched in 2002 at the World Summit on Sustainable Development. The aim of this initiative is to help mobilise EU resources, human and financial, in various geographic areas - including the Mediterranean - to achieve water-related Millennium Development Goals (MDGs) in partner countries. The EUWI is considered an international political initiative and not a financial mechanism. The initiative brings together national governments, donors, the water industry, NGOs, and other stakeholders to participate in national policy dialogues aiming to improved coordination and cooperation and to deliver more effective development assistance. The EUWI is broken down into working groups having either a regional focus (e.g. African, Mediterranean, EECCA and Latin America) or they concentrate on cross-cutting issues (e.g. Research, Finance). The EUWI was five main objectives:

- The reinforcement of political commitment towards action and innovation oriented partnership
- The promotion of improved water governance, capacity building and awareness
- Improved efficiency and effectiveness of water management through multi-stakeholder dialogue and coordination
- Strengthened co-operation through promoting river basin approaches in national and transboundary waters
- Identification of additional financial resources and mechanisms to ensure sustainable financing

[3] EU members increased over time from 15 MS to 27 with the enlargement of the EU in 2004 and 2007.

[4] For more information refer to the Joint Declaration of the Paris Summit for the Mediterranean, Paris, 13 July 2008.

[5] Ibid

The Mediterranean Component of the EU Water Initiative (MED EUWI)[6] aims to assist in designing better results-oriented water programmes, to facilitate coordination between such programmes, and to improve the effectiveness of funds. MED EUWI focuses on the following themes:

- Water supply and sanitation, with emphasis on the poorest part of society
- Integrated water resources management with emphasis on transboundary water bodies
- Water, food and environment interaction with emphasis on fragile ecosystems
- Non-conventional water resources and
- Cross cutting issues such as transfer of technology, transfer of know-how, and capacity building

MED EUWI is led by the Government of Greece (Ministry of Environment, Energy and Climate Change and the Ministry of Foreign Affairs) and receives technical support from the Global Water Partnership, which also undertakes the day-to-day tasks of carrying out the MED EUWI operational programme. As mentioned above, MED EUWI provided technical assistance to the WEG throughout the development of the SWM. Conversely, the WEG provides institutional support for the implementation of MED EUWI activities at regional and national levels by offering advice and guidance. MED EUWI realises its work through the development of annual work programmes outlining objectives and main activities. The current mandate stipulates that MED EUWI activities up to 2015 will focus on, among other things[7], implementation and monitoring of Integrated Water Resource Management plans (IWRM) including national climate change adaptation strategies. The main output with respect to climate change adaptation so far has been the formulation on a position paper on climate change adaptation and IWRM, which gave recommendations on how MED EUWI could further assist countries. This paper was further developed for the 2008 Jordan Conference and included policy recommendations on which instruments could support water-related adaptation responses for the Mediterranean (EUWI, 2007). Additionally, the MED EUWI prepared country assessments on IWRM including climate change considerations.

2.1.3 Main mechanisms

The Water Expert Group of the UfM was tasked with developing the SWM. In order to facilitate the drafting of the Strategy, the WEG held three meetings to elaborate the focus of the SWM, to discuss which UfM countries would contribute to which chapters, and to decide on the methodology and work plan to carry out the task. As the development of the SWM in collaboration with all Mediterranean countries was a highly political and sensitive process, these meetings helped to ensure transparency and co-ownership of the final output. To streamline efforts, four thematic technical working groups (TTWG) covering the four main themes were established. For each chapter (theme), the Strategy provides information on the state of play, the theme's main objectives and priorities, potential approaches and instruments, as well as recommendations for action. Each TTWG was made up of 10 participants from national institutions and regional organizations with

[6] Partner countries include Algeria, Egypt, Jordan, Israel, Lebanon, Libya, Morroco, Palestinian Authority, Syria, Turkey, Tunisa (Mediterranean partners), Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Former Yugoslav Republic of Maecedonia, Romania, Serbia and Montenegro.

[7] Additional focus points are: prioritisation of national needs for the water sector in order to meet national targets; implementation of national planning activities including assistance to countries for the elaboration,; development of sustainable financing strategies for the water sector; and improved donor coordination, harmonisation and alignment on the ground.

expertise in the subject addressed. The MED EUWI provided technical assistance throughout the process.

