Is Indonesia in a Good Position to Achieve Sustainable Low Carbon Development?

Opportunities, Potentials and Limitations

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1. Introduction:
Is Indonesia in a Good Position to Achieve Sustainable Low Carbon Development?

Kentaro Tamura[1] and Shuzo Nishioka[2]

1.1 Introduction

Sustainable low carbon development is a process through which countries pursue higher living standard and simultaneously try for controlled low greenhouse gas (GHG) emissions in a sustainable manner. Many developing Asia has low per-capita emissions today, but they began to increase their emissions very rapidly. Such an increase is driven by their aspirations for alleviating poverty and improving their standards of living. Unfortunately, many of them are following the developmental and urbanization patterns of industrialized countries, which heavily rely on fossil fuels for their energy services. According to estimates, Asia today accounts for 27% of the world's energy-related GHG emissions and this proportion is projected to increase to 40% by 2030 (IEA 2007). Besides significant emissions reductions by developed countries, mitigation efforts by developing countries are indispensable for attaining the ultimate goal of the United Nations Framework Convention on Climate Change (UNFCCC).

Given the growing consensus on the necessity of actions in developing countries, the post-2012 climate regime is likely to be equipped with scaled-up international support for climate policy efforts in developing countries. Under the Copenhagen Accord taken note of at the fifteenth Conference of the Parities (COP15), developed countries pledged to approach $30 billion for the period 2010-2012 and jointly mobilise $100 billion annually by 2020 in order to enable and support developing countries' efforts on mitigation and adaptation, technology development and transfer and capacity building for implementation of the UNFCCC. Once these financial pledges are effectively delivered, the Copenhagen Accord can provide developing countries with great opportunities to achieve sustainable low carbon development.

However, domestic factors play an important role in determining whether developing countries can actually grasp such opportunities provided by the international climate regime. Such domestic factors include political stability, leadership, institutional capacity for policy decision-making and implementation and social capacity for adapting new technologies and social systems. These factors vary from country to country. Therefore, the policy mix to attain sustainable low carbon development should be carefully examined and customised for each country and for each locality.

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Indonesia is one of the first developing countries that pledge specific emissions reduction targets. At the Group of 20 Summit in Pittsburgh in June 2009, President Susilo Bambang Yudhoyono announced his plan to reduce an emissions reduction target of 26% by 2020 and also mentioned that the target could reach up to 41% if international assistance were to be forthcoming. After COP15, the Indonesian government submitted to the UNFCCC secretariat information on its voluntary mitigation actions (the 26% reduction target) in the format set forth by the Copenhagen Accord (Government of Indonesia 2010). It was reported that Rp 83 trillion (US$8.98 billion) would be allocated to cut 767 million metric tons of carbon dioxide (CO2) to meet the 26 percent pledge, and if developed countries provide Rp 168 trillion (US$17.96 billion) Indonesia could slash its emission by 41% (the Jakarta Post, March 6, 2010). To accomplish this endeavour, Indonesian governmental bodies began to develop sectroal emissions reduction roadmaps. Development of detailed reduction plans and effective implementation of the plans remains challenges, however.

Against this backdrop, the Institute for Global Environmental Strategies (IGES) and the Bogor Agricultural University convened a policy dialogue on “Sustainable and Low-Carbon Development in Indonesia and Asia: Is Indonesia in Good Position toward Low Carbon Societies?” in February 2010 in Bogor, Indonesia. This report draws upon the policy dialogue. The report consists of 7 chapters. The following chapters address reducing emissions from deforestation and degradation and enhancing carbon stocks (REDD+), decentralisation and low carbon transport policy, technology transfer for low carbon technologies, renewable energy-based distributed power generation system, low carbon technologies in agriculture, and traditional values and practices, respectively.

1.2 International mechanisms, domestic institutions and implementation

The Copenhagen Accord recognised the crucial role of reducing emissions from deforestation and degradation and enhancing carbon stocks (REDD+) and the need to provide positive incentives to such actions through the immediate establishment of a mechanism of REDD+. REDD+ has a huge potential to contribute to low carbon development in forest rich countries like Indonesia, and its full-fledged implementation can provide opportunities to achieve real and long-term emissions reductions from the forest sector. Drivers of deforestation and degradation are complex and deeply rooted in socio-economic and political institutions. Therefore, Gené points out that besides technical issues such as the establishment of realistic reference levels, REDD+ will pose policy and institutional challenges (Chapter 2). Indeed, the failure to coordinate policies across sectors (forestry, agriculture, mines, and infrastructure), as well as ongoing poor forest governance are major stumbling blocks over which several decades of national and international efforts to curb deforestation have not succeeded. He suggests that

broad reforms of institutional arrangements as well as strong policy coordination across sectors are necessary for effective implementation of REDD+. In addition, the involvement of local actors in planning and implementation process is critically important, so that it is necessary to ensure that local actors are well informed and they have a meaningful stake in the implementation.

Another pressing issue related to implementation is found in the context of decentralisation: the transfers of authority, responsibility, power and resources downward among different levels of government. In Asia, many countries have been experiencing the process of decentralisation. Such countries include, for example, China, India, Indonesia, Japan, the Philippines and Viet Nam. This trend implies the increasing influence of local governments on short-term decisions in many policies areas related to climate policy, and its consequences need to be carefully examined.

Indonesia is an important case to understand the effects of decentralisation on transport policy, since decentralising reforms has coincided with a sharp increase in transport demand in Indonesia. Zusman and Sutomo point out that decentralisation has been both good and bad for low carbon transport in Indonesia (Chapter 3). On the one hand, it has led to policy innovations and experimentation, including bus rapid transit (BRT) systems in Jakarta, Yogyakarta, Bandung, Bogor, Makassar, Semarang, Solo, Pekanbaru and Manado, car free days in Jakarta, Surabaya, Bogor, Yogyakarta, and pedestrian programmes and bicycle lanes in Yogyakarta and Surabaya. Decentralised transport policy makes it possible to respond to local needs with flexibility. On the other hand, the decentralising process has some drawbacks on fiscal capacity and administrative coordination. Local governments still often lack the financial resources to take advantage of innovative public transport and urban reforms outlines previously. Furthermore, since transport agencies exist at the city and national levels, lack of provincial level coordinating bodies between the city and national levels often causes coordination problems in designing, planning and implementing policies.

To maximise the strengths of decentralisation and simultaneously minimize its weaknesses, a few recommendations follow. First, it is important to strengthening central-local budgeting mechanisms and empowering provincial level agencies. Second, creating provincial level transport agencies with well defined powers and roles should be given greater consideration. Third, chapter 3 also points out that nationally appropriate mitigation actions (NAMAs) under the UNFCCC process receive not only financing and technology, but also capacity building support. Thus, agencies responsible for providing such capacity building should pay as much attention to the NAMAs per se as the institutional structure for designing and implementing NAMAs. By paying due attention to such institutional structure, international support for NAMAs could be more effectively utilised to strengthen information exchange among national,

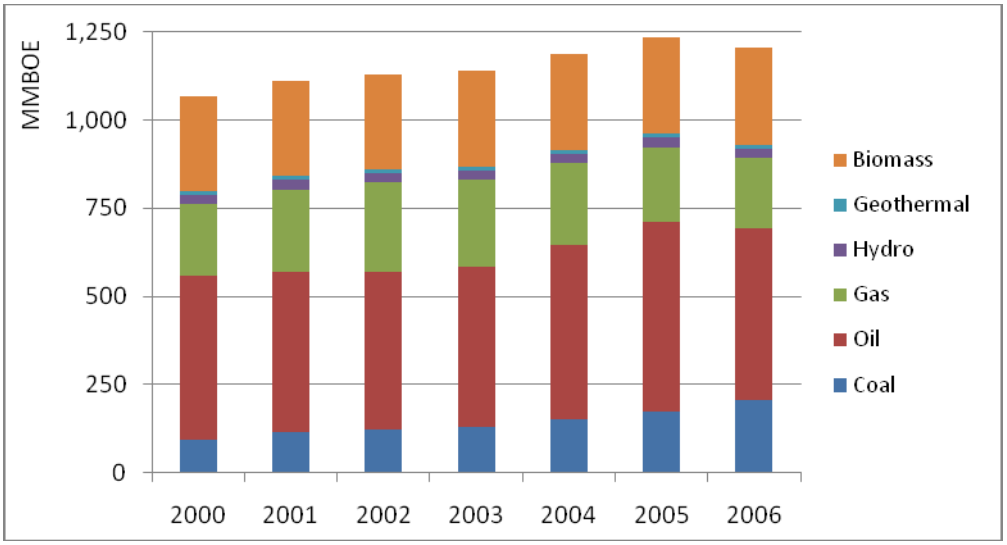
provincial and local governments to more effectively use resources and address budgeting shortfalls.

1.3 Technology leapfrogging to realise sustainable low carbon development

Technology will play a key role in achieving sustainable low carbon development. Technology leapfrogging is a term used to describe the bypassing of technological stages that industrializing countries have taken in order to avoid the resource-intensive patterns of economic and energy development by leapfrogging to the most advanced energy technologies available, rather than following the same path of conventional energy development undertaken by industrialized countries. Technology leapfrogging has also sometimes been referred to as technological catching up. It is critically important to examine how new technologies are incorporated into current systems or infrastructures, and how these systems need to be evolved and regulated to better accommodate such technologies.

In terms of energy supply, Indonesia is now at a crossroads in endeavour for sustainable low carbon development. As Figure 1 presents, Indonesian primary energy supply is still dominated by fossil fuels, in which, oil is still the major share of energy supply mix, followed by natural gas and coal. While Indonesia is currently producing about 860,000 barrels of oil a day, rapid growth in domestic demand is expected to continue to outstrip output, increasing the need for imports over time. Indeed, Indonesia became a net oil importer in 2004, and withdrew from the Organisation of Petroleum Exporting Countries (OPEC) in 2008. The country's growing dependence on oil imports has raised serious concern over energy security. In 2006, the Indonesian government launched the National Energy Policy (Presidential Decree No. 5/2006) to move away from oil and maximise the utilisation of abundantly available domestic energy resources. The targets is to decrease the share of oil in the energy supply mix from 55% in 2005 to less than 20% in 2025, while increasing the share of natural gas from 22% to 30%, coal from 17% to 33% and renewable energy from 3% to 10%. Thus, whether and how low carbon leapfrogging technologies can be adopted and deployed is key to the achievement of low carbon development.

Figure 1.1 Primary energy supply in Indonesia, 2000-2006



Source: Government of Indonesia 2009.

Technology transfer is a key vehicle for technology leapfrogging. For the Indonesian energy sector, opportunity areas include application of mitigation technologies in electricity generation such as super critical coal plants, integrated gasification combined cycle (IGCC) plants and carbon capture and storage (CCS) technologies. Occurring in various pathways such as foreign direct investment, direct purchases, government assistance programmes, licensing, joint ventures/collaboration, cooperative research agreements, public-private partnerships, among many others, technology transfer is difficult to quantify. Thus, Muzones argues that the concept of national systems of innovation (NSI) would be a useful tool in approaching the issue of technology transfer, by examining how developing countries see their local capacity to absorb and innovate on new technologies (Chapter 4). NSI refers to a "set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process." It integrates the elements of capacity building, access to information and an enabling environment into comprehensive approaches to transfer of low carbon technologies. Muzones' preliminary observation shows that universities and government bodies can potentially lay out good foundations for NSI in Indonesia, while further efforts are necessary to establish a functional NSI. Such efforts include better coordination among key stakeholders, incentives provided by the government for the industry to exploit R&D results, and the identification of priority low-carbon technologies.

Fukuda and Siagian argues that developing renewable energy (RE)-based distributed power supply system is a promising low carbon and sustainable development option for Indonesia, considering the rich natural endowments of renewable energy resources, underdevelopment of

centralized power generation system particularly for islands outside JAMALI, as well as national energy mix target and energy security point of view (Chapter 5). Given the keen interest in utilising abundant renewable energy resources, numerous governmental and non-governmental programs and projects have been implemented to support RE-based distributed power supply system. Fukuda and Siagian point out that community engagement in planning, implementation and adequate support for follow-up stage are essential for ensuring sustainability of such programs. They also observe the growth of domestic industry supported by technology transfer from donors in microhydro power turbine industry, which also contributes to ensure sustainability of distributed RE-based power supply system. Presence of social entrepreneurs and local research entity such as universities plays a catalytic role in developing and disseminating such low carbon technologies.

On the other hand, there remain various barriers for realizing such RE-based distributed system including financial barriers associated with relative price competitiveness and access to finance for investing renewable energy development, as well as institutional barriers epitomized by complexity of permit acquisition and regulatory uncertainty among others. To overcome both financial and institutional barriers, Fukuda and Siagian recommend a couple of policy actions: subsidization of RE technologies; establishment of financial institutions for the private sector; assessment and identification of appropriate RE technologies; education and training facilities; and enhanced information dissemination and award system.

Apart from the energy sector, the agriculture sector deserves attention in the context of sustainable low carbon development in Indonesia. Though the direct contribution of the agriculture sector is about 6% of total GHG emissions, agriculture plays an important role in the national economy and food security of Indonesia. Increasing food production, while not adversely impacting the climate and local environment, is a challenge to be met. Prahbakar et al. explore the role of agriculture in sustainable low carbon development (Chapter 6).

To mitigate GHG emissions while meeting the food security needs of the glowing population on Indonesia, Prahbakar et al. argue that it is necessary to identify agro-technologies which satisfy the following conditions: mitigate GHG emission; provide yield and income advantage; lower abatement costs; and provide developmental co-benefits. This prioritization of mitigation technologies is possible through estimation of marginal abatement costs and cost-benefit analysis of mitigation options. Their preliminary analysis indicates that the system of rice intensification (SRI) has high potential for abatement, followed by the zero-tillage systems. Zero tillage has negative costs since adoption of the technology saves on tillage and fuel costs, while SRI could prove costly due to labour intensiveness of operation. They also suggest that the best way to enhance the efficiency of a technology is to target it to the specific ecosystem

conditions. While focusing on individual technologies, there is a need to consider how these technologies behave in the existing context of knowledge and infrastructure on the ground.

It is also pointed out that while some mitigation technologies have already been promoted, it is far from being sufficient in meeting the sectoral mitigation target. The major barriers for expanding these technologies have been lack of proper incentives for technology adoption and capacity building of farmers. To overcome this barrier, Prahbakar et al. argue for the introduction of carbon credits for the agriculture sector (soil carbon sequestration) which could provide additional income to farmers. Furthermore, education and capacity building of farmers through rapid expansion of climate field schools and farmer field schools, a shift from benefit-cost based decision making to marginal abatement cost based one, and phasing out agricultural input distorting farm subsidies and introducing subsidies targeting low carbon technologies such as soil ameliorants are also suggested as additional measures.

1.4 Traditional and emerging values and practices

Values and practices matter in pursuing sustainable low carbon development, since development paths should be compatible with traditional values and practices. In Chapter 7, Aoyagi-Usui et al. examine how traditional values and practices that are still maintained in local communities but are about to be lost in the modernization and industrialization process could contribute to the formation of sustainable low carbon societies. They claim that societies and communities in Asia still maintain sustainable livelihoods fostered by indigenous values and practices. Such values and practices are clarified into three groups: mutual cooperation, sufficiency in a mass-consumption society, and sustainable resource management. With regard to mutual cooperation, for example, *Gotong Royong*, traditional norm of mutual cooperation in Indonesia, *Aniani*, traditional practices to equal allocation of workload at the community level in Indonesia, and resource management in commons in various countries are identified as values and key practices. In terms of sufficiency, the sufficiency economic principle promoted by the Thai government after the financial crisis in the late 1990s became to be used for local development policies. As to sustainable resource management, specific values pursuing environmental harmony over a long time scale is the foundation for emerging alternative ways of agriculture, energy management, forestry management and tourism promotion in Thailand.

Reviewing traditional values and practices identified, Aoyagi-Usui et al. provide three key messages: First, traditional values and practices are rich in the tips for designing innovative lifestyle to enable low carbon development, while applicability to the modern context and different locality should be also carefully examined. Second, principles of traditional society, such as ‘sufficiency,’ ‘co-existence with nature,’ and ‘cooperation’ should be re-vitalized in the current development context. Finally, local and indigenous technologies, methods, and wisdom

should be fully utilized in promoting Green Growth especially in sectors such as agriculture, fishery and forestry.

1.5 Conclusions

As seen its leadership role in pledging voluntary emissions reduction targets, Indonesia has exhibited a growing interest in climate actions. Many factors have contributed to this interest, including growing concerns over energy security, awareness of negative impact of climate change, and a future climate regime that provides financial, technological and capacity building support for REDD+ and NAMAs. It should also be noted that Indonesia has good domestic foundations for climate actions. They includes, among others, leadership by the Yudhoyono administration, on-going decentralisation process which enables local governments to take innovative policies and actions compatible with local needs; presence of social entrepreneurs and local research entities; and existence of indigenous values and practice to which sustainable livelihoods are anchored. These foundations provide Indonesia with a basis for absorbing and deploying low carbon technologies. However, there remain various limitations and challenges such as limited coordination among various stakeholders, fossil fuel subsidies, rich endowment of domestic coal, and the necessity to ensure food security of the growing population. The chapters of this report will highlight these potentials, opportunities, limitations for Indonesia to pursue sustainable low carbon development in key sectors i.e. forest, transport, energy and agriculture. Each chapter provides possible solutions to overcome such limitations. Traditional values and practices will also be examined. Table 1.1 provides a summary of the argument. Overall observation indicates that Indonesia is a good position to achieve sustainable low carbon development, albeit challenges still remain to be tackled.