To facilitate the realization of the Strategy's goal, the plan was for the Strategy to be complemented by an Action Plan to be developed alongside the Strategy. The intention was for the Action Plan to serve as a 'road map' to *match policy choices made at the Strategy with major on-going and future operational plans implemented and/or designed by governments, international financing institutions and stakeholder organizations* (UFM, 2009). A technical working group was also set up to draft the Action Plan; however, due to the significant amount of work to be done, it was decided to hold off on drafting the Plan until after the approval of the SWM at the 2010 Ministerial Conference in Barcelona. However, despite agreement on almost all of the strategy's content, negotiations were not successful due to political disagreements on the certain wording of territories under dispute[8]. At the moment of writing the SWM has still not been approved.

The work carried out for the elaboration of the SWM was financed through funds earmarked for the MED EUWI budget[9] from the MEDA Water Programme of the European Commission, the European Commission itself, and the Government of Greece. Additionally, funds were provided by the GEF Strategic Partnership for the Mediterranean Large Marine Ecosystems, IWRM Component. Total funds were calculated at 510,000 € with the intention to cover activities related to technical work (expert fees), organizational and participation costs of meetings, and overall administration.

Although the SWM has not yet been approved, a preliminary list of projects to achieve its objectives has been drawn up focussing on (1) Adaptation to Climate Change, (2) Balance between supply and demand, (3) Conservation and rehabilitation of natural environments, (4) Depollution of the Mediterranean and (5) Technologies and efficient use of water. Within the context of the 1st priority, the following projects with a focus on governance are foreseen:

- Long-term accompaniment and anticipation of climate change in the Souss Massa Draa region of Morocco (for urban/coastal sectors /Agadir, agricultural sectors of the Souss Plan and rural sectors of the Anti-Atlas). Estimated budget: 3.5 € million.
- Assessment of the hazardous impact of sea level rise in the Nile Delta (Egypt). Estimated budget: 650,000€.
- Framework for intra- and inter- multi-stakeholder Cooperation for the promotion of Sustainable Development in the Mediterranean with emphasis on water. This project will be carried out in all Mediterranean countries.
- Cooperation on Climate Change Impact and Adaptation Studies in the Water Resources Sector (Egypt, region).
- Climate Change Impact and Adaptation Studies for the Coastal Line and Deltas (Egypt, region).
- Addressing the impact of Global Climate Change on Water Resources of Jordan. Estimated budget: 2.65 €million
- Establishment of a Regional Research Center for Climate Change in the Mediterranean Region. Estimated budget: 2 €million.

[8] E.g. Israel opposed a reference to the "occupied territories".

[9] The MED EUWI currently receives its financing from the European Neighbourhood and Partnership Instrument. Previously, it was funded through the now defunct MEDA Programme.

- Establishment of a Regional Early-Warning System and a network for the monitoring of sea-level rise.
- Assessment of Climate Change effects on the Mediterranean Environment in Egypt. Estimated budget: 2.8 €million.

Pending approval of the SWM, these projects will be developed in more details and implemented in the foreseeable future. Funding for these individual country and regional projects will come from a wide variety of sources such as the private sector, national development agencies from EU Member States (e.g. the French Development Agency), international and regional banking institutions (e.g. the African Development Bank, the World Bank, the European Investment Bank), etc. Additionally, the SWM calls for the mobilisation of additional financing for the water sector through national water tariffs and public subsidies.

In order to evaluate whether the Strategy will achieve its goals, it is envisaged to set up periodic policy assessments and monitor progress towards agreed objectives based on coherent and homogeneous data. As such, the Strategy is intended to include indicators and quantified objectives so that regular monitoring can take place. A preliminary list of quantitative objectives and indicators[10] were presented by Lebanon and France during the SWM development for each sub-theme; however, it was decided to finalize these indicators during the drafting of the Action Plan which has been delayed.

2.2 Evaluation

Since the Strategy for Water in the Mediterranean was not approved at the June 2010 Ministerial Conference in Barcelona, implementation of projects to achieve the Strategy's aims have been delayed. Another UfM Summit was scheduled for November 2010 but subsequently postponed and a new date has not been set; however, in December 2010 there were new discussions at the UfM Senior Officials Meeting to re-launch the Strategy and finalize the process[11]. Given that the Strategy has not been approved, it is not possible to fully evaluate its implementation at this time. As such, this section will focus on whether the contents of the Strategy lends itself to achieving its objectives and whether the Strategy has addressed the policy interface between climate change, hydro-climatic events and human security.

2.2.1 Relevance

The objectives of the main themes of the SWM, as described in detail in Table 2 Objectives of the Strategy for Water in the Mediterranean are appropriate for the overall goals of the Strategy and to address the water-related problems outlined in the introduction. The sub-objectives of each theme fit with the goals to conserve water quality, balance water quantity and ensure access to water for all. The SWM highlights the need to secure water resources today as well as ensure proper supply in the future. It acknowledges the potential impacts of hydro-events (i.e. droughts and long term water imbalance (water scarcity)) and seeks to minimize the effects in order to ensure water security in the region. As the means of achieving the objectives will be through implementing individual projects, it is important that the implementing authorities in each country keep the

[10] For the preliminary objectives and indicators please refer to Annex 1

[11] Communications with Vangelis Constantianos, MED-EUWI Secretariat, 20 January 2011.

overall goals in mind. Proper monitoring and regular policy assessment envisaged should help to ensure that individual projects as a whole work to realise SWM goals.

2.2.2 Effectiveness

It is not possible at this time to evaluate the extent to which the policy is attaining its objectives. Whether the objectives are likely to be achieved rests on whether political tensions unrelated to water use (i.e. the conflict over the wording of country names in the SWM) will be resolved. The Arab/Israeli conflict has negatively impacted cooperation at regional level since the inception of a Euro-Mediterranean cooperation. In the past MED EUWI activities/projects have been heavily influenced by the political nature of the work (EUWI, 2010). Lessons learned from MED EUWI work indicates that *due to the strong political nature, water related activities in the region must respond to demand by high level competent authorities and be embedded in legitimate political processes and frequently assessed and adjusted* (Ibid, p.19). Additionally, the MED EUWI has learned that in order for interventions to be successful they must have clear objectives and outputs. As such, a potential factor limiting the achievement of goals is whether the Action Plan develops appropriate objectives and indicators of progress for SWM activities.

2.2.3 Efficiency

It is not possible at this time to evaluate the potential efficiency of the projects to be carried out under the auspices of the SWM since they are still in development phase and no detailed descriptions exist.

2.2.4 Impact

At the moment it is not possible to evaluate the impact of the SWM since it has not been approved. Draft environmental indicators to determine whether the SWM is achieving the sub-objectives of each theme are listed in Annex 1. They will be further developed in an Action Plan, which will hopefully be re-launched this year.

2.3 Conclusion

The Long Term Strategy for Water in the Mediterranean represents a first sound approach to improve water resources management in the region. By focussing on four main themes, the Strategy hopes to steer the region towards a more sustainable use of water resources. The Strategy is a political document and does not provide detailed information regarding how it will achieve its overarching objectives. The approaches and instruments described are vague and the recommendations for action are ambitious. However, an Action Plan is intended to accompany the Strategy and operationalize its objectives.

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3 Case Study 2: The European Security Strategy

3.1 Background

Partly in response to the growing divide among its members over the Iraq war, the European Union (EU) issued the European Security Strategy (ESS) in 2003.[12] Drafted by the High Representative for the Common Foreign and Security Policy[13], Javier Solana, *A Secure Europe in a Better World* conceptualizes security in broad terms, mentioning both national as well as human security. The ESS thereby acknowledges that with the end of the Cold War, the threat scenario has become more diffuse. Among the "key threats" that the ESS identifies are terrorism, proliferations of weapons of mass destruction, regional conflicts, state failure, and organized crime. Climate change is not specifically listed as a key threat. The ESS only warns that "Competition for natural resources – notably water – which will be aggravated by global warming over the next decades, is likely to create further turbulence and migratory movements in various regions."[14]