Table 1.1 Potentials, opportunities, limitations and solutions for Indonesia's sustainable low carbon development

	Potentials and Opportunities	Limitations and challenges	Solutions
Forest	・Huge mitigation potentials ・Financial and technical assistance through REDD+	・Technical issues (esp. establishment of realistic reference levels ・Cross-sector policy coordination ・Poor forest governance	・Broad reforms of institutional arrangement and strong policy coordination ・Involvement of well-informed local actors
Transport	・Policy innovations and experimentation under decentralisation ・Co-benefits in low carbon transport policy ・International assistance under NAMAs	・Limited financial resources ・Lack of coordinating bodies between national and city levels	・Strengthening central-local budgeting mechanisms ・Creating provincial level transport agencies to promote policy coordination

			・Capacity building through NAMAs assistance
Energy (clean coal technology)	・Expected changes in primary energy supply ・Mitigation potentials ・Good foundations for a national system of innovation (NSI) in Indonesia	・Rapid expansion of coal usage ・Lack of coordination among key stakeholders ・Lack of financial resources	・Further effort to create functional NSI through better coordination, the provision of incentives and identification of priority technologies
Energy (renewable energy: RE)	・Rich endowments of renewable energy resources ・Underdevelopment of centralised power generation system ・Growing concern over energy security ・Presence of social entrepreneurs and local research entities	・Financial barriers (relative price competitiveness and access to finance) ・Institutional barriers (complexity of permit acquisition and regulatory uncertainty)	・Subsidisation of RE technologies ・Assessment and identification of appropriate RE technologies ・Education and training facilities ・Enhanced information dissemination and award system
Agriculture	・Existence of low and negative cost mitigation technologies	・Need to ensure food security of the growing population ・Lack of proper incentives for wider deployment of low carbon technologies ・Lack of awareness / capacity of farmers	・Carbon credit for the agriculture sector ・Expansion of climate field schools and farmer field schools ・Marginal abatement cost-based decision-making ・Subsidising targeted low carbon technologies
Values and practices	・Existence of indigenous values and practice to which sustainable livelihoods are anchored	・Rapid economic development and modernisation	・Revitalising local and indigenous values and practices ・Carefully examining applicability of such values and practices to the modern context and different locality

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2 Reducing Emissions from Deforestation and Forest Degradation and Enhancing Carbon Stocks (REDD+) in Indonesia: Opportunities and challenges

Enrique Ibarra Gené[3]

2.1 Introduction

Reducing emissions from deforestation and degradation and enhancing carbon stocks (REDD+) has a potential to contribute to low carbon development in forest rich countries. Indonesia is a leading country in the design and implementation of REDD+ in the international arena. The efforts that the country is currently undertaking are valuable to the international community as a way to draw lessons on how to approach climate change mitigation in the forest sector. Of course REDD+ is an attractive alternative for developing countries because it has the potential to deliver financial resources in amounts that dwarf past overseas development assistance. The concept of REDD+ is quite simple, it proposes to make performance-based payments to actors (forest owners) that can credibly reduce emissions and increase removals of CO_2. Nonetheless, the road to a full-fledged REDD+ payment scheme is anything but simple. It requires dealing with problems that have marred efforts to achieve sustainable forest management and forest protection over decades.

This paper discusses some of the opportunities as well as the challenges that Indonesia faces towards the implementation of REDD+. Section 2 gives a brief overview of the significance of forests for the global efforts to mitigate climate change and the importance of the forests of Indonesia (particularly peat forests) for climate change mitigation. Section 3 discusses the opportunities that are offered by REDD+ in terms of the potential financial resources that the country can access – should it implement REDD+ successfully – as well as the challenges it faces at the policy and at the market level. Particular attention is given to the timber market which shows an ongoing excess of demand for round wood and a consequent predation of natural forests. Section 4 discusses the relevance of consulting and including local actors in the design and implementation of REDD+. Section 4 draws conclusions.

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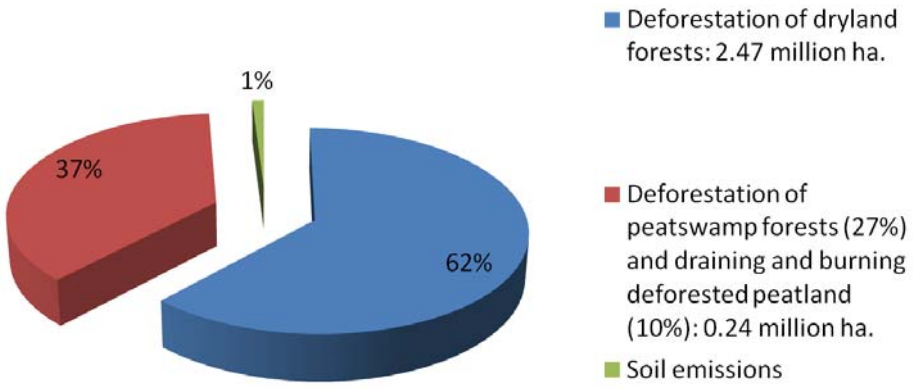
2.2 Forests & climate change

Today there is wide agreement that to effectively mitigate climate change and avoid an imminent threat to humanity's welfare deforestation and forest degradation must be urgently addressed. The scientific community acknowledges that forests contribute approximately 17% off all anthropogenic CO_2 emissions (IPCC 2007) and that reducing emissions from deforestation and degradation is a cost-effective way to mitigate climate change (Eliasch 2008; Grieg-Gran 2008). Indonesia is a key stakeholder in the endeavour of reducing global CO_2 emissions since it is the world´s third largest CO_2 emitter behind the USA and China. But different to these two countries, where the bulk of emissions originates from the consumption of energy (96% and 74% respectively), 85% of Indonesia´s CO_2 emissions originate from deforestation and forest degradation (PEACE 2007).

Figure 2.1. (below) depicts the distribution of CO_2 emissions in Indonesia from deforestation in drylands and peat forests between the years 2000 and 2005 (MoFor 2008). Whereas in this period most emissions (62%) originated from the deforestation of dryland forests in an area of approximately 2.47 million hectares, the emissions that originated from the deforestation, drainage and burning of peatlands (37%) took place in an area ten times smaller (0.24 million hectares). Indonesian peatlands store enormous carbon stocks and a comprehensive climate change mitigation strategy will necessarily have to address the degradation and loss of these areas. Peat forests in Southeast Asia store at least 42,000 megatonnes of carbon below the ground which is being released through processes of degradation (such as logging) as well as land conversion for oil palm and forest plantations (Hooijer et al. 2006). Most of the peatlands of Southeast Asia (83%, or 22.5 million hectares) are found in Indonesia. Emissions from the ongoing deforestation and degradation of peatlands in Southeast Asia amounts to approximately 2,000 million tons of CO_2 per year, and 90% of these emissions originate from Indonesian peatlands.[4]

Figure 2.1. Distribution of Indonesia`s CO2 emissions from dryland forests and peat lands betweeen 2000 and 2005



Source: Ministry of Forestry, IFCA consolidation report, 2008

[4] http://ckpp.wetUS/Default.aspx

The conversion of peatlands (to oil palm and forest plantations) is being supported by the central government (through the ministry of agriculture as well as by provincial and local governments (MoA 2006), while at the same the central government (through the Ministry of Forestry) is pursuing the conservation and restoration of peatlands (MoFor 2008). It is expected that the rapid growth of the oil palm sector will continue and that until 2020 it will demand between 5-6 million ha. (MoFor 2008). Moreover, it is expected that smallholders will engage in the future establishment of at least 50% of oil palm plantations in Sumatra and Kalimantan (Hooijer et al. 2006), which is partly the consequence of the loss of livelihood strategies that used to rely on forests and of ongoing government support of the palm oil industry, which is one of Indonesia's main agricultural exports (MoA 2006; Schrevel 2008).

2.3 **Reducing emissions from deforestation and degradation and enhancing carbon stocks (REDD+): Opportunities and challenges**

Essentially, the full-fledged implementation of REDD+ is a payment for an environmental service. It proposes to issue performance-based payments to; governments, local governments and landowners (forest owners such as communities, indigenous groups, private companies, etc.) to reduce emissions from deforestation and forest degradation. REDD+ is voluntary agreement where a specific service (carbon emission reduction, and fixation) is bought by at least one buyer from at least one provider under the condition that the service is provided (Wunder 2005), which means that payments are conditional upon performance. The road towards the implementation of REDD+ as a PES scheme is full of challenges. At the technical level the most pressing issue is the establishment of realistic reference levels that contribute to establish credible business as usual scenarios. At the policy and institutional level, REDD+ will require broad reforms of institutional arrangements as well as strong policy coordination across sectors (forestry, agriculture, mines, and infrastructure). The improvement of policy coordination as well as of governance is a pressing task for all developing countries aspiring to participate in REDD+, since lack of these are significant underlying causes of deforestation and forest degradation (Contreras-Hermosilla 2000). The failure to coordinate policy (and thus address extra-sectoral drivers of deforestation) as well as ongoing poor forest governance are major stumbling blocks over which several decades of – national and international – efforts to curb deforestation have not succeeded (Sunderlin and Atmadja 2009). The conditionality of REDD+ may have potential to provide a strong incentive to promote much needed (and long overdue) policy and institutional reform as well as the improvement of forest governance. Nonetheless, such reforms will necessarily take time. Therefore it is unlikely that a PES scheme for REDD+ can be established in the short term in many developing countries. Rather, REDD+ is likely to be implemented in three stages.

During the first stage REDD+ (as well as RED and REDD[5]) projects would receive crediting at the sub-national (project) level, countries would design a national REDD+ strategy, undertake legislative and policy assessments, consultations across a wide range of stakeholders would be conducted and institutional reform would be undertaken. Funding for the development of national strategies and related measures is provided by donors such as the Forest Carbon Partnership Facility (FCPF), the UN-REDD programme as well as by bilateral agreements. Investments are also made for the development of capacity for monitoring, reporting and verification. A second stage would see the crediting of REDD+ (and REDD) at the sub-national and the national scale (nested approach), countries would endorse policies and enforce them and stronger (but probably still basic) monitoring of carbon stocks is undertaken. Funds would be available from multilateral and bilateral sources as well as from funds authorized by the UNFCCS's Conference of the Parties. The final stage would see the establishment of either a nested or a national REDD+ approach, monitoring capacities and the establishment of reference levels are reliably established and enable the quantification of carbon stock changes relative to the established reference levels. In this stage, funding should be primarily dependent from compliance markets (for payments to become truly performance-based), but global funds are not necessarily excluded (Wertz-Kanounnikoff and Angelsen 2009).

The successful implementation of REDD+ is expected to deliver significant financial resources to developing – forest rich – countries. The Ministry of Forestry of the Republic of Indonesia estimates that if the country is successful in halving deforestation annual revenues from carbon credits can lie between USD 2.5 and 4.5 billion. The cost of an integrated land use programme to achieve this goal is assessed roughly around USD 10 billion between 2008 and 2012 (MoFor 2008). Thus the capacity of the country to finance such an integrated land use programme through fresh – market – financial resources is limited in the short term by the fact that hitherto no carbon credits are being sold through either voluntary or compliance markets. Therefore financing will depend from the country itself and donor funds.[6]

The improvement of policy coordination is a significant challenge to the implementation of REDD+ in Indonesia because over the years, conflicting laws and lack of coordination between governmental organizations have created overlapping mandates over forest resources. Similarly, lack of transparency and appropriate administrative systems have hampered monitoring and the exercise of sanctions foreseen in the law (MoFor 2008). Additionally, corruption, weak monitoring and weak law enforcement have eased the overexploitation of forests as well as illegal logging (Barr et al. 2006; HRW 2009).

[5] Reduced Emissions from Deforestation (RED) was first proposed by PNG and Costa Rica…
[6] The Copenhagen accord pledged USD 30 billion from developed countries for the period 2010-2012 to provide new and additional resources to several sectors (including forestry) in developing countries. These resources are destined to attend needs including adaptation and mitigation. Thus how much will be allocated to forestry and how much individual countries will receive from these funds is uncertain.

The Ad-Hoc Working Group on Long-term Cooperative Action under the Convention of Climate Change states that the policy approaches towards the implementation of REDD+ in developing countries should pursue both forest conservation and the sustainable management of forests to maintain and enhance carbon stocks (UNFCCC/AWG-LCA 2009). The sustainable management of forests depends heavily on the timber market, that is, on the potential of the timber supply to satisfy the demand without undermining the productivity of the forest, its regeneration capacity, vitality and its potential to continuously fulfil relevant ecological, economic and social functions (at the national, regional and global levels) and without damaging other ecosystems (Tacconi et al. 2003; Higman et al. 2004). But the timber market in Indonesia gives reasons for concern about the likelihood of implementing REDD+ (and of achieving sustainable forest management) in the short- and medium-term.

According to the World Bank (2006), the annual industrial demand for round wood is about 60 million m^3, whereas the sustainable yield from natural forests is about 8-9 million m^3 per year and the sustainable yield from forest plantations (which are insufficient and perform poorly) is about 3-4 million m^3 per year and the gap between the demand and supply of round wood is filled through the conversion of natural forests to other land uses. The Ministry of Forestry assesses the excess demand of timber from natural forests at a lower level to approximately 9 million m^3 per year, and estimates that the gap may only be reduced to approximately 6 m^3 per year until 2030 (MoFor 2008). To the Ministry, the excess of demand for round wood over the sustainable yield of both natural and forest plantations remains a major factor driving illegal logging and the loss and degradation of forests (ibid),[7] and to address the gap between the demand and supply of timber the Ministry of Forestry states that "intensive plantation silviculture on degraded and commercially unproductive land is the option open for this to occur". For that matter, the predicted total additional plantation area required is about 4 million ha. to supply; the pulp production at full capacity (1 million ha. additional to the existing 3 million ha.), the production of chips for export (1 million ha.), and the production of solid wood products (2 million ha.) (ibid: 100, 102). To the Ministry, the income from verified reductions in deforestation is necessary to expand the area of forest plantations – and even oil palm plantations – to reduce the pressure on natural forests (ibid: xiii). The achievement of this task represents an extraordinary challenge in terms of the policy effectiveness and resource use efficiency it requires.

Since REDD+ will necessarily require that forests are used according to their sustainable yield, the lack of availability of round wood from forest plantations will work against the implementation of REDD+ unless the demand for round wood is correspondingly reduced. Otherwise, the gap between the demand and supply for timber will endure, and will produce leakage and lack of permanence for REDD+. Furthermore, the effectiveness with which new

[7] According to the World Bank (ibid) approximately two thirds of the production of Indonesia's forest sector has a suspect or undocumented origin.

plantations are being established gives rise for genuine concern about the likelihood of reducing the use pressure on natural forests since "only a third of the lands allocated for plantation have been planted, and only a portion of these lands are yielding timber at industry-recognized levels of performance" (WB 2006: 10). Thus in the short term, pressures on natural forests (from not only the pulp industry, but also from plywood producers and furniture manufacturers from Indonesia and abroad) are likely to continue unabated.

The effects of the continuing excess of demand for round wood are depicted in Figure 2.2. Let us assume that before the implementation of REDD+ the demand and supply meet at point A, where the demand is D_1 and the supply is S_1. Following, let us assume that the implementation of REDD+ reduces the legal timber supply (from S_1 to S_2). Thus, if no measures are taken to reduce the demand (that is, if D_1 remains constant), the short term market effect will be an increase in the price and a reduction of the demanded quantity. How strong the reduction of the demanded quantity and the price increase will be will depend on the price elasticity of the demand.[8] An elastic demand (D_1) may signal that there are a number of good substitutes available for timber from natural forests – for example from forest plantations – and so the new market equilibrium would be on point B. An inelastic demand (D_2) poses a more difficult situation because the more inelastic the demand is, the higher the price increase and the smaller the reduction of the demanded quantity (C). An inelastic demand for timber may exist where there are poor substitutes for timber (for example in places where there is great need of construction materials, or when the demand is focused on specific sorts of high value timber or where there are no substitute supply sources). In this case illegal logging is bound to surge, increasing the supply of timber (S_{illg}) and reducing the desired effect of the REDD activity even more (G).

The ideal situation is to address the demand to neutralize as much as possible the effect of a reduction of timber supply to attain a point such as "E". At this point, it can be argued, avoided emissions are achieved with maximum efficiency. But this outcome is not self evident for a number of reasons. For example, reducing the demand for timber from natural forests may be achieved by making available substitute goods like timber from forest plantations.[9] But timber from forest plantations may not be readily available in the sorts and quality demanded, not to mention that production cycles in forestry go from the long into the very long term.[10] Another alternative could be to tax end products to induce consumers to seek for alternative goods (for example to buy a bamboo table instead of mahogany), and increase information on the

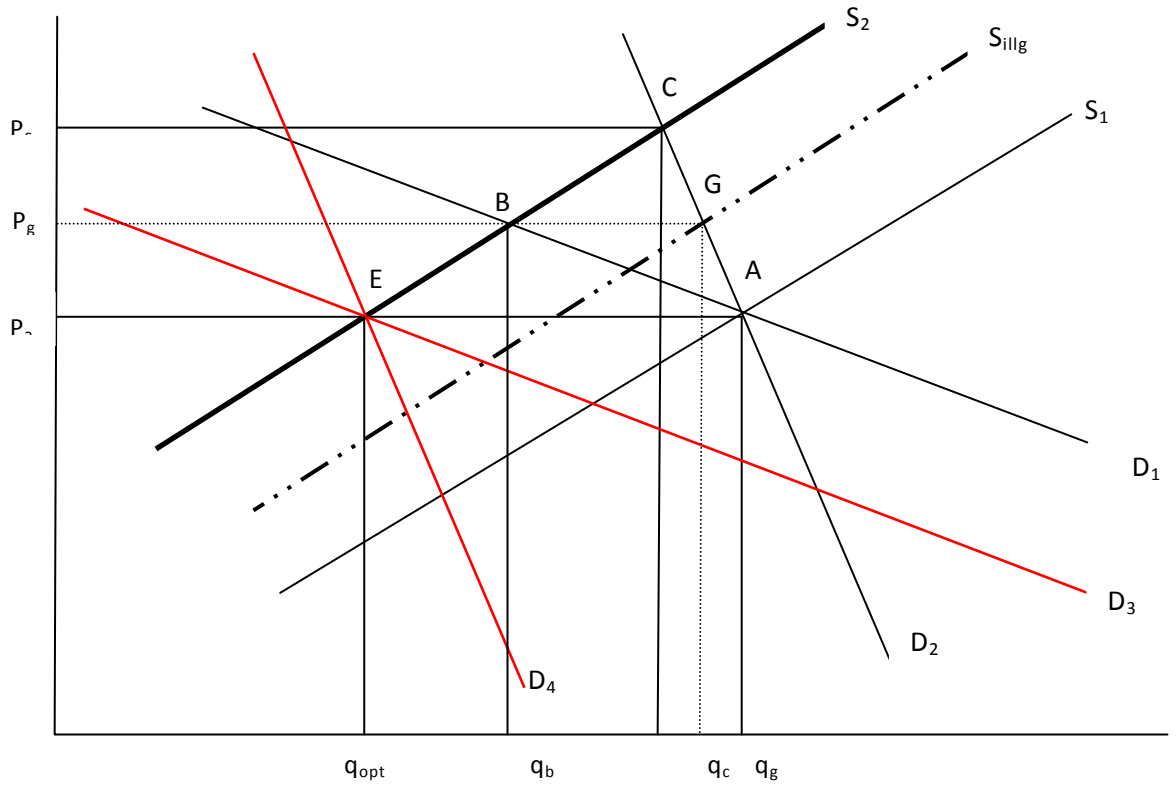
[8] The demand for timber is price elastic if a price increase triggers a decrease in the demanded quantity proportionally larger than the price increase (for example a 1% price increase produces a 3% decrease of the demand for timber). Likewise, the demand is price inelastic if a price increase produces a decrease of demand proportionally smaller than the increase in price (say, a 1% price increase produces only a 0.1% decrease of the demand).