In the following years, however, climate change was increasingly regarded not just as an environmental but also an economic and security issue. Climate change moved from the sidelines to the centre of the security debate in Europe. Several developments and events were responsible for the newly discovered link between climate change and security in the EU. Several reports and studies that were published in the second half of the 2000s insisted that climate change would likely produce disastrous economic, social, and political consequences around the world. For instance, in 2006 the *Stern Review on the Economics of Climate Change* noted the close relationship between growth and non-income indicators of development such as peace and security, and warned that the consequences of climate change included the risk of large-scale movement of populations and global insecurity.[15] It therefore argued that the benefits of strong, early climate change adaptation measures would considerably outweigh the costs. A year later, the Intergovernmental Panel for Climate Change (IPCC) published its Fourth Assessment Report in which it predicted that global warming would have disastrous consequences for tens, if not hundreds of millions of people, especially in developing countries.[16] At the 2007 Munich Security Conference Chancellor Angela Merkel called climate change a "global threat".[17] Inside the European Commission, DG Relex and DG Environment strongly pushed for a stronger role of the EU in the area of climate change and security.

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[12] *A Secure Europe in a Better World. European Security Strategy*. 12 December 2003. *http://www.consilium.europa.eu/uedocs/cmsUpload/78367.pdf* (last accessed: 22 October 2010).

[13] Following the entry into force of the Lisbon Treaty, this post has become the "High Representative of the Union for Foreign Affairs and Security Policy", Article 18 TEU.

[14] *ESS,* pg. 3.

[15] N. Stern, *The economics of climate change: The stern review*, 2007. pg. 84, 109 http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/stern_review_report.htm.

[16] M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden and C. E. Hanson (eds.), *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007*, (Cambridge, United Kingdom and New York, NY, USA, 2007). For a summary, see the Synthesis Report 2007 of the IPCC, Chap. 3. *http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm* (last accessed: 22 October 2010).

[17] *http://www.securityconference.de/archive/konferenzen/rede.php?menu_2007=&menu_konferenzen=&sprache=de&id=178&*

In June 2007 the European Council invited Javier Solana and the European Commissioner for External Relations, Benita Ferrero-Waldner, to draft a joint paper that would discuss in more detail the challenges that emanated from climate change.[18] Ferrero-Waldner and Solana convened several roundtables of non-governmental organisations and research institutes to discuss this matter. The input of these experts and academics in combination with findings of the IPCC's Fourth Assessment Report shaped the structure and content of the 11-page paper that Solana and Ferrero-Waldner submitted in March 2008.[19]

The paper argues that "Climate change is best viewed as a threat multiplier which exacerbates existing trends, tensions and instability. The core challenge is that climate change threatens to overburden states and regions which are already fragile and conflict prone."[20] More concretely, the paper warns that climate change could diminish access to critical resources – such as, water, arable land, food, etc. – due to droughts, floods, and other extreme weather events as well as rising sea levels. Climate change also poses risks to coastal cities and critical infrastructure as well as leads to a loss of territory. Climate change will cause an intensification of conflicts over scare resources. These conflicts and growing public pressure on governments to compensate for lost resources might overburden already fragile states whose eventual collapse creates lawless areas in the developing world. Instability in weak or failing states affects Europe's economic and political interests, as access to critical natural resources in developing countries becomes more difficult and conflict over these resources will intensify. Furthermore, exacerbated instability in failing states could spread across borders and advance terrorism. Finally, climate change makes human survival in Africa increasingly difficult. Europe will therefore have to cope with mass migration from this continent.[21]

The Solana Paper further warns that "Climate change impacts will fuel the politics of resentment between those most responsible for climate change and those most affected by it", posing an additional challenge to international governance.[22] Moreover, international law may have to be revised to deal with new sources of conflict (e.g., who owns the resources in the Arctic that have previously been inaccessible?) and changing meanings of sovereignty (e.g., what are the rights and obligations of states that have lost their territory due to rising sea levels?). In short, the international security structure might unravel due to the combined impact of increasing conflicts within and between states and the fact that international norms have yet to emerge that can address new sources of conflict. This means that even if climate change does not directly harm Europe's interests (Europe might to some degree even gain from moderately rising temperatures), European security will indirectly be at stake.

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[18] European Council, 21-22 June 2007, presidency Conclusions, Doc. 11177/1/07 REV 1, Para. 41.

[19] *Climate Change and International Security. Paper from the High Representative and the European Commission to the European Council (S113/08)*, 14 March 2008. *http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/reports/99387.pdf*, pg. 2.

[20] *Climate Change and International Security*, pg. 2.

[21] *Climate Change and International Security*, pg. 3-5.

[22] *Climate Change and International Security*, pg. 4.