[9] Or by reducing existing installed processing capacity, but vested interests may stand in the way of this course of action.

[10] Except for the production of pulp, where the rotation periods are relatively short. But still, availability of timber for pulp will hardly solve the problem when the major issue is excess installed capacity.

availability of substitute goods that are not energy intensive (such as cement, aluminium, steel etc. in the case of construction). But increasing taxation on specific timber goods may have the end effect of increasing illegality, particularly in countries where governance is weak. A complementary measure is to educate consumers to influence their preferences, but this is also a long term process.

Figure 2.1. The timber market and REDD



2.4 Local consultation and participation

Consultation and inclusion of local and indigenous communities is deemed as an essential requirement for the implementation of REDD+ because there needs to be a common understanding of what REDD+ is about and because local actors are key stakeholders in the process of improving forest governance. Only through appropriate consultation and meaningful participation of local and indigenous communities can the implementation of REDD+ have some assurance that; 1) there is common understanding of what rights accrue to different stakeholders, 2) there are clear rules about where, at what time and through what means and how much resources are available, 3) there is an active involvement of local actors in monitoring because they have a self interest in the maintenance and availability of forests, 4) there is a minimal recognition of the rights of participants to organize around the use of the resources on which they depend (Ostrom 1990). As a matter of fact, the AHW-LCA

(UNFCCC/AWG-LCA 2009) argues that one of the safeguards that should be considered when designing the architecture of REDD+ is to "respect the rights and knowledge and rights of indigenous peoples and members of local communities, by taking into account relevant international obligations, national circumstances and laws, and noting that the General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples". In spite of the repeated calls for the inclusion of local and indigenous communities there is mounting evidence of lack of meaningful local participation in the design and implementation of REDD activities (Griffiths 2007; Dooley et al. 2008; DTE 2009; Global Witness 2009). In a letter to the Permanent Mission of Indonesia to the United Nations, the High Commissioner for Human Rights – referring to Indonesia's Regulation on Implementation Procedures for Reducing Emissions from Deforestation and Forest Degradation (REDD) – remarks that "the property rights of indigenous peoples over traditional land were not properly taken into account in the formulation of the Regulation, and financing for implementation is being sought from the World Bank's FCPF without having secured the meaningful participation or consent of indigenous peoples".[11]

2.5 Conclusions

Developing countries such as Indonesia, who have shown strong enthusiasm and leadership for REDD, may be underestimating the challenges of achieving real and long-term emissions reductions from the forest sector. Whereas it is a well known fact that in order to implement REDD+ deep policy and institutional reforms are necessary, it is not clear what actions are being taken to coordinate policy strategies across sectors, or what institutional reforms are underway to improve the governance of forest (and in general, natural) resources. The structure of the timber market is a significant hurdle for the advancement of REDD+ in Indonesia. Authorities are well aware of this, but there is much room for doubt on the plans they propose to supply an ongoing excess demand, in particular because there may be a time lag between the point in time where REDD+ is implemented, and the point in time where forest plantations can supply the excess demand – that is of course, assuming that the additional forest plantations will be able to supply the goods in the quantity and the quality required. If REDD+ restrains the supply and forest plantations do no perform as expected, it will be difficult for the government to secure the control over forest resources and follow up on the implementation of REDD+. This would bring additional trouble for the country if the investment necessary for the expansion of forest plantations depends on the income that can be obtained from REDD+. An ongoing disequilibrium of the timber market will undermine the efforts to implement REDD+.

Additionally, if it is accepted that the involvement of local actors is necessary for the successful implementation of REDD+, then the government (and project developers as well as

[11] See: http://www.forestpeoples.org/documents/asia_pacific/indonesia_cerd_response_urgent_action_sept09_eng.pdf

multi-lateral organizations) will need to invest much more time and effort in ensuring that local actors are well informed and that they have a meaningful stake in the endeavour. Otherwise, old mistakes (such as unequal benefit sharing, discrimination, eviction, etc.) will be committed again, conflict over resources will continue and REDD+ will have limited potential to alleviate poverty and become the win-win initiative its promoters say it can be.

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3 Institutions and Low Carbon Transport: The Case of a Decentralizing Indonesia

Eric Zusman[12] and Heru Sutomo[13]

Key Messages

- More rigorous research on institutions is needed in studies on low carbon development in Asia. Decentralization is an institutional trend that should receive more attention in these studies.
- Decentralization has been both good and bad for low carbon transport in Indonesia. On the one hand, it has led to policy innovations such as bus rapid transit (BRT) systems. On the other, it has strained fiscal capacity and administrative coordination needed to capitalize on promising transport reforms.
- Strengthening central-local budgeting mechanisms and empowering provincial level agencies can help realize decentralization's potential in Indonesia's transport sector.
- International development agencies will need to consider fiscal and administrative institutions when providing capacity building support for Nationally Appropriate Mitigation Actions (NAMAs). The case of decentralization in Indonesia may provide some useful lessons.

3.1 Introduction

In recent years, developing Asia's policymakers have exhibited a growing interest in climate actions. Many factors have contributed to this interest, including a future climate change regime that provides financial, technological and capacity building support for "nationally appropriate mitigation actions" (NAMAs) (UNFCCC, 2007). But among those factors with the greatest potential to shape the region's climate policies is research on low carbon development. This research has already demonstrated the technical and economic feasibility of a low carbon future in China, India, Indonesia, and Asia's other emerging economies (Jiang 2009, Shukla, Dhar, and Mahapatra 2008, Shrestha, Pradhan, and Liyanage 2008, Retno and Kobashi 2010). This chapter will nevertheless argue that low carbon studies could prove more policy relevant if they accounted for institutions.

Institutions—the rules and structures governing policy design and implementation—can have significant impact on low carbon policies. While several methods can illustrate these impacts, this chapter employs a case study approach to analyze the effects of decentralization on transport policies in Indonesia. The case study reveals that decentralization has been good and

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bad for Indonesia's transport sector. On the one hand, it has led to policy innovations such as bus rapid transit (BRT) systems and car free days. On the other, it has strained the fiscal capacity and administrative coordination needed to capitalize on recently promising initiatives. The chapter suggests that strengthening central-local budgeting mechanisms and empowering provincial level agencies could help realize decentralization's potential in Indonesia's transport sector. More generally, the chapter recommends more rigorous research on institutions to make low carbon studies more policy relevant in Asia.

The chapter is divided into five sections. The next section focuses on the importance of institutions for research on low carbon development in Asia. The third section applies arguments regarding decentralization to Indonesia. The fourth section provides a preliminary assessment of the effects of decentralization on Indonesia's transportation sector. The final section outlines the way forward. The chapter draws upon a policy dialogue that the Institute for Global Environmental Strategies (IGES) and the Bogor Agricultural University convened on "Sustainable and Low-Carbon Development in Indonesia and Asia: Dialogues between Policymakers and Scientists on Green Growth" in February 2010 in Bogor, Indonesia.

3.2 Low Carbon Research: Bringing in Institutions

Over the past half decade, several low carbon studies have helped to identify policies and measures that could lead to a significant deviation in carbon dioxide (CO_2) emissions from business-as-usual (BAU) projections (Strachan, Foxon, and Fujino 2008). Energy modeling has occupied a critical place in this research. Because the combustion of fossil fuels is the single greatest source of anthropogenic greenhouse gases (GHG), it is with good reason that these studies rely heavily on energy models. It is further noteworthy that low carbon research has arrived at ever more precise estimates of the costs of low carbon policies in developed and developing countries. Cost-effective mitigation scenarios have had an important influence on climate policies in developed countries such as Japan (Fujino *et al* 2008). Demonstrating that low carbon development is economically feasible may matter even more in the developing world (Jiang, 2009).

It is, however, important to underline that low carbon models employ simplifying assumptions to reach their conclusions. And these simplifying assumptions place at least two limits on the models application to actual policies. One such limit is that the models focus on long-term equilibria when short-term policy decisions can alter the likelihood of future development paths. Another limit is that the model's policy recommendations are based on technical and economic criteria when decisions frequently come down to which agencies have authority in specific policy areas (Sugiyama 2008) (Crassous and Hourcade 2008). This chapter, therefore, focuses on an institutional trend that is expanding the influence of local governments on short-term decisions in many policy areas in Asia: decentralization.

Decentralization involves the "transfers of authority, responsibility, power and resources downward among different levels of government" (Bennet 1990). This process is typically intended to align popular demands with government supplies of public goods. The process commonly takes place along administrative, fiscal and political dimensions. Administrative decentralization involves granting subnational government's authority over policy areas previously under the jurisdiction of the central government. Fiscal decentralization involves vesting subnational governments with expanded power to raise and spend revenue. Political decentralization involves establishing mechanisms such as local elections to make subnational leaders more accountable to their constituents (Bennet 1990).

Rarely do countries adopt all three forms of decentralization simultaneously. Rather most governments decentralize some powers while retaining others according to their own national circumstances. For instance, China has introduced extensive administrative and fiscal reforms but been more measured with political reforms. Similarly, countries rarely decentralize all of their power at once. For example, Viet Nam has gradually devolved authority to provincial, district and communal governments over the past two decades. Decentralization, then, is an evolving process that exhibits country specific characteristics (see table 3.1. for examples from the region).

Table 3.1. Decentralization in Asia

Philippines	Local government code (1991) improved efficiency and effectiveness
China	Decentralization (late 1970s and early 1990s) credited with creating hard budget constraints and stimulating growth
India	Adopted constitutional reforms that created third-tier of government in 1993 to improve governance and service delivery
Viet Nam	Localizing reforms phased in incrementally since 1980s Doi Moi reforms with increasing autonomy for provincial, district and communal governments in mid-1990s

Though few studies have looked at decentralization and climate actions in developing Asia, studies on climate actions in *developed countries* have generated a debate relevant to the region. At one end of this debate are those who view decentralization favorably. For example, some observers contend that decentralization enables governments to tailor climate policies to local circumstances. Another set of favorable assessments holds that decentralization can lead to increased policy experimentation and innovation. Yet a third group of supporters points to the local ownership of climate concerns that comes from expanding the influence of local governments (Lutsey and Sperling 2008).

At the other end of this debate are those who find more faults with decentralization. For example, some detractors argue decentralization leads to patchwork of regulatory requirements and resulting difficulties coordinating policy goals. Another set of critics reflect on the limited human resources and lack of financing at the local level to implement climate policies. Yet a third group points to the lack of local interest in tackling a global issue (Weiner *et al* 2006, Ludwiszewski and Haake 2008) (see table 3.2. for a summary).

Table 3.2. The Strengths and Weaknesses of Decentralization

Dimension	Summary	Strengths	Weaknesses
Administrative	Authorizes local governments to make decisions over issues previously under central government control	Local expertise and flexibility	Limited coordination
Fiscal	Vests responsibilities to raise and spend revenue with local governments	Local innovation and autonomy	Limited capacity
Political	Make officials more accountable through lower level elections	Match local preferences	Local not global needs

These arguments typically reduce to whether decentralized or centralized systems are better for climate policy. Those viewing decentralized systems favorably contend it can lead to more policy innovation and experimentation (Lutsey and Sperling, 2008); those holding the opposite view claim it can strain fiscal capacity and administrative coordination (Weiner et al, 2006). It is nonetheless important to underline that these arguments are not necessarily mutually exclusive. Decentralization could lead to greater policy innovation and experimentation, while simultaneously straining fiscal capacity and administrative coordination. This possibility is even more likely if countries are still phasing in decentralizing reforms in an attempt to find a suitable balance between local and central power. This characterization applies to many countries in developing Asia, including Indonesia.

3.3 The Case of a Decentralizing Indonesia

Indonesia is an important case to understand the effects of decentralization. Not only is Indonesia the world's fourth most populous country, but it was also a centralized state for most of its modern history. From 1966-1997, the Suharto administration presided over a regime that sharply limited local autonomy in Indonesia. It was only after a 1998 coup brought an end to

Suharto's rule that Indonesia's new government ushered in reforms changing the institutional landscape. Two of the more consequential reforms during this period were Law 22/1999 on Local Governance and Law 25/1999 on Fiscal Autonomy.

Law 22/1999 on Local Governance presented a positive list of functional responsibilities that were to be delegated to Indonesia's 365 local governments (kabupaten/kota). Among other things, the law devolved responsibility for the transport sector to local governments. Meanwhile, Law 25/1999 on Fiscal Autonomy placed more responsibility on local governments to generate and manage revenue. By some estimates, the regional share of general government spending doubled to over 40% following the reforms (Embassy of Indonesia 2010).

Yet consistent with the previous descriptions, decentralization has been an evolving process in Indonesia (Rabassa and Chalk 2001). For instance, the provisions in the Law 22/1999 and Law 25/1999 have been continually refined through the passage of 13 separate implementing rules (Embassy of Indonesia 2010). Moreover, part of the redefinition has involved clarifying the functions of provincial governments. Provincial governments operated between Indonesia's national government and 365 local governments but were not given significant authority in the first wave of decentralizing reforms. Since then, repeated attempts have been made to grant provincial governments more authority without upsetting the balance of power between the central and local governments. How has this gradually unfolding process affected Indonesia's transport sector?

3.4 Low Carbon Transport in Indonesia

The introduction of decentralizing reforms has coincided with a sharp increase transport demand in Indonesia. As a result of this rising demand, transport-related CO_2 emissions grew nearly fourfold in Indonesia between 1980 and 2005 (Timilsina and Shresthra 2009). Moreover, during the next few decades Indonesia's emissions are projected to grow more sharply; some estimates suggest that they will climb from 70 to 500 million tones of CO_2 between 2005 and 2030 (Suhadi 2009). The general consensus is that no single policy or measure can alter these projections, but one of the more cost effective approaches is improving urban planning and public transport (Wright and Fulton 2005). Not only would better urban planning and public transport avoid unnecessary travel and increase the efficiency of motorized transport, but they would help Indonesia's cities avoid becoming locked into carbon intensive infrastructure and vehicles. Moreover, these reforms would be largely under the jurisdiction of local governments. How has Indonesia's local governments responded to this opportunity? The evidence is mixed.

3.4.1 The Benefits: Innovation and Experimentation

Some indications suggest that decentralization has been largely beneficial for Indonesia's transport sector. This evidence focuses on the fact that decentralization has led to policy innovations and experimentation, including those mentioned below.

- **Bus Rapid Transit (BRT) Systems-**A BRT is a bus system that runs on segregated lane of traffic and resembles an above-the-ground subway. In 2004, Jakarta's local government introduced Indonesia's first BRT system. Since the 2004 opening, ten lines have been constructed on what will eventually be a fifteen line system. By most accounts, the Jakarta BRT has been a success. The system has helped alleviate some of the city's traffic problems, saved time for commuters, and reduced emissions of both local and global pollutants (Ernst 2005). The program has also generated interest from transport agencies throughout Indonesia. Based on the experience of Jakarta, BRT systems are being planned or constructed in Yogyakarta, Bandung, Bogor, Makassar, Semarang, Solo, Pekanbaru, and Manado (Suhadi 2009). The national level Ministry of Transport has also recognized the value of the systems and introduced a program to provide buses to cities initiating a BRT system.

- **Car Free Days-** Low carbon transport requires changing both actions and mindsets. Car free days are an example of program that is designed for both purposes. Introduced in 2002 by Jakarta's non-governmental organizations (NGOs), car free days have since grown into a government-supported initiative held every Sunday in one of Jakarta five administrative municipalities. Car free days attract crowds of up to 5,000 and help educate the public of the virtues of non-motorized transport. Public transport is also promoted since Jakarta's BRT is the only mode allowed to run on the closed-off segment of the road. Similar to the case of the BRT, the success of Jakarta's program has had demonstration effects. Other Indonesian cities such as Surabaya, Bogor, and Yogyakarta have begun organizing their own car free days (Dillon and Damantoro 2008).

- **Pedestrian Programs and Bicycle Lanes**-Some cities have taken initiatives to improve the urban infrastructure for pedestrians and bicyclists. This includes pedestrianization and bicycling programs initiated in Yogyakarta's Maliboro district that have made cycling and non-motorised transport more feasible. They also involve a project in Surabaya that aims to create 7.5 kilometers of pedestrian, cycle and rickshaw lane along some of the cities' major thoroughfares (Sutomo 2010)

3.4.2 The Drawbacks: Fiscal Capacity and Administrative Coordination

While the above examples highlight the strengths of decentralization, there have also been signs of strains in Indonesia. These strains can be traced to constraints on fiscal capacity and administrative coordination.

- **Fiscal Capacity-**One of the policies with the greatest potential to cut emissions is Indonesia's Road Transport Act of 2009. The act includes many important provisions such as clearer guidance on the roles of transport-related agencies, funding for road maintenance, and inclusion of bicycle lanes and sidewalks. Moreover, these provisions are supposed to be defined by local legislation. There are nonetheless evidence of the law's ineffective enforcement and insufficient monitoring of local implementation (Sutomo 2010). These concerns are echoed by more general reviews of the transport sector that suggest "regional agencies, with new planning responsibilities due to decentralization vary considerably in capacity and performance, and require capacity building and incentives to use planning tools."(World Bank 2009) These concerns are also borne out by suggestions that budget allocation mechanisms from the central to local level are not earmarked specifically for the transport sector. As such, local level governments often lack the resources to take advantage of innovative public transport and urban planning reforms outlined previously. Training and expertise are also reported to suffer from resource shortages.

- **Administrative Coordination-**A similar set of concerns relates to coordination of policies between the central and local government. Some of these concerns focus on a need to improve interagency coordination between transport agencies when designing, planning and implementing policies in general. But this is particularly relevant to Indonesia because transport agencies exist at the local level and national level but not the provincial level. Unlike other policy areas such as the environment, a provincial level agency to coordinate transport activities has not been established in Indonesia. While such an agency could clearly be important for cross-boundary transport problems, it would also pay dividends in communicating information from the national level to Indonesia's 365 local governments and from local governments to the national level. Finally, better information exchanges could lead to the more efficient use of resources and address budgeting shortfalls cited previously.

3.5 The Way Forward

This chapter has argued that institutions need to be given more consideration in low carbon research. One of the more important institutional trends in Asia is decentralization. While there has been a heated debate on the merits and drawbacks of decentralization, this chapter

suggests that decentralization can be both good and bad for low carbon policies, especially as countries are in the process of decentralizing. A preliminary review of the evidence in Indonesia's transport supports this conclusion. Indonesia's transport sector appears to be reaping the benefits of experimentation and innovation while struggling with the burdens of administrative coordination and fiscal capacity. A few recommendations follow from this finding.