Notwithstanding this imposing threat, Yet Ferrero-Waldner and Solana optimistically point out that the EU would be an ideal candidate to cope with the adverse consequences of climate change due to "its leading role in development, global climate policy and the wide array of tools and instruments at its disposal. Moreover, the security challenge plays to Europe's strengths, with its comprehensive approach to conflict prevention, crisis management and post-conflict reconstruction, and as a key proponent of effective multilateralism."[23] The Solana Paper however falls short of presenting a comprehensive plan to deal with climate change and its consequences.

The presidency conclusions of the European Council welcomed the Solana Paper.[24] Thereafter, the Council Secretariat and the Commission worked closely together to formulate a framework for concrete action, building on the Solana Paper. In December 2008, Solana summarized these efforts in a short paper.[25] The proposed strategy includes three main recommendations:

> "More detailed analysis of the security implications at **regional level**;
>
> Integration of these analyses into our **early warning** mechanisms;
>
> and an **intensified dialogue** with third countries and organisations."[26]

In particular, the paper presents short analyses of threat scenarios in Africa, Middle East and North Africa, and Central Asia, proposing concrete steps that the EU should take to address the security challenges in these regions. Among these measures are steps to enhance bilateral and multilateral dialogues between the EU, regional organisations, and national governments in those regions. The paper also outlines specific policies to manage scarce water resources in the Middle East and Central Asia.

Furthermore, the paper recommends a more comprehensive EU early warning system that incorporates data on climate-related developments such as food prices, water supply, extreme weather events, etc. Finally, the paper recommends to intensify the dialogue with third countries and organisations on climate change and security, especially with the US, China, India, and Russia, as the key global partners; organisations that represent regions that are at particular risk, and key international organisations such as the UN, AU, and OSCE.

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[23] *Climate Change and International Security*, pg. 2.

[24] European Council, 13-14 March 2008, presidency conclusions, Doc. 7652/08, para 26.

[25] *Climate Change and Security: Recommendations of the High Representative on follow-up to the High Representative and Commission report on Climate Change and International Security* (S412/08), 18 December 2008. The paper was preceded by a more general *Report on the Implementation of the European Security Strategy - Providing Security in a Changing World - (S407/08)*, 11 December 2008.

[26] *Climate Change and Security: Recommendations of the High Representative*, pg. 1.

In short, the EU's strategy specifies the following goals as appropriate measures to counter climate change related threats to international security: a) enhanced bi- und multilateral dialogues with governments and organisations in regions that are especially vulnerable to security-related implications of climate change; b) increased cooperation with international organisations and large powers; and c) an improved early warning system that includes variables for the consequences of climate change. An assessment of this strategy therefore needs to address two questions. First, are these measures sufficient to address the threats to international security that arise out of climate change? Second, have these measures been effectively and efficiently implemented since 2008?

3.2 Summary of actors and institutions

Within the EU's institutional structure, several national and EU actors assume a more or less official role in the field of climate change and security. There does not seem to be a clear allocation of resources and authority for this cross-cutting issue. One perspective is that security is a common foreign policy issue that could still be regarded as largely intergovernmental and in the domain of the Council and European Council, while climate change as an environmental issue has for a long time been subject to the EC's (now EU's) legislative competence, driven by the European Commission:

On one hand, the EU's Common Foreign and Security Policy (CFSP) is mainly driven my Member States through the European Council and Foreign Affairs Council. The EU competence in this field explicitly excludes legislative acts.[27] Although the President of the Commission is a member of the European Council, which lays down the strategic guidelines for the CFSP and ensures consistency, the role of the Commission in CFSP is limited. In other areas such as climate change, where the EU has legislative competence, the Commission has a strong role through its rights of legislative initiative and its functions in implementing legislation. In contrast, the CFSP is driven and put into effect by the Council, the High Representative of the Union for Foreign Affairs and Security Policy, or Member States.[28] The Commission has neither initiating nor implementing roles, does not represent the EU in CFSP matters and is confined to other areas of external action.[29]

The post of High Representative of the Union for Foreign Affairs and Security Policy was created by the Treaty of Lisbon. The Treaty merged the post of the previous High Representative for the Common Foreign and Security Policy and the post of the European Commissioner for External Relations and European Neighbourhood Policy. The task of the High Representative is to strengthen the EU's foreign policy and provide it with more coherence in the face of often diverging national interests. She is in charge of the EU's External Action Service, the de facto diplomatic corps of the Union, which started to operate on January 1, 2011. The High Representative and the diplomatic corps could be regarded as institutionally located somewhere between the European Commission and the Council. However, the High Representative's parallel role as the Vice-President of the Commission is largely related to external relations in areas other than the CFSP and, from a formal institutional perspective, does not increase the role of the Commission in the CFSP. In a

[27] Art. 16 (6), 18 (2) and (3), 22 (1), 24, 26 TEU.

[28] See in particular Art. 24 (1) and (3), 26 (2) and (3), 27, 30 TEU.

[29] Art. 22 (2) TEU.

similar vein, although the staff of the EEAS includes officials from the Council's General Secretariat, the Commission Member States, the EEAS is explicitly set up as a functionally autonomous body of the European Union, separate from the General Secretariat of the Council and from the Commission.[30]

Several EU Member States have also assumed a prominent role in the area of climate change and security – within the EU and on their own in bi- und multilateral forums. Among these Member States are notably Germany, the United Kingdom, The Netherlands, Denmark, and Sweden. Government representatives of four of these countries also form an informal steering group with the European Commission and the Council in which they discuss the challenges that climate change poses to international security.[31] The steering group serves as a clearing house for information on climate change and international security. It also facilitates the attempts of its members to coordinate climate change adaptation programs in third countries.

3.3 Assessment

The Council and the Commission have committed themselves to keep score of the steps that the EU has taken to address climate change related security threats. These "scorecards" are supposed to be published every year, towards the end of each year. The first and (so far) last *Joint Progress Report and follow-up recommendations on the climate change international security (CCIS) to the Council* was indeed issued in November 2009.[32] The next progress report was due at the end of 2010, but was not published by February 2011.

The 2009 Joint Progress Report takes the goals mentioned by the High Representative in December 2008 as a yardstick, namely:

- Enhancing capacities at the EU level for early warning, analysis and response to climate-induced implications for security
- EU multilateral leadership to build and implement a successful post-2012 international agreement on climate change and to promote global climate security
- Cooperation with third countries to strengthen dialogue, create awareness, and operational response capabilities, carry out scientific cooperation across the many facets of climate change dynamics and its impact, share analysis and cooperatively address the challenges of climate change[33]

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[30] Art. 1 (2) of Council decision 2010/427/EU of 26 July 2010 establishing the organisation and functioning of the European External Action Service, OJ L 201/30.

[31] Denmark, Germany, Sweden, United Kingdom. On the Steering Group cf. *Joint Progress Report and follow-up recommendations on the climate change international security (CCIS) to the Council,* Council Doc. 16645/09 of 25 November 2009.

[32] *Joint Progress Report and follow-up recommendations on the climate change international security (CCIS) to the Council* (16645/09), 25 November 2009.

[33] *Joint Progress Report* 2009, pg. 3f.

Along these lines, the Report acknowledges progress especially in the area of multilateral leadership and public diplomacy, noting in particular the crucial role that the EU has played in pushing the climate change-security nexus high up on the agenda of the United Nations. In addition, the Progress Report details EU efforts in initiating formal and informal dialogues with other regional organisations, such as the OSCE and NATO, and bilaterally with the world's major powers such as China, India, Russia, Brazil, and the US. The EU has also increased its cooperation in the area of climate change with countries and regional organisations in Asia (including Central Asia) and Africa. For instance, the EU supported the establishment of the African Climate Policy Centre (ACPC) in Ethiopia.

Furthermore, as the Report as well as former and current members of the Commission and Council attest, capacity building within the EU on climate change and international security has been significantly enhanced. Formal training sessions on this issue have been organised for EU officials, studies have been commissioned, and new variables that account for environmental degradation, water scarcity etc. have been included in the EU's early warning system. Finally, the Progress Report notes that climate change and international security has been successfully anchored in the EU. For instance, the Report states that "climate change was reconfirmed as one major emerging security challenge in the review of the implementation of the ESS."[34]