First, it will be increasingly important to improve central-local budgeting mechanisms for Indonesia's transport sector. It is clear that Indonesia's local governments need greater financial support in implementing existing regulations. Adjusting existing funding channels such as the central governments special allocation mechanism so that transport becomes a priority area may be the a step in the right direction. Setting up a special grant to cities program for the transport sector may also boost local capacity (Sutomo 2010). It is further important that these mechanisms not only be designed to strengthen the implementation of existing policies, but help to scale up local innovations. Demonstration effects appear to be occurring even in several cases without national support; however, promising programs could achieve more with the full-fledged financial backing of the national government.

Second, creating provincial level transport agencies with well defined powers and roles should be given greater consideration. One of the barriers to implementing transport reforms is the challenges of coordinating policy goals with numerous subnational governments. In Indonesia's case, the number of local governments is in the hundreds. This poses a significant challenge to the Ministry of Transport because it does not have an intermediary institution through which to communicate policy advice and monitor implementation progress. Provincial level transport agencies would not only support the transfer of information downward, it would also help pull up promising approaches. This could again be particularly important for spreading policy innovations and capitalizing on demonstration effects at the local level.

Third and finally, Indonesia has recently introduced an ambitious voluntary commitment to reduce GHG emissions by 26% by 2020 off of BAU levels. The voluntary commitment also includes a provision for increasing the reduction target from 26% to 41% with additional international support. These voluntary commitments have been pledged to the United Nations Framework Convention on Climate Change (UNFCCC) in line with language on NAMAs. The chapter suggests that it will be increasingly important that NAMAs receive not only financing and technology, but capacity building support. It further suggests that agencies responsible for providing that capacity building should pay as much attention to the NAMAs as the institutions responsible for designing and implementing them. In this connection, low carbon research that systematically accounts for institutions could become even more policy relevant to Asia.

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4 Technology transfer and a national system of innovation: A case of Indonesia

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4.1. Introduction

The chapter on low carbon technology development and transfer aims to examine the policy environment on the transfer of priority low carbon technologies in key GHG-emitting sectors in Indonesia, as well as assess the function and performance of the country's national systems of innovation (NSI) in facilitating the effective transfer of these technologies. The session is part of the ongoing broader research which will look into the key enabling conditions and institutional mechanisms which facilitate the development and transfer of priority low carbon technologies in Asia. Indonesia is one of the countries in focus for the first year of this research project.

One of the three currently identified components under the Sustainable, Low Carbon Development Project, otherwise known as S6 Project is “technology leapfrogging”. This study will form part of this component. Technology leapfrogging is a term used to describe the bypassing of technological stages that industrializing countries have taken in order to avoid the resource-intensive patterns of economic and energy development by leapfrogging to the most advanced energy technologies available, rather than following the same path of conventional energy development undertaken by industrialized countries (Gallagher 2008). Technological leapfrogging has also sometimes been referred to as technological catching up.

The Information and Communication Technology (ICT) Regulation Tool Kit cites four main factors affecting leapfrogging. And while this tool kit provides insights largely in the context of information and communication technologies, it nevertheless can find application to technologies in general and thus may also offer some lessons for low carbon technologies. These include the following: a) the technology itself and how the new technology fits into the existing technology system; b) the economic aspects which include investment and financial resources which are generally scarce in developing countries and thus impacts on the deployment of new technologies; c) the examination of the power relations surrounding the technology especially in cases when the new technology systems are implemented by others than the existing dominating companies and more critically, when the new solutions offered potentially substitute for the older systems; and d) refers to a broad range of other socio-economic factors including absorptive capacity, access to equipment and know-how, complementary technologies, and downstream requirements (relations with the end users).

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From an environmental leapfrogging perspective, Perkins (2003) noted that "the consensus is that leapfrogging implies a development strategy for industrializing countries to bypass the 'dirty' stages of economic growth through the use of modern technologies that use fewer resources and/or generate less pollution". Perkin's discussion on leapfrogging refers to both cleaner production processes and the deployment of less polluting technologies. However, in his review of existing approaches to leapfrogging in 2003, Perkins argues that leapfrogging is not only characterized by considerable ambiguity but is also based on an incomplete understanding of the technological and policy requirements of cleaner industrialization.

At the heart of the concept of technology leapfrogging especially for developing countries, it comes as no surprise to find technology transfer as a common feature (Sauter and Watson, 2008). Technology transfer is one of the key pillars necessary for the successful implementation of the United Nations Framework Convention on Climate Change (UNFCCC). The seventh meeting of the Conference of Parties (COP) to the Convention through the Marrakech Accord adopted a framework for the meaningful and effective actions to enhance the implementation of Article 4.5 of the Convention. Additionally, the Accord established the Expert Group on Technology Transfer (EGTT) whose continuing work aims to develop and test a balanced and robust set of performance indicators to monitor and evaluate the effectiveness of the implementation of the technology transfer framework (FCCC/SB/2009/INF.3).

While there have been numerous efforts to help accelerate the diffusion of low carbon technologies as a key to achieving the objectives of the Convention, the rate and volume of transfer of these much-needed technologies have yet to create an impact if we were to see significant levels of mitigation of greenhouse gas emissions, as well as address challenges relating to sustainable development. In the climate and energy security context, the International Energy Agency (IEA) has emphasized that to achieve the required emissions reductions, there is a need to unleash the potential of existing low carbon technologies, bring new technologies to the market, and deploy available technologies.

The question however which needs a more empirical investigation and a careful assessment is on how to make these much-needed low carbon technologies available especially to countries which either do not have access to, and/or those countries which have less capacity to access (in the short term), as well as countries whose capacity to innovate has not been thoroughly examined. This assessment can be taken from various perspectives and one of which is through how developing countries see their local capacity to absorb and innovate on these technologies. Trends have shown that technologies, particularly low carbon technologies such as those on renewable energy and motor vehicle abatement for example, are not necessarily available where they are most needed. While some developing countries have made some progress, they are still net importers of technology (UNDESA 2008). This practically

translates to challenges relating to access and the high cost associated with the right to access these technologies, among others.

Hence at the international level, Article1(d) of the Bali Action Plan adopted in 2009 during COP 14, the crucial role of accelerating technology development and diffusion in achieving the goals of the Convention have been further reiterated. The Intergovernmental Panel on Climate Change (IPCC) has also echoed that the most common barrier identified to technology development and transfer has been the challenges pertaining to deployment of available technologies and bringing new technologies to the market. Policies governing technology development and diffusion at the national level therefore, need to be examined. To this end, understanding the level of development of a country's national system of innovation (NSI) would be vital in analyzing appropriate and effective approaches to development, diffusion and transfer of priority low carbon technologies at the local level.

4.2 National Systems of Innovation Approach and Relevance to Policy Research and Application in Developing Countries

National systems of innovation (NSI or NIS) refers to a "set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer knowledge, skills and artefacts which define new technologies" (Metcalfe 1995). It integrates the elements of capacity building, access to information and an enabling environment into comprehensive approaches to transfer of low carbon technologies or ESTs (IPCC 2001).

According to the IPCC Fourth Assessment Report (2007), effective diffusion and transfer of technologies would require a thorough understanding of at least seven (7) characteristics of the following: 1) of the technology concerned; 2) of the originator of the transfer; 3) of the enabling and disabling environment in the country of origin; 4) of the conditions of transfer; 5) of the characteristics of the recipient; 6) enabling or disabling environment in the host country; and 7) the ultimately valuable post-transfer steps which include assimilation, replication and innovation. To this end, an examination of a country's national system of innovation –of its actors and activities, would certainly be a key input in effectively understanding a country's capacity to develop , diffuse and transfer its priority low carbon technologies.

Occurring in various pathways such as foreign direct investments, direct purchases, government assistance programs, licensing, joint ventures/collaboration, cooperative research agreements, public-private partnerships, among many others, technology transfer is difficult to quantify. Additionally, the barriers and challenges to, and the instruments for each of the

technology concerned would vary depending on a number of factors such as the level of maturity of the technology concerned, the stakeholders concerned and the capacity of each stakeholder.

This is where an analysis of a developing country's NSI such as Indonesia, would come in a useful tool in approaching this study from a systemic perspective. In particular, it would be helpful in Indonesia's advancement of diffusion of clean coal and renewable energy technologies, given the country's current national energy mix and energy mix targets. Indonesia' National Energy Policy to 2030 indicates an economy-wide target of 1% reduction per year in energy intensity. Based on the country's Energy Blueprint 2005-2025, renewable energy share on the other hand in the total primary energy source (TPES) would be increased from the current 4.3% to 17% in 2025, particularly for geothermal and biofuels.

To achieve such targets, Indonesia will benefit indeed from accomplishment of ongoing country activities pertaining to mapping of technologies for each renewable energy type and identifying its priority technologies, assessing the major pathways and conditions through which these transfer occurs, understanding the capacity and condition of each stakeholder, as well as the enabling and disabling conditions for such transfer. It is in this context that a national system innovation (NSI) approach would support a bigger assessment of the country's capacity to develop, diffuse and transfer low carbon technologies.

As an approach, it is a useful tool in guiding policy. The Science and Development Network (2005) enumerated succinctly the relevance and usefulness of the NIS approach to policymaking. It stated that the NIS approach does so by shifting focus away from policy of individual organizations to both the organizations and the interactions between them. It also calls for a shift away from the traditional focus – from one which puts emphasis on research and development activities which serve as the scientific and technological inputs, to one which gives focus on innovation processes (introduction of new products and methods) and outcomes.

Additionally, the emphasis of policy also shifts from deciding whether to support the supply and demand for science and technology, to issues that affect the interaction between the supply and demand of knowledge. It also acknowledges the behavior of both firms and science and technology organizations – universities, research organizations or technological centers. It also takes into consideration the influence exerted by a wide range of institutions and supporting organizations. Informal rules, norms, customs and routines that favor new ways of doing things are also important. The approach emphasizes that policy analysis including interventions to support innovation, can operate at many levels of the economy- national, regional, local, sectoral and technology levels. Differences in types of innovation will sometimes demand that the design and implementation of a policy at an appropriate level. And finally, following a systems of innovation thought process already changes the way we focus

our analysis – that from the internal working of an economic system, to the way the systems interact with the outside world.

The approach is applicable to both developed and developing countries. It is both an analytical tool – to identify obstacles to the formation of a well-functioning system of innovation in countries where such a system may only exist in embryonic form, and a prescriptive tool when it encourages policy initiatives to view the whole innovation process in a systemic way. Thus, understanding a country's level of NSI will be significant in assessing its capacity to absorb and innovate priority low carbon technologies. Literature has shown that some developing countries in Asia have been more successful in addressing key barriers to developing, diffusing and transferring low carbon technologies because of a robust and resilient NSI.

Therefore, if NIS is important in facilitating a sustainable, low carbon development and helps in fostering long-term economic growth in Asian developing countries, assessing how the NIS in Indonesia is currently doing- the actors and their activities and how these relate within and with each other, would provide insights into technology development and transfer. In so doing, the study can identify and assess the appropriate requirements for a strengthened NIS, and thus explore potentially effective approaches in strengthening the country's capacity to absorb, innovate and diffuse priority low carbon technologies.

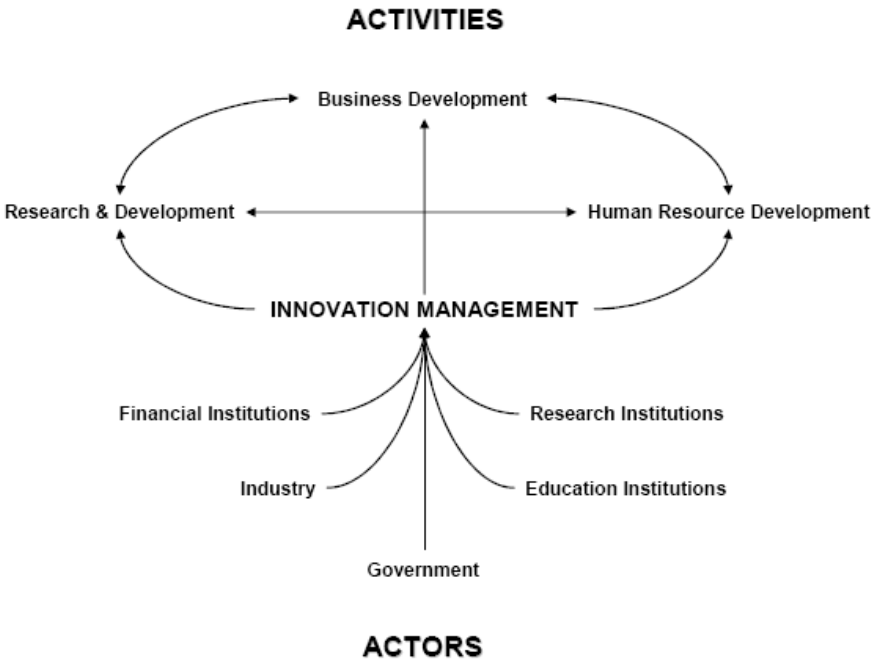
Otherwise known as the problem-identifying analysis, the conduct of an empirical analysis of a country's local innovation system- of its actors and activities, is very helpful for the purposes of policymaking (Edquist 1994). For example, to collectively identify and manage failures in the NSI in order to improve national competitiveness, a new innovation management framework for use by innovation actors has been proposed by Lingela and Buys (2007). In this paper presented during the 2007 16th International Conference on Management of Technology held in Miami, Florida, Lingel and Buys introduced a new management framework (figure4.1.) for better articulation, identification of gaps and challenges to help improve national competitiveness.

Utilizing a 20-year time series data from 1985 to 2005, the paper demonstrated the use of the proposed framework as a national innovation management tool for the innovation actors in order for them to 1) determine and manage their contribution in the NSI; 2) to assess and manage functional relationships among their activities in the NSI; and 3) to identify and manage factors limiting competitiveness in the NSI.

An effective assessment of an NSI through this proposed management framework will serve as significant, if not a vital input when assessing key enabling conditions and mechanisms for transfer of low carbon technologies in developing countries such as Indonesia. Understanding Indonesia's NSI, along with the current modalities of technology procurement and of the

policies influencing the transfer of the country's priority low carbon technologies in the short term, and will also help in the country's assessment of which technologies have higher chances of absorption and innovation at the local level in the long term.

Figure 4.1. New Innovation Management Framework



Source: Lingel and Buys (2007)

In the case of Indonesia, a preliminary literature review pointed us to a study conducted by Dhewanto and Umam (2009). This paper, though very preliminarily as well, examined the roles of institutions and organizations in promoting and assisting technology commercialization in the country. It outlined some key innovation policies in Indonesia which included those under the Indonesian Technology Commercialization Map. This included the Science and technology Vision 2025 with the National Science and Technology Strategic Policy 2005-2009 which focused on strengthening the linkage partnership among R&D institutions, universities and industry. The Industrial Development Policy is seen as complementing the S&T Strategic Policy.

In addition, Presidential Decree on the National Mid-Term Development Plan identified fields of research priority which now includes a new area such as renewable energy and transportation technology besides food and agriculture, security, health, ICT and aeronautics and nuclear science – the latter two having been given in the past stronger focus than the others. Likewise, the Ministry of Research and Technology, otherwise known as RISTEK, has launched incentive programs in 20067 for basic research, enhancement of S&T capacity

production system, acceleration of R&D result diffusion and utilization, and incentives for the conduct of national strategic policy research.

In terms of key innovation players, Dhewanto and Umam noted that universities as one of the key actors are armed with a Tr-Dharma mission of education, research and society empowerment. Guided by these, universities are expected to produce 'technopreneurs' to help develop competitive local industries that can help build the national economy. In Indonesia, four leading universities with technology commercialization activities include the University of Indonesia (UI), University of Gajah Mada (UGM), the Institute of Agriculture (IPB), and the Bandung Institute of Technology (ITB). In the case of IPB and ITB for example, it noted that an intellectual property Rights (IPR) office has been established. In the case of IPB, ITB and UGM on the other hand, business incubators to assist students, alumni and staff in starting their own business have been set up. Additionally, the University of Indonesia in 2007 is starting to realize its long-term vision of developing science parks aimed at integrating research, development and commercialization activities.

RISTEK is the key government player tasked with policy formulation. Dhewanto and Umam notes however that coordination among ministerial offices is yet to be clarified. Ranked as 39th of 136 countries for quality of research institutions under the Global Competitive Index (GCI), Indonesia is seemingly a promising developing country in terms of technology development. In the low carbon technology area, the country has for example been able to develop products such as the "Marmut Listrik LIPI or Marlip" which is a battery-powered car as a result of extensive research at the Centre for Research for Electricity and Mechatronics. It is also worth mentioning that this patent innovation has more than 80% of local contents.

From the industry side, Dhewanto and Uman have noted that the slow transformation of the country's agricultural based economy makes the country still largely dependent on FDI and foreign R &D. They noted that majority of MNCs or foreign companies only establish its manufacturing and distribution office with only a handful whose R &D are based in Indonesia. It has also been observed that the Indonesian Chamber of Commerce (KADIN) is recently becoming an active player in technology cooperation and promotion. This study has provided a useful overview of the country's NSI. It can however, be further deepened and made more meaningful by more thorough and deeper examination of the country's NSI, particularly in the context of the country's identified priority low carbon technologies. More useful could be by approaching it from a sectoral needs analysis of priority low carbon technologies.

The challenges identified in the paper by Dhewanto and Umam can be used as a take-off point in conducting research in this area. These challenges include those pertaining to commercialization of technology from public R &D to industry, particularly due to a weak coordination between these two players. The very limited incentives from the government for

industries to exploit R &D results has also been cited. Current trends show that industries are more willing to buy technology while limited capacity to obtain license for these technologies have also been raised as an issue. There is also limited effort to protect IPR of research outputs. In terms of marketing, budget to conduct market testing remains a challenge. Thus, resulting as well to a lack in the clarity of R&D marketing direction and policy.