The Report concludes with several recommendations. In essence, it advocates staying course and increasing the efforts in the three areas mentioned above. However, the Report also urges to enhance not only the EU's monitoring capacity but also its readiness and ability to respond to climate change related disasters and conflicts. In addition, the EU should increase its efforts in supporting the capacity of partner regions and countries to implement climate change adaptation measures. In fact, responding to the Progress Report, the Council emphasizes that "Adaptation to climate change, sound policies on displacement, migration and conflict prevention are the most effective ways of dealing with the international security implications of climate change."[35]

It is therefore fair to say that the EU has made significant progress towards achieving the goals that it set out in 2008. How ambitious these goals were may be a different question. It could be argued that ambition was hampered by the differences mentioned above between the institutions addressing the CFSP and security on the one hand and climate change on the other. The same applies to competition for influence between actors and institutions within these respective policy areas, for instance different DGs claiming or having competence over issues such as water scarcity. However, it is difficult to assess whether such factors actually stifled ambition or progress. The EU as a governance structure is used to cross-cutting issues falling into more than one policy area and sphere of competence.

[34] *Joint Progress Report* 2009, pg. 6.

[35] *Council conclusions on Climate change and security*. 2985th Foreign Affairs Council meeting (Brussels, 8 December 2009).

Against this background, the achievements could owe a lot to the informal steering group. Indeed, the informal nature of this steering group had certain advantages. First, it brought together highly committed and knowledgeable individuals who were able to engage in informed and open debates. The voluntary and personal commitment of a small group of persons might have avoided premature compromises. Moreover, its informal character could have helped in avoiding procedural or institutional deadlocks and to become a strong advocate for increased EU efforts in the area of climate change and international security. However, the informal nature of the steering group had its pitfalls. The limited number of players involved in this group limited the steering group's authority and material resources, which in turn ultimately curbed the group's potential impact on EU policies.

When applying the DAC Principles for the Evaluation of Development Assistance in this brief assessment, we have to distinguish between the goals stated by the EU and the goals that should ideally be achieved. Most of the EU's objectives have been achieved or will be achieved in the foreseeable future. Through its public diplomacy as well as internal action, the EU has shown leadership in global climate change politics. It has raised awareness and it has institutionalised bi- und multilateral dialogues with the most affected countries and regions. The EU has significantly contributed to linking climate change to security, and participated in the effort by the UK and other Member States to move climate change at least temporarily to the top of the global agenda. It has also enhanced its monitoring and analytical capacity as far as the security aspects of climate change are concerned. The EU has achieved these objectives with minimal resources, taking into account that the climate change-security nexus does not have a separate budget in the EU administration. Against this (highly condensed) background, the ESS, as far as its objectives on climate change and international security is concerned, can be considered as *effective* and *highly efficient*.

However, how *relevant* has the ESS been and how lasting will its *impact* be in the area of climate change and international security? If the ultimate goal were to prevent the outbreak of violent conflict that could result from water scarcity, the loss of arable land, etc. , the EU would have to stimulate local and regional climate change adaptation measures through its enhanced dialogues and awareness raising campaigns. However, this is a somewhat optimistic assumption. More often than not, the countries that are most affected by climate change lack the resources and technical expertise to implement effective adaptation strategies. The EU would have to provide significant financial support to ensure that adaptation measures were implemented. Yet the ESS has not set aside any funds to provide this form of assistance. These funds could for instance come out of the budget of DG Development which, however, pursues a set of diverse objectives, leaving few, especially dedicated funds for climate change adaptation measures. On the other hand, in the UN climate negotiations, the EU, under the responsibility of DG Climate, and its Member States have supported the Adaptation Fund with its innovative source of funding and direct access modalities, and have mobilised new financial "fast start" resources as part of the Copenhagen Accord. However, it remains debatable to what extent the current sources of conflict due to climate change are adequately addressed by the ESS . The ESS could be regarded as *not very relevant* and its *impact* as *limited*.

This assessment appears sobering and could put into doubt whether the EU should massively invest in climate change adaptation measures. The Solana Paper argues that climate change is a "threat multiplier". In other words, it intensifies existing threats but does not constitute a

separate challenge to international security. On this basis, Steen Nordstrøm from the Royal Danish Defence College asks: "Why is so much awareness paid to a threat multiplier that is hard and time-consuming to prevent, while factors such as small weapons proliferation that have much more direct bearing on conflicts receive scant attention?".[36] However, this view appears too narrowly focused on conflicts rather than taking into account the whole range of climate change impacts and the benefits from adaptation to its unavoidable effects climate change.