Based on the preliminary survey of literature in the area of low carbon technology development, diffusion and transfer in Indonesia, the following research questions have been proposed to be included in the study:

- Who are the key stakeholders in low carbon technology development and diffusion in Indonesia? What are the roles played respectively and how they be strengthened? In essence, does Indonesia have a functional, if not a robust and resilient national system of innovation? If yes, how well does it contribute to the development and transfer of low carbon technologies in the country? If not, how can its role be strengthened and how can it contribute to accelerating the development and diffusion of priority low carbon technologies?
- What are the allocation and utilization trends in Indonesia's R&D budget on renewable energy and clean coal technologies?
- What are the priority low carbon technologies of the country? What are the key issues/challenges in the diffusion of these technologies?
- What are the key policies and targets and what is the policy mix on the development and transfer of clean coal technologies and priority renewable energy technologies in Indonesia?
- What are the key policy issues (eg tariff elimination, IPRs, financial incentives) that need to be addressed to facilitate the adoption and diffusion of these technologies?
- What are the financing mechanisms available –public and private for development and diffusion of these technologies?
- What are the main barriers (market and non-market) in the key technologies for the major GHG-emitting sectors in the country, as well as those confronted by each key stakeholder? How can these barriers be overcome?
- How can regional and international climate and non-climate policy processes (eg. trade) enhance or facilitate the local policy environment or enabling conditions to promote low carbon technology development and diffusion in the country?
- What lessons can be learned from the experience of private firms in the country or in other countries in terms of effective strategies to facilitate low carbon technology development and transfer?

4.3 Perspectives on a national system of innovation in Indonesia

4.3.1 On Barriers and Opportunities in the Transfer of Low Carbon Technologies (Dr. Idwan Suhardi, Ministry of Science and Technology, Republic of Indonesia)

The comprehensive presentation by Dr. Suhardi began by identifying the key sectors in Indonesia which contribute to carbon emissions. He proceeded by identifying opportunity areas for technology application in these identified sectors which include energy, industry, transportation, agriculture, ocean, waste, and forestry.

In the case of the energy sector, opportunity areas included more efficient conversion of fossil fuels, application of mitigation technologies in electricity generation such as super critical coal plants, switching to low carbon fossil fuels to suppress emissions and switching of coal to natural gas, the need to decarbonizes flue gases and fuels, the need for carbon capture and storage (CCS) technologies, increased use of renewable energy technology applications, and the use of nuclear energy.

For the industry sector, assessing the efficiency level of equipments used for power cogeneration, in electrical appliances would be among the key intervention technology areas along with improvements in the production process and product utilization. In the case of the transportation sector whose growing carbon emissions was also presented, improvement in engine efficiency, and in the transport management system such as those pertaining to traffic signal control system, highway/railroad crossing and interface system and emergency management system, are among the major opportunity areas for this sector. For agriculture, technologies pertaining to climate prediction, integrated crop management, water resources management, livestock management, biomass processing, and those on hydrological model for peatland management were the areas identified.

In general, the barriers common to most if not all of the sectors pertain to challenges regarding prioritization of the use of alternative energy resources such as biomass, solar and wind, among others. Reaching a common understanding among all stakeholders regarding low carbon technologies and their impact also remains a challenge. A national standard for energy efficiency is yet to be formulated.

A very useful map of the country's national innovation system was presented with corresponding assessment (strong, mild, weak) provided for the key system components which included policy and infrastructure which include those on the IPR system, financial system, tax, competition, ICT infrastructure and socio-cultural policies; incentive structure for company; technology transfer mechanism; basic/applied research and human resource development; and the policy and infrastructure of the educational system, among other components. This was

based on a study conducted in 2002. This presentation was discussed in relation to the national innovation system framework presented by Arnold (2003).

The crucial role of the NSI was highlighted as one of the key inputs in effectively diffusing green technologies. In the context of the country's emission reduction target of 26% in 2020, technology transfer and utilization can be enhanced in order to help reach this target which can be further increased to 41% given international assistance.

A number of policies were enumerated including Law No. 30 of 2007 on Energy, Presidential Regulation No. 5 of 2006 (National Energy Policy) among others and emphasis was placed on the need for enforcement of these laws and regulations. As regards barriers in adoption of alternative energy forms, subsidy provided to fossil fuels was identified as a major item since renewable energy sources cannot compete with these subsidized fossil fuels. High investment cost, tax incentives on parts and not on the systems for example also proved to be a difficulty (eg. tax incentive is provided only for imported solar modules but raw materials for solar modules like the silicon solar cells, laminating materials or class covers are not extended with tax incentives. A roadmap was also presented for Indonesia's photovoltaic industry.

4.3.2 On Renewable Energy Development Towards Achieving Low Carbon Energy Utilization in Indonesia: The Case of Solar PV (Mr. Soedjono Respati, METI)

Dr. Soedjono Respati's succinct presentation centered on the key issues, key barriers and outlined the opportunities in the renewable energy development and utilization in Indonesia. The key issues included those relating to policies on energy in general and those on energy pricing. He also cited the weak coordination as well as problems in consistency of policy implementation. Financing was also a major concern.

The barriers on the other hand pointed to low level of awareness or understanding among policymakers on the importance of the issues aforementioned. A lack of a reliable database to serve as a credible source and basis for policy formulation was also identified as a barrier, Indonesia as a large archipelago is also a challenge which is exacerbated by differences in the educational and socio-economic conditions of the population. Likewise, a weak enforcement of laws and regulations act as hindrance in renewable energy development and utilization in the country.

Mr. Respati however noted that there are numerous opportunities in the country. With Indonesia's abundance in renewable energy resources (with a good potential capacity for hydro, geothermal, biomass), an adequate level of knowledge and skills for research and development, a strong private sector coupled with a democratic system of government with an openness to

globalization, he is confident that the barriers can be overcome given the right policy mix and effective enforcement of these policies.

In the case of solar PV, the proposed strategy for utilization include supportive policies to make it a part of the national energy solution, need for strong involvement of autonomous district governments with a good coordination with the central government in the planning and implementation to achieve the 2025 national energy mix targets. Attractive incentive systems preferably feed-in-tariffs must be offered to create and boost demand. There is a need to improve the national energy management system to ensure proper accountability at the technological, socio-economic and financial terms.

The case of feed-in-tariff (FIT) for Indonesia was also elaborated. Citing the proven success in many countries, it is an effective instrument to pull demand for PV, push the national industry to grow significantly and increase the quality of systems components. As a temporary instrument, it will help PV reach its economies of scale to be made more competitive against fossil fuel energy forms, among other advantages.

Financing solar PV development was also presented showing the various applications at the rural, urban and industry level with the corresponding sources of finance and applicable financing models. A comparison of expected PV generation costs for roof-top systems at different locations in the world was also presented. The effectiveness of the FIT instrument in Germany was also featured and can be used to draw significant lessons from for Indonesia and other developing countries.

4.3.3 On Industry's Implementation of Innovative Low Carbon Technology (Mr. Mochamad Ilham Pratopo, PT Tracon Industri)

Mr. Pratopo's insightful presentation came from the industry perspective. The presentation started by making a distinction in the technical barriers encountered by low carbon technologies. These barriers differ depending on the maturity of the technology concerned, the specific technology involved, and barriers at the laboratorium scale. There are also risks associated with low carbon technology innovation and includes when there is an incomplete laboratorium evaluation, cases of improper documentation of laboratorium equipment, the sometimes unforeseen risks of environmental impacts of construction materials, lack of care in observing operation procedures, among others.

There is also the associated commercial risk in low carbon technology implementation. How to resolve these challenges requires a mix of approaches from provision of direct financial benefit to owners, the need for intensive collaboration with client before and during technology development, provision of what is called an engineering, procurement, construction and

commissioning or EPCC package as examples. These endeavours can be further strengthened by conducting research on suitable business implementation models from the very beginning (a research idea) to exploration, to exploitation and marketing.

In promoting low carbon technology innovation, Mr. Pratopo proposes that in the case of a rural context, an 'integrated back to nature living model' can be applied. In so doing, it can apply low carbon technologies to directly meet the community's basic needs, be able to utilize the local alternative energy resource potential or endowment, and be able to host a pilot processing system for alternative energy. In promoting low carbon technology diffusion, he cited the Government Regulation PP No. 35 of 2007, which can be coupled with incentives for green products as well as direct and simple implementation. Additionally, international collaboration in the education and capacity building for low carbon technology implementation in industry would be very helpful in promoting innovation of low carbon technologies. An international fund for research collaboration is also recommended so that simple and innovative technologies which can bring solutions to local problems and maximize local resources (people and products) can be further enhanced.

4.4 Way Forward –Some Thoughts

The most common barrier identified to technology development and transfer pertain to challenges in the deployment of available technologies and bringing new technologies to the market. Diffusion of the much-needed technologies for low carbon development, particularly for developing countries where mitigation potential is highest, can be accelerated given the right policy mix and institutional mechanisms to support these technologies. Identifying priority low carbon technologies would be a first key step in understanding the country's technology needs and in assessing the country's capacity to develop, diffuse and innovate these low carbon technologies.

The role of the national system of innovation (NSI) as a key component in a country's capacity for technology transfer and absorption cannot be underestimated. Examining carefully the key actors and their capacity, as well as their activities would be helpful in understanding transfer of low carbon technologies can be accelerated to address both development and climate goals. Each key stakeholder and their role – government, universities/research institutions, and industry needs to be assessed. The dynamics of these stakeholders with one another or heir effective coordination would be key in improving the development and adoption rate of low carbon technologies.

5 Potential of Renewable Energy based Distributed Power Generation System toward Low Carbon Development Option for Indonesia

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Key Messages

- Developing renewable energy (RE)-based distributed power supply system is a promising low carbon and sustainable development option for Indonesia, considering the rich natural endowments of renewable energy resources, underdevelopment of centralized power generation system particularly for islands outside JAMALI, as well as national energy mix target and energy security point of view.
- Major barriers for realizing such RE-based distributed system include financial barriers associated with relative price competitiveness and access to finance for investing renewable energy development, as well as institutional barriers epitomized by complexity of permit acquisition and regulatory uncertainty among others.
- Numerous governmental and non-governmental programs and projects have been implemented to support RE-based distributed power supply system. Community engagement in planning, implementation and adequate support for follow-up stage are essential for ensuring sustainability of such programs.
- The growth of domestic industry supported by technology transfer from donors is observed in microhydro power turbine industry, which also contributes to ensure sustainability of distributed RE-based power supply system. Presence of social entrepreneurs and local research entity such as universities plays a catalytic role in developing and disseminating such low carbon technologies.

5.1 Introduction

Energy is an indispensable driver of economic growth. Epitomized by the Asian Miracle, developing Asia has demonstrated rapid economic growth for the past couple of decades. Such rapid economic growth has accompanied increasing energy demand in the region. Richly endowed with fossil fuel resources, Asia has historically relied on fossil fuels for meeting its energy demand through large-scale centralized grid power supply systems.

As electricity demand in Asia is projected to grow rapidly with an annual rate of growth of 4.5% in the period 2006 to 2030 in the Reference Scenario (IEA 2008a), and it is also projected that power sector will account for about 44% of total global greenhouse gas (GHG) emissions by 2030 (UNFCCC 2007), the status quo solution of a centralized power supply system is neither environmentally sustainable nor does it ensure regional energy security.

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There is an urgent need to shift the economy toward a low carbon society that reduces GHG emissions by a significant level. Identifying alternative, less carbon-intensive development path will be crucial to this effort. In this chapter, authors explore renewable energy (RE)-based distributed power supply system as one of an alternative, low-carbon and sustainable development path for power sector in developing Asia. This paper focuses on the potential of RE-based distributed power systems in Indonesia, and assesses the potential and barriers to taking advantage of RE-based distributed power generation in Indonesia.

5.1.1 Features of Renewable Power-based Distributed Power Supply System

A distributed power supply system is an on-site power generation system utilizing locally available RE resources where power supply facilities are placed close to demand. Because a distributed power supply system harnesses locally available RE resources, the system contributes to “local production for local consumption” of energy resources.

The main features of RE-based distributed power supply system as opposed to a centralized power supply system are summarized in table 5.1. While a conventional centralized power supply system is characterized by demand-driven power generation in which power is supplied by gathering and concentrating fuel resources both from domestic sources and abroad into power plants, a distributed power supply system is characterized as supply driven, in which the supply of energy is dominated by the amount of RE resources available in the region. As table 5.1. indicates, the main benefits of a distributed power supply system lie in its potential to mitigate GHGs from the use of by full utilization of locally available RE resources, contribution to energy security due to a decreasing dependency on fossil fuels, and potential to create green markets. The drawbacks of a distributed power supply system lie in its technical aspects including lower efficiency in power generation and less stability of power supply as compared to a conventional fossil-fuel based centralized power supply system.

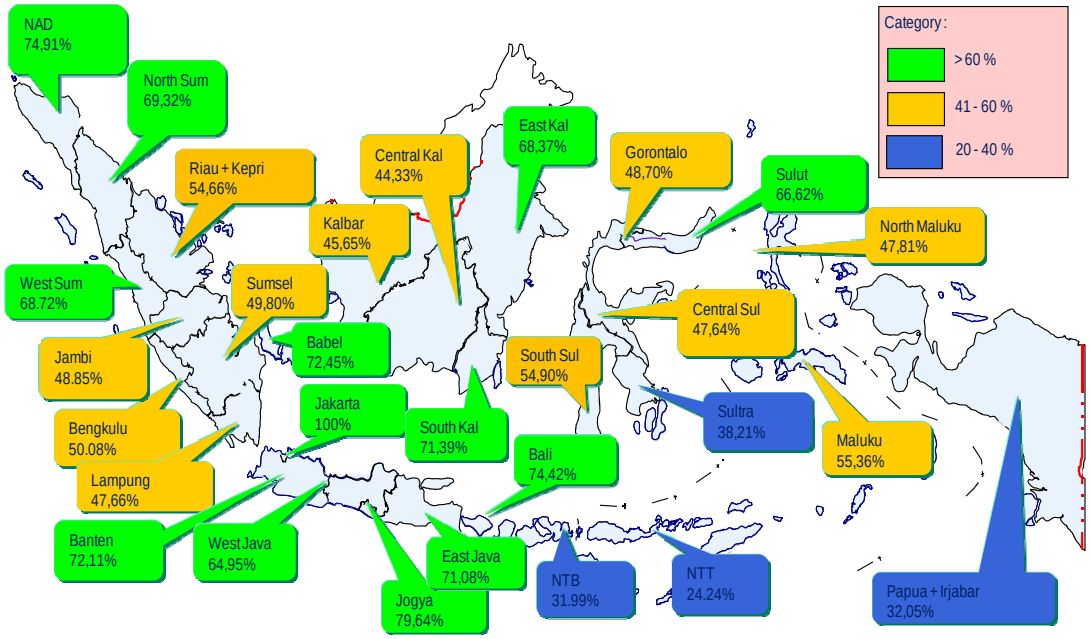
5.1.2 Status on Power Supply System and Electrification in Indonesia

Looking closely at power generation infrastructure in Indonesia, most of the centralized power supply system is concentrated on Java-Bali and Sumatra islands, while the power grid system in other outer islands are still in a developmental stage. The disparity in infrastructure development and access to energy is also evident in the household electrification ratio summarized in Figure 5.1. Access to energy is closely associated with the standard of living of community. According to the IEA, some 70,000 villages in Indonesia have no access to electrify, among which 45% are considered to be under the poverty line (IEA 2008b). It is estimated that an Perusahaan Listrik Negara (PLN) (the state-owned electric company) additional $58 billion is needed for PLN to increase the electrification ratio while meeting increasing energy demand from 2008 to 2018. (Abdurrahman 2010)

Table 5.1. Features of Centralized and Distributed Power Supply System

Factors	Fossil Fuel-based Centralized Power Supply	Renewable Energy(RE)-based Distributed Power Supply
Scale of power generation	Large	Small
Lead time for construction (Investment Risk)	Long	Short
Distance between demand and supply	Long	Short
Supply Risk	High (Impact in large area once system damaged)	Low (Impact limited once system damaged)
Distribution of resources	Concentrated	Distributed
Efficiency of power generation	High	Low (could be high if accompanied by co-generation)
Energy Intensity (calorie based)	High	Low
Stability of Power Supply (collectivity)	High	Low
Mitigation potential	Low	High
Contribution to Energy Security	Low	High
Potential of green market creation	Low	High

Figure 5.1. Electrification Ratio in Indonesia (2007)



Years	1990	1995	2000	2007
Electrification Ratio (Household)	28%	43%	53%	64%

Source: DGEEU

5.1.3 Status of Renewable Energy Development in Indonesia

Aside from fossil fuel resources, Indonesia is also richly endowed with RE resources. Such RE resources are widely available throughout Indonesia, and can potentially contribute to a distributed power supply system. But only a small portion of the potential has been harnessed so far, as indicated by the actual installed capacity shown in table 5.2.

Table 5.2. Theoretical Potential and Installed Capacity of RE Resources

Type of Energy	Potential	Installed Capacity
Hydro	75,670 MW	4,200.0MW
Geothermal	27,510 MW	1,052.0 MW
Mini/Microhydro	500 MW	86.1 MW
Biomass	49,810 MW	445.0 MW
Solar Energy	4.80 kWh/m2/day	12.1 MW
Wind	9,290 MW (3-6m/sec)	1.1 MW

Source: DGEEU

5.1.4 Elements of Realizing Distributed Power Supply System

While endowment of RE resources across the country and harnessing of such resources on regional basis is an important element of a distributed power supply system, other elements for promoting and realizing a distributed power supply system include:

- Presence of a policy framework (regulatory, institutional) to support such development
- Assessment of power demand across the country (esp. outer island) including an assessment of the ability to pay (purchasing power),
- Presence and/or opportunity for acquiring technologies to put in place such system which reflects the local capacity of technology and growth of domestic industries
- Human resources (social workers, practitioners) to implement such a system which measures readiness of local community, empowerment, presence of programs/projects and placement and O&M of system

5.2 Existing Regulatory Framework

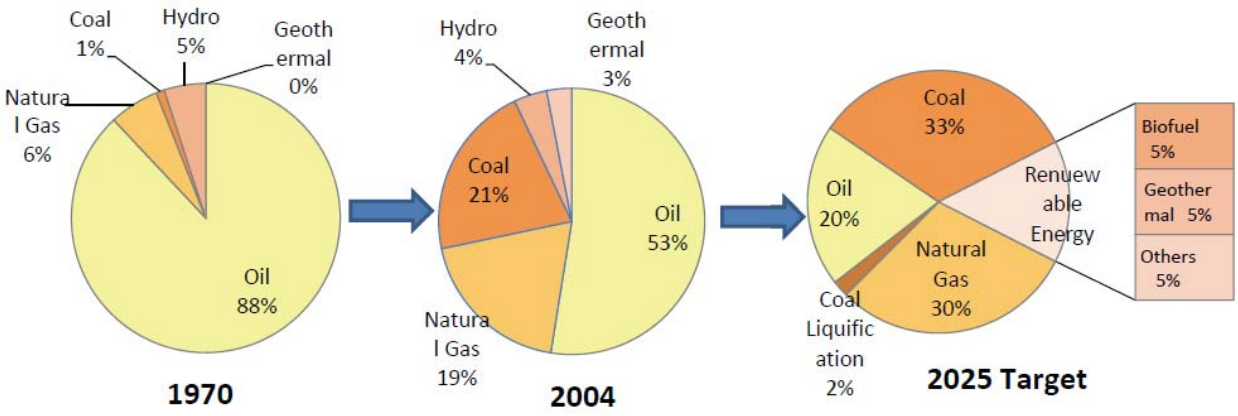
Presence of regulatory framework is a vital element for promoting RE development and realizing a distributed energy system. Looking closely at status of regulatory framework in Indonesia, the national direction and plan for RE development is included in the national energy policy and the Law on Energy, whereas more detailed policy options for promoting RE development are included in ministerial regulations.

5.2.1 National Direction for Renewable Energy Development

National Action Plan for Climate Change (2007) sets forth the energy diversification, energy efficiency and implementation of clean technology as the three priority pillars of the energy sector in Indonesia, and this overall direction is compatible the RE-based distributed power supply system as it contributes to energy diversification.

National Energy Policy (Presidential Regulation No.5/2006) provides the energy mix target for Indonesia in 2025 along with energy elasticity target as shown in Figure 5.2. The highlights of this energy mix include reducing the share of petroleum to 20% in the energy mix, and increasing share of new and RE to 17%[17] with a view toward energy diversification. While the concept of energy diversification encourages utilization of RE resources, such shift of types of resource utilization is mainly attributed to the reduced sustainability of conventional fossil-fuel dependent energy mix. Particularly for petroleum, as an oil exporting country with rich endowments of oil fields, Indonesia had been actively producing and exporting petroleum, which contributed for significant portion of national income. In the meantime, Indonesia has introduced a fuel subsidy to provide cheaper, fuel prices for domestic consumers. Nonetheless, a decrease in petroleum production rates, increased domestic demands for energy as well as increased production costs and fiscal burdens from fuel subsidies due to a price hike for petroleum in international markets, Indonesia contributed to an expanding budget deficit and a conscious effort to diversity energy sources.

Figure 5.2. Trend and Target of Energy Mix in Indonesia



Aside from the National Energy Policy, **the Law of Energy (No.30/2007)** issued in August 2007 stipulates the issuance of presidential regulation to provide fiscal and other incentives for promoting new and RE development, along with establishment of National Energy Council (DEN) presided over by the President of Indonesia to discuss comprehensive energy policies, as well as a set of rules for developing National Energy Plan (RUEN).

[17] 17% target of energy mix is based on the Optimizing Energy Management scenario of The Energy Blueprint 2005-2025

5.2.2 Ministerial Regulations Supporting Renewable Energy Development

Various ministerial regulations have so far been issued in order to materialize and ensure effectiveness of above national direction for RE development in Indonesia. As RE development is delegated to national utility company (PT.PLN) and Independent Power Producers (IPPs), related ministries have been issued regulations aiming for providing better investment climate for IPPs. To increase relative price competitiveness of RE-based power against conventional fossil fuels, the purchasing tariff from RE-based power has been recently set forth by the Ministry of Energy and Mineral Resources (MEMR) under its regulations[18]. **Ministerial Regulation No.31/2009** of MEMR stipulates the purchasing tariff of RE-based power below 10 MW by PLN, in which the tariff differs between each island by voltage of the interconnection (medium voltage or high voltage). Likewise, **Ministerial Regulation No.32/2009** of MEMR sets the ceiling purchasing tariff for geothermal power at 9.7 cents/kWh[19]. Although the duration required for the PLN to purchase geothermal-based power at this tariff rate nor fixed rate has been set for geothermal power, both regulations attempted to provide a purchasing tariff to promote IPP investment for RE development. Additional financial incentives to improve general investment conditions for IPP-based RE development have been designed by the recent **Ministerial Regulation 24/2010** of the Ministry of Finance (MOF) issued in January 2010 which provides various tax incentives for importing RE technologies. The set of existing regulations to promote RE development is summarized in table 5.3.

Aside from the above regulatory framework, RE development in Indonesia is further carried out by the 2nd 1 acceleration program stipulated under the Presidential Regulation No.4/2010 to add 10,000 MW of installed capacity from 2010 to 2014, with the total developmental cost of $16 billion. This program envisages RE resources supplying 51% of the installed capacity (geothermal and hydropower). While the program achieves 10,000MW installed capacity through large-scale power plants, and it does not contribute to the development of RE-based distributed power supply system per se, it does contribute to the national 17% energy mix target by 2025.

[18] These regulations related to purchasing tariff for RE resources have been stipulated on the basis of Feed-in-Tariff (FIT) scheme which have been widely introduced across the world. Both pros and cons among stakeholders are observed on the rate of purchasing tariff stipulated under these regulations. The biggest difference from the conventional FIT scheme is that 1) duration of purchase by PLN is not defined by the regulations, and 2) the purchasing tariff for geothermal is not a fixed price. As the utility market in Indonesia is characterized by single buyer market, PLN has incentive to purchase geothermal based power at the lowest bidding price, which is less than ceiling price.

[19] Designing of fiscal incentives for IPP-based RE development are supported by various studies jointly conducted by donor agencies. For instance, FIT scheme on geothermal power development is covered by the JICA study as well as overall fiscal policy strategies for climate change including FIT for geothermal has been covered by Green Paper study of AusAid.

Table 5.3. Regulatory Framework for Promoting Renewable Energy Development in Indonesia

Regulations	Contents
National Energy Policy (Presidential Regulation No.5/2006)	Target for 2025 1) Energy Elasticity to be less than 1 2) Energy Mix (share of new and renewable energy (RE) to be 17%)
Law of Energy （No.30/2007）	1) Issuance of presidential regulation on new and RE 2) Promulgation of National Energy Council (DEN) 3) Promulgation of National Energy Plan (RUEN)
Ministerial Regulation (MEMR) No.31/2009	Purchasing Tariff for PLN from Renewable Power Plant Voltage of interconnection: 1) Medium Voltage: 656 Rp/KWh×F 2) High Voltage: 1004Rp/KWh×F where F stands for island specific load factor F=1.0 for Java and Bali, F=1.2 for Sumatra and Sulawesi, F= 1.3 for Kalimantan, East and West Nusa Tenggara, F=1.5 for Maluku and Papua
Ministerial Regulation (MEMR) No.32/2009	9.7cents/KWh as the ceiling purchasing tariff for PLN from geothermal-based power
Ministerial Regulation (MOF) No.24/2010	1) Income Tax Facility (5% reduction of net income per annum for 6 years) 2) Value Added Tax Facility (exemption of VAT on imported RE machines and equipment) 3) Import Duty Facility (exemption of import duty)

5.3 Existing Programs

Aside from the regulatory framework, various programs and projects have been introduced and implemented to support energy diversification and renewable energy-based distributed power supply system. These programs can be divided into government-funded programs and non-government-funded programs. The government-funded programs include rural electrification program and energy self sufficient village program(ESSV), whereas the non-government-funded programs are mostly private and NGO programs.

5.3.1 Government-funded Programs

Looking at government-funded rural electrification program, the issuances of the Law on Decentralization of 1999 and Law of Electricity of 2002 have shifted the responsibility for implementing rural electrification programs from the central government to local governments. Rural electrification has been implemented by enlarging electrified area through elongating distribution and transmission lines of power grid, as well as installation of stand-alone, off-grid power generation facilities. While conventional rural electrification has been carried out based on diesel power-based power generation, the emphasis had shifted from diesel to renewable

energy resources due to the increase of diesel fuel prices and the growing emphasis on energy diversification. Under the newly issued Law of Electricity of 2009, the PLN has been delegated responsibility for backing up electrification activities implemented by state-owned enterprises, private enterprises and local cooperatives, and PLN is currently in charge of operating and maintaining electrification through elongation of distribution and transmission lines. Despite such effort, some argue that the potential impacts of enlarging electrified areas by simple elongation of transmission and distribution lines is limited in view of scattered national geography and wide distribution of rural communities across the country.

Another program associated with renewable energy-based distributed power supply system is the Energy Self Sufficient Village Program (ESSV). ESSV involves the village supplying 60% of total energy demand from locally available renewable energy resources. The program also serves as a comprehensive social development program, utilizing the access to renewable energy resources for rural economic development through increase in productivity, improved employment opportunities and social welfare. The ESSV program has been implemented since 2007 under the coordination by the Coordinating Ministry of Economic Affairs (EKUIN) with various line ministries, including the Ministry of Agriculture, Ministry of Home Affairs, MEMR, Ministry of Industry and local governments. The ESSV program is categorized into two segments; biofuel based program (jetrofa, coconut, cassava, palm, sugarcane) and non-biofuel based program (microhydro, photovoltaic, wind, biogas, biomass), and is funded by multiple sources, including the state budget (PNPM), local government budgets and other sources from state-owned and private enterprises. The status of implementation and future projections are summarized in Table 5.4.

Table 5.4. Target of ESSV Program based on Strategic Plan (RENSTRA, 2007-2014)

Year	2007	2008	2009	2010	2011	2012	2013	2014
Amount Established Energy Self Reliance Village	230	270	350	350	300	500	500	500
Cumulative	230	500	850	1,200	1,500	2,000	2,500	3,000
Focus of Activity	Consolidation of DME Concept	Pilot Location	Evaluation of pilot location	Replication	Replication	Replication	Replication	Evaluation of replication & overall
Initiator	Central Government	Central Government	Central government & regional government	Regional government	Regional government	Regional government	Regional government	Regional government

Source: RENSTRA Strategic Plan 2009-2014.Program of Village with Energy Independence. November 2008.

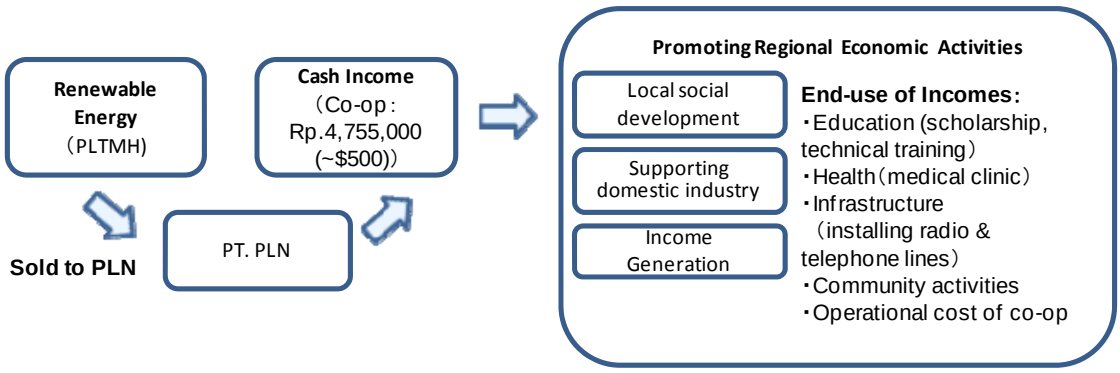
5.3.2 Non-government-funded Programs

Regional programs to promote distributed power supply system are also implemented by the initiatives of private sector and local NGOs. One of the distinctive features of Indonesia's rural electrification and associated social development programs is the presence and active involvement of local NGOs equipped with technical capacity and financial viability.

The microhydro power development program at Cinta Mekar village in Subang is a good case study to demonstrate NGO involvement. The microhydro program has been developed under the joint-venture scheme by a local private firm and local NGO, along with the acquisition of external funding from United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). Cinta Mekar village adopted the business model of acquiring cash income of around $500 per month by selling electricity generated from newly constructed microhydro power generation facilities to PLN. The cash income generated from the sale of microhydro-based electricity is managed by a local cooperative, and spent on procuring local public goods including education (scholarship, occupational training), a health center, and basic infrastructure such as telephone lines and radio installations. The project specification and the cash flow model of the village is summarized in Table 5.5.

Table 5.5. Specifications and Business Model of Cinta Mekar Village, Subang

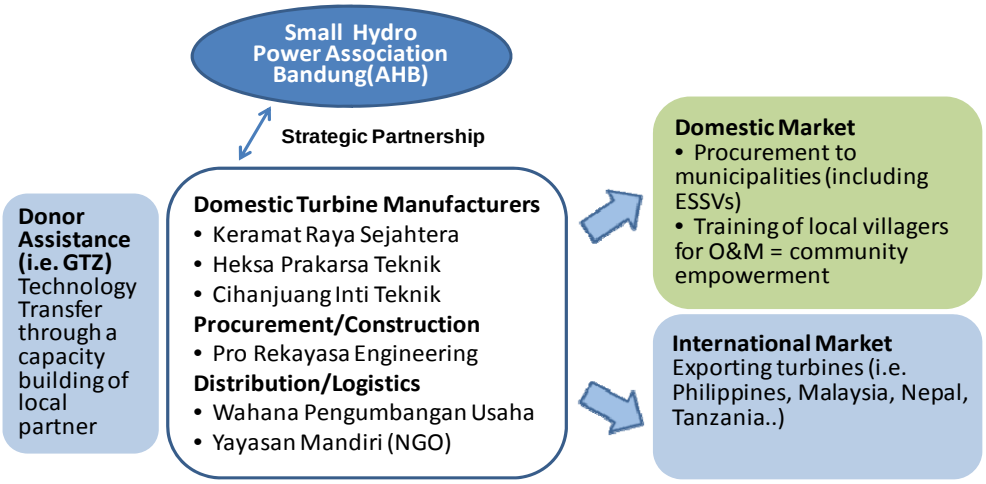
Category	Joint Venture +NGO
Mode of financing	Private financing, external Funds(UNESCAP)
Operation hours	24 hours
Output	40kW+40kW
Max Discharge	1100 L/sec
Effective Head	18.6 m
# Household	122 Households
Usage of Power Generated	To be sold to PLN(432Rp(4.96 cents)/kWh)
Others	Income to Co-op: Rp.4,755,000 (approx. $500)



5.4 Growth of Domestic Industry

The growth of domestic industry through uptake of appropriate RE technologies serves as a crucial element for ensuring sustainability and scaling-up RE-based distributed power systems. Preliminary evidence shows that the growth of domestic industry by means of technology transfer from donors is observed particularly in microhydro power turbine industry in Indonesia, as described in the Figure 5.3.

Figure 5.3. Business Flow of Microhydro Power Turbine Industry in Bandung



Looking closely at microhydro power turbine industry in Bandung, domestic manufacturers have successfully absorbed technology under the technology transfer scheme through capacity building of local partners carried out by the Directorate of Energy Efficiency and Electricity Utilization(DGEEU) of MEMR and GTZ since the 1990s (AHB 2009). Building on this support scheme, as of today the Small Hydro Power Association, domestic turbine manufacturers, procurement and construction companies and consultant companies under the strategic partnership procure turbines for the domestic market which directly contributes to the development of RE-based distributed power system, as well as for international market. Local universities also contribute by providing inputs on turbine designs and power generation efficiency from their R&D activities, and in this regard, the business flow can be regarded as a successful model of partnership among industrial, academic and government sector.

One of the interesting phenomena observed in this case study is that the manufacturing companies do not seem to be governed by the profit maximization principle. This observation is exemplified by the voluntary provision of technical training programs for operators of microhydro power generation facilities from rural communities by manufacturing companies who bear part of the cost of the training. Hence, it may be hypothesized that at early

developmental stage of domestic industry, social entrepreneurship serves as one of the main drivers for the growth, contributing to fulfill their developmental aspirations with a sense of ownership by engaging in rural development through provision of their products across the country. Such highly motivated individuals, however, are a scarce resource, and identifying and securing such individuals is not easy.

While good practice of domestic growth of industry is observed for microhydro power resource, the next challenge for Indonesia is how to replicate such good practice for other renewable energy resources. While Indonesia still depends on foreign technologies for realizing potential of other renewable resources, building appropriate technology transfer scheme along with capacity building of local partners would be the next step for stakeholders, including government, donors and domestic entrepreneurs.

5.5 Barriers over Realizing RE-based Distributed Power System

Despite seemingly large potential for realizing distributed power supply system utilizing domestic renewable energy resources in Indonesia, limited amount of renewable energy potential has so far been harnessed. While various factors attribute to such limitation, many of them can be classified as financial and institutional barriers.

5.5.1 Financial barriers

Subsidization of fossil fuels

While subsidizing fossil fuels is regarded as a political agenda and is one of the most contentious issues in Indonesia, the negative impact of such non-market pricing of fuel is evident as it causes price distortions and undermines the price competitiveness of renewable energy resources, resulting in distortion of the decision of investors and injecting concerns about stability and returns on investments (IEA 2008).

Another negative aspect of fuel subsidy is the financial burden imposed on the state budget. For instance, the price hike of international petroleum price and increasing demand pushed the cost of fossil fuel subsidy up to 150 trillion Rp, which accounted for about 25% of the total national budget in FY2005. This reduced the financial resources that otherwise could have been used for other developmental purposes. While the overall resource for subsidy has reduced in recent years due to a decrease in international petroleum prices, the overall energy subsidy still accounts for around 10% of the total national budget.

Table 5.6. Amount of Energy-related Subsidies

Subsidy	2009	2010 (Budget)
Energy-related (total)	102.40 (total)	89.91 (total)
1) Petroleum products	54.30	58.98
2) Electricity	48.16	40.43

Source: Jakarta Post

High Generation Cost

The generating cost of renewable energy based power is generally higher than conventional fossil fuel energy. The relatively higher generation cost of renewable energy is partly due to the immaturity of technology itself, and also partly due to the subsidized price of competing fossil fuel based power.