3.4 Conclusion

Despite several studies, the climate change-security nexus in the EU has not yet moved beyond its early stage, as it lacks a clearly formulated plan of action that assigns responsibilities, resources, and authorities. The division of competences and responsibilities under the EU treaties in the areas concerned has not been helpful in this respect . Following the creation of the new post of High Representative of the Union for Foreign Affairs and Security Policy and the EU's External Action Service, the foreign policy goals of the EU and the means to achieve these goals might be revised. In a speech in May 2011 on main aspects and basic choices of the CFSP, the High Representative did not mention climate change, but focused on the situation in North Africa and the Middle East, democracy and human rights.[37] It remains to be seen whether this is due to current developments or whether this indicates a more significant shift meaning that climate change is no longer included in the list of main threats to be considered and addressed by EU security policy.

Moreover, the disappointing results of the 2009 Climate Conferences in Copenhagen have left the general public disillusioned as far as international efforts to contain climate change is concerned, and it remains to be seen whether the more positive Cancun outcome in 2011 can restore public confidence. In addition, for the past two years or so, European policy-makers have had to deal with global financial crisis and the search for adequate measures to prevent the outbreak of a similar crisis in the future. So far this does not appear to have stifled the EU's internal policy or external diplomatic efforts on climate change -apart from a potentially more cautious approach regarding financial support. However, is not clear to what extent the financial crisis and its aftermath might affect the cross-cutting issue of climate change and security .

These circumstances seem to make it unlikely that new policies in the climate change and security arena will be proposed. However, the Lisbon Treaty might offer a way out of the institutional overlaps that might have complicated the formulation of an unmistakable action plan for the climate change-security nexus. The TEU has strengthened the role of the EU's main external representative, the High Representative for Foreign Affairs and Security Policy, and provided it with the EEAS as an institutional backbone. On this basis the High Representative could in the long term become a strong player in the climate change and security area by addressing climate change in the CFSP. In the medium term, at least, the EU should nevertheless be able to integrate the climate security agenda into already well established policy areas such as international development. The "mainstreaming" of the climate change-security nexus in the EU and among its Members States has already made some progress even without a strong institutional leader. At this

[36] Steen Nordstrøm. 2010. "Climate Security: From Agenda-setting to Policy". Research Paper, Royal Danish Defense College. *http://forsvaret.dk/FAK/Publikationer/Research%20Papers/Documents/Climate%20Security%20web.pdf* (last accessed 14 February 2011), pg. 5f.

[37] EU RAPID press release SPEECH/11/326, 11 May 2011.

stage it is too early to assess whether the High Representative and the EEAS will pursue the similar or different objectives, and whether they will be able to shape their role accordingly.

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Annex 1 Preliminary list of Indicators to measure progress of the Strategy for Water in the Mediterranean

Theme 1 Water Governance

- no indicators in the preliminary draft

Theme 2 Integrating the Climate Change dimension into water resource management

- Soil organic carbon
- Water retention
- Crop yield variability
- Water Requirements River flows

Theme 3 Water Demand Management and Non-Conventional Water Resources:

- Water efficiency index
- Total water demand and sectoral water demand/GDP
- Exploitation index of renewable water resources
- Non-sustainable water production index
- Surface equipped with modern irrigation systems
- Water volume consumed /AGDP
- Soil erosion by non-conventional water resources: indicators to be proposed

Theme 4 Water Financing

- Water cost recovery rate (total and by sector)
- Rate of public investments and expenditure allocated to water and water demand management
- Public development assistance devoted to water and proportion of this aid dedicated to programs of water demand management
- Water tariffs

Water Quality and Ecosystems

- Share of population with access to an improved water source
- Share of population with access to an improved sanitation system (total, urban, rural)
- Share of water collected and treated by the public sanitation system

- Share of industrial wastewater treated on site
- Releases of toxic substances and nutrients from industrial sites
- Wastewater treatment rate before sea release for coastal agglomerations over 100,000 inhabitants
- Proportion of coastal urban population connected to a sanitation network
- Area of protected coastal marine zone
- Extinction threatened species percentage
- Number of marinas and berths per km of coast
- Nutrients concentration in coastal water
- Quantity of fertilisers/AGDP
- Quantity of pesticides /AGDP