Lack of Financial Channels

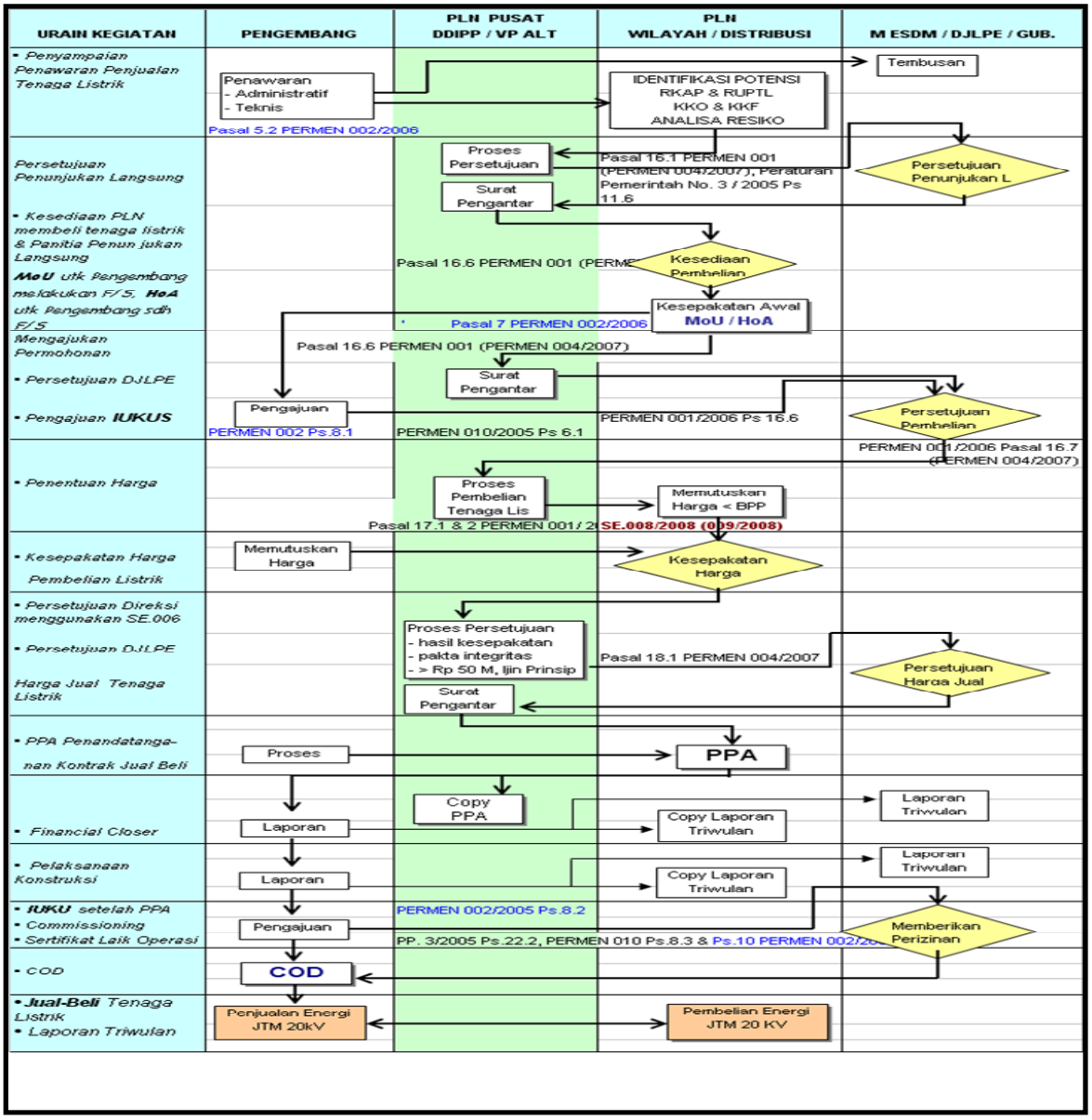
One of the features of RE technologies is its high start-up costs. To accelerate domestic implementation of RE technologies, financial support is required. While tax incentives provided by the recently issued Ministerial Regulations No.24/2010 by MOF, including an exemption on import tax duties and VAT, contribute to the start-up cost issue, limited access for private sectors to financial channels such as loans, micro credit and grants remain a significant financial barrier (IEA 2008). Public support would also contribute to the development of domestic commercial market for RE technologies.

5.5.2 Institutional barriers

Complexity over Permit/Licensing Acquisition and Power Purchase Agreement

Complicated and lengthy procedures for permit and licensing acquisition for development projects including renewable energy development raises administrative cost for investors (as described in the figure 5.4. and serve as a major institutional bottleneck for realizing distributed energy system in Indonesia. Moreover, the provision of permit and licensing is concentrated mainly on on-grid power generation projects, while not much support has been provided for off grid, stand-alone power generation systems. Considering geographical distribution of Indonesia, and scattered distribution of population in islands other than Jamali, enhanced support for providing permit and licensing for stand-alone power generation system is required.

Figure 5.4. Processes for Permit/Licensing Acquisition



Source: Siagian 2010

Key actors of permit/licensing and Power Purchase Agreement (PPA) includes the project developer, PLN headquarter, regional PLN office, and Directorate General of Electricity and Energy Utilization (DGEEU) office. While the conventional negotiation and decision over power purchases is conducted between project developers and the local PLN office, the recent issuance of the ministerial regulation No.31/2009 by MEMR have helped simplify such negotiation/decision process by providing level of tariffs for each island.

Acquisition of different type of permit, namely land use permit, is yet another issue to be addressed particularly for utilizing microhydro power for distributed system in Indonesia, as the installation of power generation devices can be located within protected forest areas[20].

Regulatory Uncertainty

Regulatory uncertainty also serves as an institutional bottleneck for realizing RE-based distributed system (Siagian 2010). As summarized in the Figure 5.5., regulations related to renewable energy development in Indonesia have undergone frequent changes over the past couple of years. While the reinforcement of regulatory framework in general have helped create an investment climate for renewable energy development, the frequent revocation of existing regulations, particularly concerning the purchasing tariff of RE-based power as well as designation of authority to set such pricing[21], increases uncertainty over investments for renewable energy development, and has a negative impact on investment decisions. To reduce investment uncertainty, establishing a public support system to ensure the cost recovery of investment made under previous regulations is required.

Lack of Experiences among Stakeholders

As utilization of clean energy for distributed power generation system is a relatively new concept, the experiences and expertise among stakeholders are still at an early stage of development. The lack of technical capacity of local stakeholders, designing of business models/plans for renewable energy development for business sectors, and greening process of investment portfolios of banking sector will all need to mature.

Issues over Program Design and Demonstration of Existing Programs

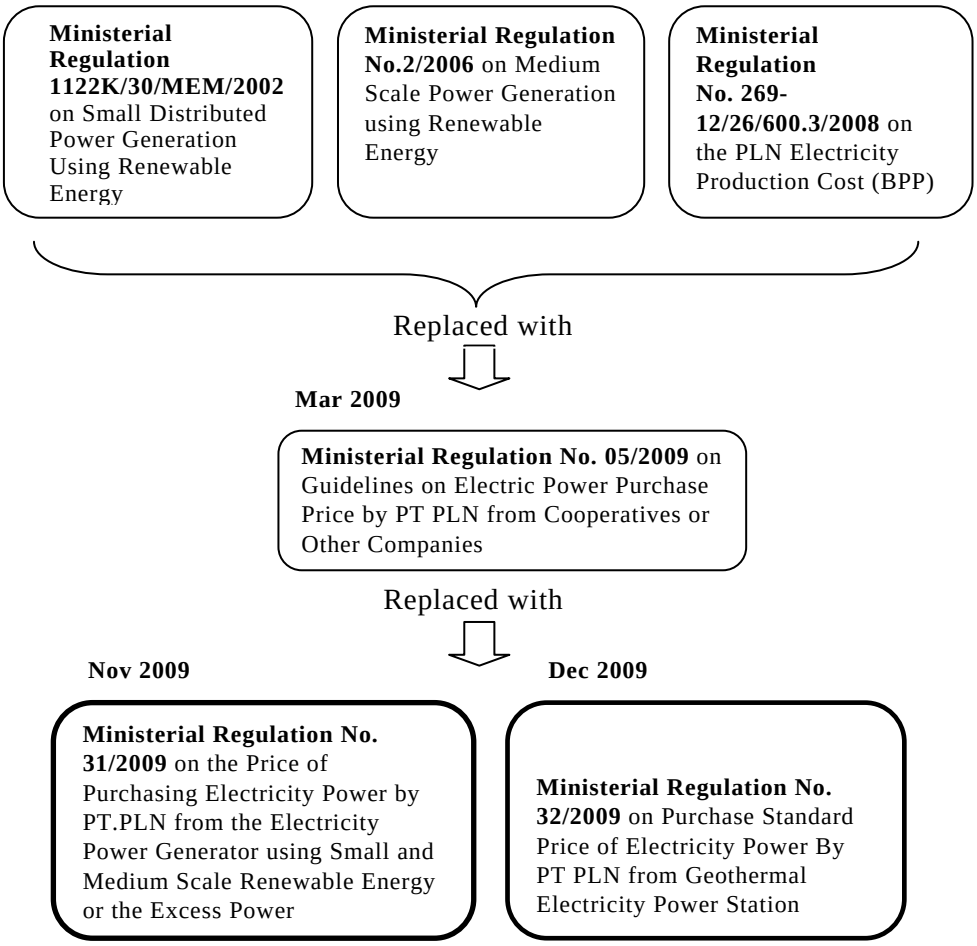
Good project design and implementation of demonstration projects in scalable manner is essential for ensuring the sustainability of RE-based distributed power supply system at the regional level. Looking closely at the existing design of the ESSV program, while the program provides funding for installation of RE devices, no financial resources have been spent on follow-up activities such as monitoring and assessment of overall economic development of the target community. There has also been no resources spent on supporting activities for operation and maintenance and private sector development, rendering the program to be “build and

[20] For those distributed power generation projects that do not need land use permit, consultation and negotiation with local stakeholders, usually representatives of village people directly affected by the installation, is required. Microhydro power geneneration project locating outside of protected forest area, for instance, project developer needs to negotiate with representatives of village which is directly affected by the flow of the river.

[21] For instance, Government Regulation No.5/2009 stipulated the delegation of authority for setting purchasing tariff of RE-based electricity from the Government to PT.PLN. Shifting from price taker to price maker for PT.PLN in single buyer market has huge implications over price setting.

leave" type of model. Identification of appropriate RE technology as a sustainable solution for each target community is also missing (GTZ 2009).

Figure 5.5. Transition of Regulations over Purchasing Tariff for Renewable Energy Resources in Indonesia



Insufficiency on Information Dissemination

While various programs have been implemented both by government and non-governmental entities, the information of the status of implementation of these programs, best practices and lessons learned are not available to general public. Dissemination of such information is crucial for increasing awareness of stakeholders, as well as providing opportunities for replication for other local communities.

Assessment of Resource Availability

While the theoretical potential of renewable energy resources at national level is available, the information on commercially viable potential of individual resource at regional or local level is

entirely available. Such information is also critical for promoting private sector involvement in renewable energy development.

5.6 Way Forward and Policy Recommendation

In the final analysis, the preliminary evidence shows that Indonesia has significant potential and opportunities for harnessing richly endowed renewable energy resources across the country. Considering the scattered national geography and limited development of national grid infrastructure (particularly in outer islands along with relatively low electrification ratio), RE-based distributed power supply system could potentially contribute to an alternative, low carbon and sustainable development path for Indonesia while improving access to energy at the regional level.

Addressing both financial and institutional barriers is crucial for realizing such RE-based distributed power supply system, and in this regard, the following policy actions are recommended.

- **Subsidization of RE Technologies**

  Energy subsidy issue needs to be considered in conjunction with best allocation of financial resources for overall energy development. It is therefore suggested for National Energy Council to consider partially redirecting financial resources originally used for untargeted energy subsidy to RE development applications. While preliminary evidence shows the microhydro turbines seems to be well adopted by local industries, Indonesia still depends on imported RE technologies for other renewable resources. To enhance the maturity of RE technologies at the domestic level, the provision of a subsidy for the target technologies is useful until such technologies become mature enough at local level to be competitive with conventional technologies and ready for dissemination.

- **Establishment of Financial Institutions for Private Sector**

  To overcome start-up cost issue and further promote private sector involvement in renewable energy development, wider financial channels should be provided by setting up financial institutions. Such financial institutions must be capable of providing microfinance, grants and loans to meet the needs of the private sector and local communities.

- **Assessment and Identification of Appropriate RE Technologies**

  In order for distributed power supply system to function as an alternative, sustainable low carbon energy solution to in the region or communities, conducting detailed assessment and identification of appropriate RE technologies at regional and community level reflecting readiness and technical capacity of the target community is crucial. The identification of best combination of RE technologies is equally important to achieve hybrid power supply system to realize full potential of locally available RE resources. To

do so, a considerable amount of time and resource need to be invested in field testing and monitoring.

- **Education & Training Facility**

  It is pointed out that conventional build and leave approach of existing RE based programs has limited their impact on local communities and the region. To ensure the sustainability of RE-based distributed power supply systems, the emphasis should be shifted from a technology-centered approach to human-centered approach (Iskandar 2010), where policies support capacity building aspect of the programs. The provision of such support may be realized by allocating resources to establish education and training facilities at regional level to disseminate proper operation and management skills of facilities to participants. Simultaneously, developing a standard business model, including enhanced community participation from the planning stage for building distributed power supply system would also help smooth introduction of RE technologies.

- **Enhanced Information Dissemination and Award System**

  In view of complexity of permit and licensing acquisition for RE development, a clearing house for permit and licensing processes at the regional level is essential for the smooth introduction of RE technologies. The provision and public announcement of award for best practices may also provide additional incentives for local communities as well as for the private sector and social entrepreneurs to scale up investment for introducing RE technologies at the local and regional levels.

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6 Low Carbon Agriculture for Indonesia: Challenges and Opportunities

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- Agriculture plays an important role in the national economy and food security of Indonesia. Increasing food production, while not adversely impacting the climate and local environment, is a challenge to be met.
- Indonesia has set an economy-wide emission reduction target of 20%. This would require rapid and substantial scaling up of mitigation technologies in agriculture sector as well. Prioritization of mitigation technologies is important from the context of policy focus. Such a prioritization is possible through estimation of marginal abatement costs and cost-benefit analysis of mitigation options.
- While some mitigation technologies have already been promoted, it is far from being sufficient in meeting the sectoral mitigation target. The major barriers for expanding these technologies have been lack of proper incentives for technology adoption and capacity building of farmers.
- The best way to enhance the efficiency of a technology is to target it to the specific ecosystem conditions. While focusing on individual technologies, there is a need to consider how these technologies behave in the existing context of knowledge and infrastructure on the ground.

6.1 Introduction

Indonesia is an agrarian economy with agriculture contributing to 13.8% of national GDP in terms of value addition and employs 38% of Indonesian population. The government of Indonesia has made serious efforts to improve the food self sufficiency and nutritional security over the past decade. The national expenditure on agriculture stood at 21.9 trillion IDR in 2007, which is double the expenditure made in 2001 (The World Bank, 2008). Despite the rising investments in agriculture, Indonesia is still a net importer of cereals, pulses and sugar and is facing the challenge of hunger and malnutrition with nearly 38% of its children suffering from under weight and malnutrition. Indonesia is classified as 'serious' in global hunger index by International Food Policy Research Institute (IFPRI).

While the above challenges are yet to be fully addressed, the climate change brings another dimension of challenge to the Indonesian agriculture which includes it being vulnerable to the climate change impacts while also contributing to the climate change (Las & Unadi, 2010). Agriculture contributes to climate change in both direct and indirect means. As a direct source,

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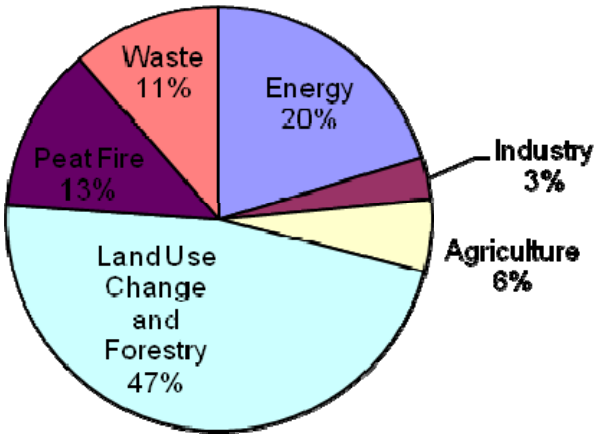
Indonesian agriculture contributes to about 6% of total greenhouse gas (GHG) emissions and the sector stands fourth after land use, land use change and forestry, fuel combustion, and waste sectors. The major contributors of GHG emissions in agriculture sector are rice paddies (Methane emissions to the tune of 34,860 GgCO2e), soil fertilizations (nitrous oxides emissions to the tune of 15,534 GgCO2e), and other minor sources such as emissions from manure piles, biomass burning etc (to the tune of 12,271 GgCO2e) (Suryahadi & Permana, 2010).

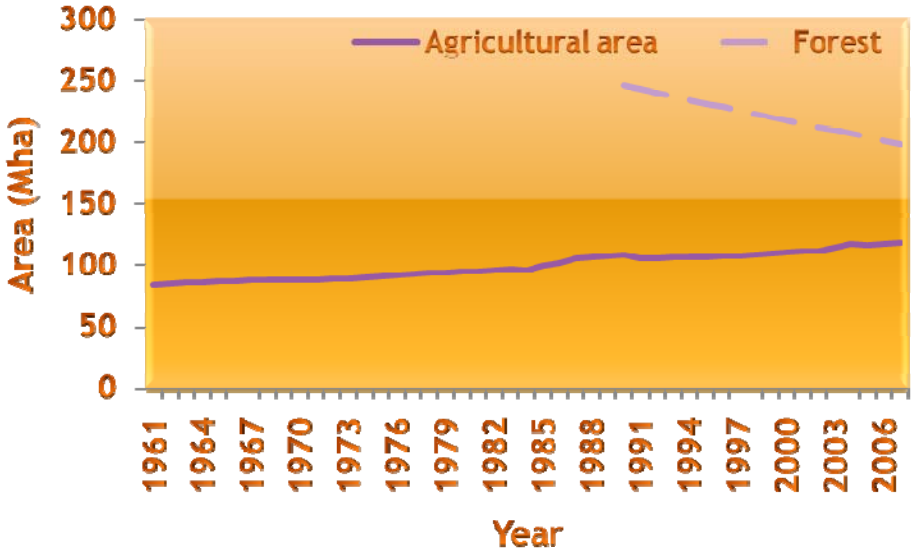
Figure 6.1. GHG emissions from various sectors in Indonesia



Source: Las and Unadi 2010

The indirect contribution of agriculture to GHG emissions is through demand for land. The growing population exerts pressure on food that in turn exerts pressure on land and other sources forcing intensive cultivation practices such as fertilizer applications and irrigation water pumping. In a scenario of increasing population, the agriculture is expected to produce more food either through vertical expansion (increase in productivity) or through the horizontal expansion (land use changes from forests to agricultural purposes). In Indonesia, both these phenomenon can be seen in the recent past. The productivity levels of Indonesian agriculture have increased over the years and more specifically in food crops such as rice. The rice productivity has more than doubled over a period of 40 years (FAO, 2010), mostly due to employment of high yielding varieties, irrigation, fertilizers, and pesticides. At the same time, the cereal demand during the past four decades has also increased from 10 million tons in 1961 to 39 million tons in 2005 (FAO, 2010). In order to meet this demand, over the same period, the area under primary crops has increased by 113% and the area under agriculture has increased by 25.6% while the area under forests has reduced by 38% in the last two decades alone (FAO, 2010). This partially indicates that agriculture has played a role in converting the land under forests to agriculture in Indonesia. This is in conformity with the trend observed in the Southeast Asia (Figure 6.22.).

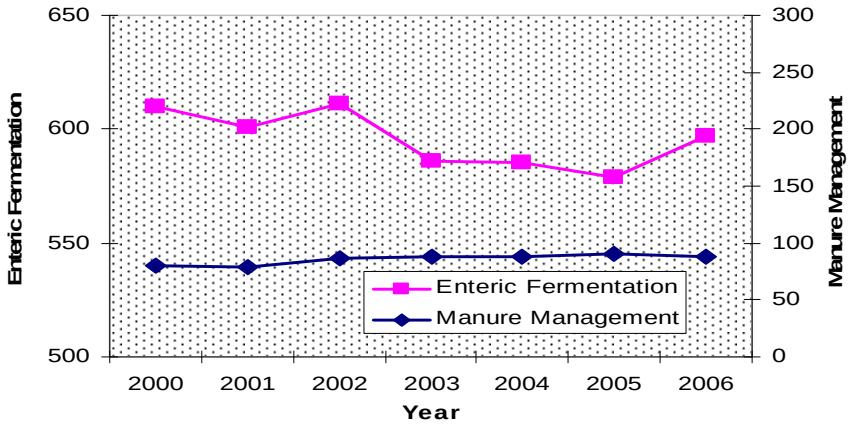
Figure 6.2. Expansion of area under agriculture with concomitant decline in area under forests in Southeast Asia



Source: Prabhakar 2010

Indonesia is a major non-vegetarian population. With growing income levels, the per capita consumption of animal products is also increasing over the years. As result, the emissions from animal husbandry are significant in Indonesia. The enteric fermentation contributes to the tune of 12,755 GgCO2e of methane annually. As shown in Figure 6.3, the animal husbandry related emissions have shown an increasing trend since 2003 owing to relative increase in animal population (Suryahadi & Permana, 2010).

Figure 6.3. Indonesian Methane Emission from Livestock in 2000-2006



Source: Suryahadi & Permana, 2010

If no corrective measures are taken, the above trends may continue in the future as well. Most available future projections indicate that the non-CO_2 emissions will continue to increase in agriculture sector at global and regional levels (Christensen, et al., 2007; Stern, 2007; United

States Environmental Protection Agency, 2006). Similar projections available for Indonesia also indicate an increase in agricultural emissions from 0.17 GtCO2e in 2005 to 0.25 GtCO2e by 2020. Similar projections were also made for methane emissions from the animal husbandry sector in a BAU scenario (Suryahadi & Permana, 2010).

There are several other trends that would enhance emissions from agriculture sector in the future, if unhindered. These trends include change in the source and amount of on-farm energy consumption, reducing organic matter application, and burning of paddy straw. Though the energy related emissions are, including farming, are accounted in the energy sector, the policies and interventions for reducing on-farm energy should have to come from the agriculture sector and hence it deserves particular attention in the discourse on GHG mitigation in agriculture. Trends such as increasing farm mechanization associated with rural to urban migration of population and increased groundwater pumping for irrigation can have significant impact in terms of on-farm direct energy consumption. In terms of indirect energy consumption, the declining organic matter inputs in soils necessitate increasing inorganic fertilizer use resulting in demand for crude oil. In addition, expansion of cash crops such as oil palm is projected to increase demand for fertilizers in Indonesia (Heffer & Prud'homme, 2008).

6.2 What low carbon society means for Indonesian agriculture?

From the foregone discussion, it is clear that the historical and current agro-economic situation and the current and future projected emissions from agriculture indicate a challenging puzzle i.e. GHG mitigation while meeting the food security needs of the growing population of Indonesia. From this context, the low carbon society for Indonesian agriculture means producing sufficient food for the country to meet the food and nutritional security while not degrading the environment and contributing to the climate change. As simple as it may look, the task could be difficult looking at the growing food and nutritional insecurity of the country. This requires identifying agro-technologies those will satisfy the following conditions: 1. mitigate GHG emission, 2. provide yield and income advantages, 3. lower abatement costs, and 4. provide developmental co-benefits. The following are necessary for achieving the task of GHG mitigation in Indonesia: a sound approach that identifies GHG mitigation technologies that do not impact the food production in agriculture and allied sectors, and sufficient policy environment that helps in scaling up of these GHG mitigation technologies.

6.3 Current state of low carbon agriculture in Indonesia

Low carbon agriculture is not a new concept for Indonesia since it has been implementing various policies to promote low input and organic agriculture over the past decade. Much of these policies were driven primarily not because of climate change but due to environmental degradation and food safety issues. To site an example, the subsidies that have been in existence for the long time have been known leading to the fertilizer imbalance, pesticide overconsumption and decline in factor productivity (Lesmana & Hidayat, 2008; Sano & Prabhakar, 2010). As a result, Indonesian government has been actively promoting organic agriculture as a low-input and eco-friendly agriculture. One of the significant programs to mention is the 'Go Organic 2010' program by the Government of Indonesia that aims at developing Indonesian organic agriculture as significant organic food exporter in the world. A roadmap has been developed to achieve the set goals. Though the area under low-input and organic agriculture has been growing at a steady rate, with an estimated area of 17783ha in 2005 (Willer, Yussefi-Menzler, & Soren, 2008), several limitations including poor availability of organic fertilizers, poor access to agro-technology, and high cost of organic certification are hampering the rapid expansion.

As a part of its initiative to promote environmentally friendly agriculture, the government of Indonesia has made significant investments in promoting the system of rice intensification (SRI), the technology that is known to save irrigation water, reduced seed rates, bring early crop maturity, and significantly increase the rice yields (Uphoff, 2006). Various other technologies are also being promoted which include Implementation of no-burning practices for land clearing in particular in horticulture and agriculture plantation sub-sectors, introduction of low methane emitting rice varieties (Ciherang, Cisantana, Tukad Belian and Way Apo Buru), use of agriculture waste for bio-energy and composting, biogas technology for reducing methane emission from livestock sector, and formation of R & D Consortium on Climate Change in Agricultural Sector. Several of these programs have been implemented through the '*Bantamas'* program (Las & Unadi, 2010). Though there are no statistical figures available on the extent of adoption of these technologies, the ongoing engagement with various stakeholders indicate significant efforts being invested by both the government and the non-governmental organizations in the spread of these technology using various media such as farmer field schools and climate field schools.

A speech delivered by the Indonesian President at the Conference of Parties 13 at Bali, Indonesia, outlined a three-pronged strategy to rejuvenate Indonesian agriculture sector (Las & Unadi, 2010). This include harmonization of economic development and environment conservation, to boost the capability to absorb carbon in forest, agricultural land, and ocean, and a commitment to reduce green house gas emissions in various policy initiatives. The development of agriculture sector was identified as a general strategy with both adaptation and mitigation built into it. Indonesia is the only developing country in East Asia that has announced an ambitious economy-wide mitigation target of 20% at Copenhagen. This includes

a reduction of 8 MtCO2e through the support of the national budget and an additional reduction of 11 MtCO2e through the support of developed counties. The focus for agriculture sector includes food crops, estate crops, livestock, land and water management, and R&D. The plan proposes to undertake 5 main activities and 1 supporting activity for mineral soils and 2 main activities and 1 supporting activity for peat lands. The plan proposes to spend an estimated 0.7739 trillion USD for GHG mitigation from mineral and peat lands (Las & Unadi, 2010).

6.4 Low-carbon technologies for Indonesian agriculture

The research in Indonesia and elsewhere has already identified several technologies with the potential to mitigation GHG emissions (Table 6.1.) and animal husbandry sectors (Table 6.2). These technologies have already been either developed or are being adopted by farmers. This indicates that there is no dearth of mitigation technologies in agriculture and animal husbandry.

Table 6.1. List of agro-technologies that have mitigation benefits

Technology	Major Benefits
1. Zero-tillage	1. Zero-Tillage saves 70-90 L of diesel/ha 2. Saves water (to the tune of ~1.0x106 L water) 3. Farmers save USD 40-55/ha 4. Reduced/ eliminate burning of crop residues
2. Leaf color charts	1. Reduced N applications and hence reduced demand for fertilizers 2. Reduced pest incidence 3. Yield advantages
3. System of rice intensification with mid-season drainage	1. Saving in irrigation water 2. Higher yields 3. Reduced pests and diseases 4. Reduced labor costs 5. Higher income
4. Aerobic composting	1. Doest contribute to CO_2 emissions 2. Eliminates CH_4 and N_2O emissions 3. Considered as a natural cycle
5. Alternative nutrient management strategies through altering sources	1. Slow releasing fertilizers such as coated urea granules and super granules has the potential of reducing leaching losses and increased N use efficiency and reduced N usage 2. Neem coated urea/sulfur coated urea/tar coated urea formulations that inhibit nitrification leading to less N_20 emissions

Source: Prabhakar, 2010

Table 6.2. List of mitigation technologies that are either currently at adoption or development stage in Indonesia

Techniques	Methane Reduction (%)	Feed Efficiency	Animal Production	Strengths	Weaknesses
Dietary Supplementation					
1. Unsaturated fatty acid	10	Increase	+15%	Local product Simple application	Needs scaling up and in limited supply
2. Probiotic (Yeast)	8	Increase	+9	Local product Easily adoption	Needs scaling up and in inconsistent results
3. Concentrate	8	Increase	126	Easily adoption Simple application	Limited supply
4. Fish oil + Zn	54	Increase	+61.2	Local product	Needs scaling up and in limited supply
5. Ionophore Salinomycin	Decrease	Increase	+26.6%	Advanced Technology Effective	Limited supply, imported product, and poisonous
6. Mineral bypass nutrients	Decrease	Increase	22%	Local product	Need diffusion action
7. Defaunating agents	Decrease	Increase	+20%	Local product Abundant Simple application	Inconsistent result and needs maintenance
8. Urea molasses block	Decrease	Increase	+6%	Simple application Advanced technology	Need extension program
9. Leguminous	Decrease	Increase	Increase	Local resources Simple application	Limited plantation, limited use, and poisonous
Mechanical and chemical techniques					
1. Chopping and Pelleting	Increase	Increase	Expensive	-	Cumbersome
2. Sodium hydroxide	Increase 10-20	Increase	Expensive	Simple	Poison
3. Ammonia	increase	Increase	Expensive	Simple	Poison

Source: adopted from Suryahadi and Permana 2010

The next step is prioritizing these technologies for wider dissemination and adoption, both through the government driven policy initiatives and by the individual players. Such a prioritization should not only consider GHG mitigation potential but also consider yield and income advantage to the farmers. Prioritizing low carbon technologies is possible through marginal abatement cost curves, Benefit-cost analysis, and abatement cost per unit production. Marginal abatement costs refer to the cost incurred in mitigating a unit of carbon (equivalent) emissions when compared to the business as usual scenario (Equation 2) (Prabhakar, 2010).

$$MAC = \frac{Mc}{M_{GHG}};\ Mc = C_a - C_b;\ M_{GHG} = GHG_a - GHG_b;\ GHG_a = Activity \times Ef \times Sf$$ **…Equation 1**

Where, MAC is marginal abatement cost ($\$t^{-1}$); Mc is the marginal cost of the new technology when compared to the baseline technology; M_{GHG} is marginal reductions in GHG emissions; C_a is cost of technology a; C_b is cost of technology b; GHGa is GHG emissions from technology a; and GHGb is GHG emission from technology b. Activity refers to activity data (e.g. area under particular technology or amount of biomass burnt or amount of particular fertilizer type used); Ef refers to emission factor, factor that provides GHG quantity by multiplication with the activity data; Sf refers to scaling factor, factor that modifies a sub-practice from the base line practice (e.g. intermittent irrigation as against continuous flooding).

The preliminary analysis carried out indicated that the SRI has higher potential for abatement (2016 kg CO2e per hectare per season followed by the zero-tillage systems (450 kg CO2e per hectare per season). Zero tillage has negative costs since adoption of technology saves on tillage and fuel costs while SRI could prove costly due to labor intensiveness of operations.

Figure 6.4. Marginal abatement costs of various technologies for Indonesia

Source: Prabhakar, 2010

The benefit-cost ratio (BCR) refers to the ratio of total benefits obtained per unit of cost incurred in mitigating GHG emissions (Equation 2). Various costs considered for the BCR analysis are listed in Table 6.3. The data on actual benefits and costs were obtained by interviewing farmers.

$$BCR = \frac{TotalBenef\ its}{TotalCosts}$$ **……Equation 2**

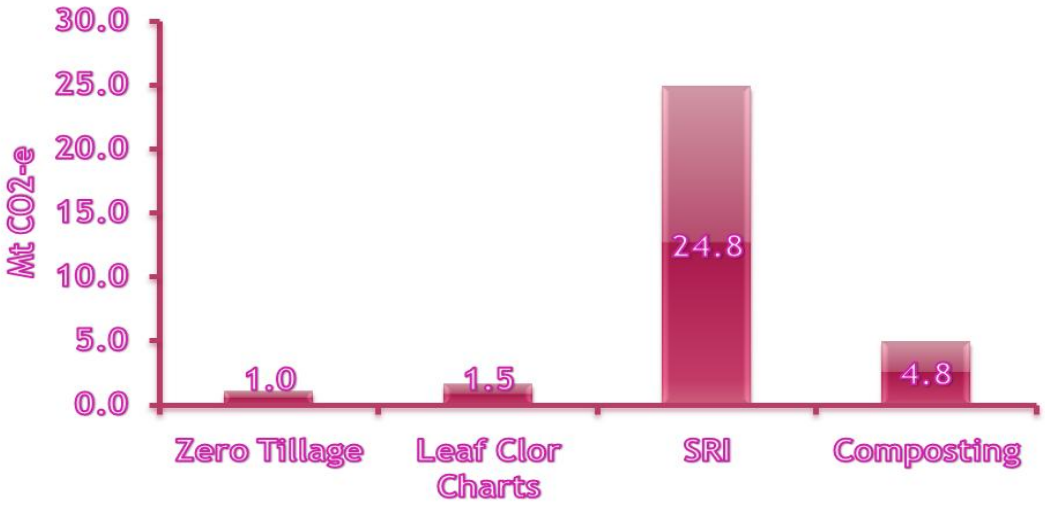
Table 6.3. List of costs and benefits considered for cost benefit analysis of various agro-technologies

Total Costs	**Total Benefits**[26]
Operational costs	Yield per ha (t/ha)
Human labor	Value of main product per ha
Bullock labor	Value of by product per ha
Machine labor	
Seed	
Fertilizers and manures	
Fertilizers	
Manure	
Insecticide	
Irrigation	
Interest on working capital	
Fixed cost	
Rental value of owned land	
Land tax	
Depreciation on implements and farm buildings	
Interest on fixed capital	

Source: Prabhakar, 2010

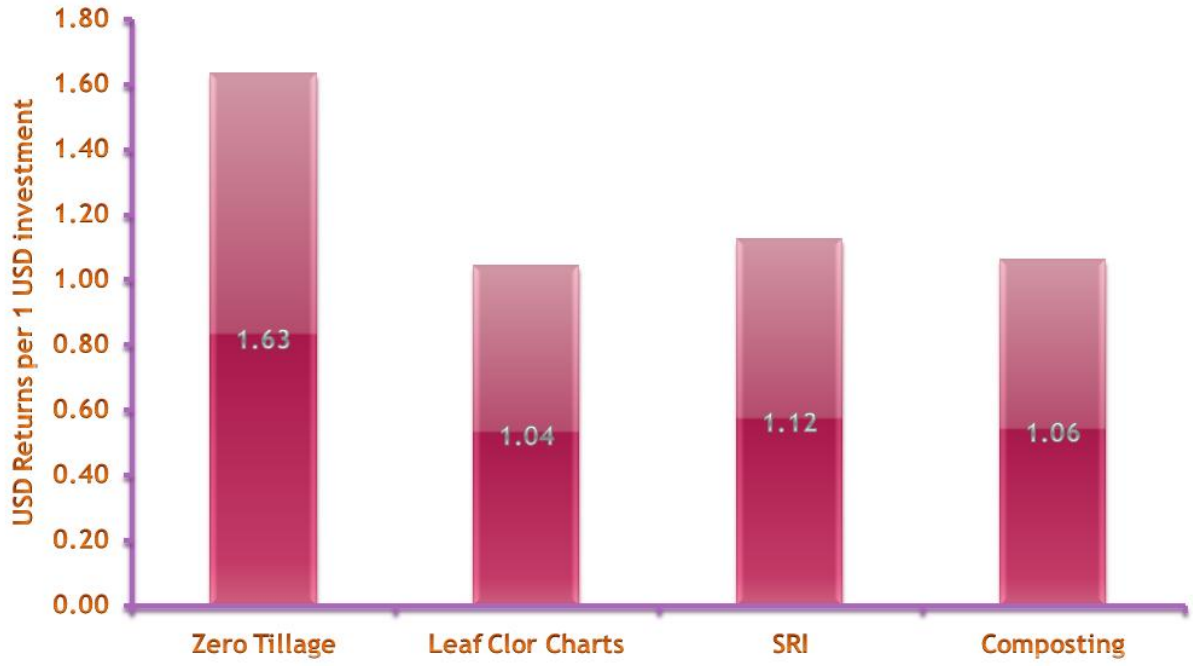
These technologies would be able to provide substantial mitigation benefit at the national level. The cumulative mitigation potential of the four technologies depicted in Figure 6.5 could be as much as 32.1 Mt CO2e per annum which is 43% of the GHG emissions in 2000 (75.42 MtCO2e).

Figure 6.5. Cumulative mitigation potential of agriculture technologies in Indonesia



[26] For assessing the benefits presented in Figure 5.6. Please note that the non-monitory and indirect benefits mentioned in Table 6.1 are not quantified for this analysis.

Figure 6.6. Benefit-cost analysis of various GHG mitigation technologies for agriculture in Indonesia



Source: Prabhakar, 2010

In terms of CBR, zero-tillage provides higher benefits and lower costs followed by SRI, windrow composting and leaf color charts. It should be noted that there is a mismatch between marginal abatement cost analysis and cost-benefit analysis. Zero tillage proved to be a lucrative technology for farmers while SRI provides maximum mitigation potential. These calculations may vary once the non-monitory and indirect benefits and costs (negative and positive externalities) are included in the equation.

6.5 Technology adoption and need for support policies

From the above preliminary analysis, it is clear that the assessed technologies provided higher benefit-cost ratio (of more than 1) with significant mitigation potential. Despite these advantages, the current rate of adoption of these technologies is still at nascent stages. To date, the area under zero-tillage is negligible in Indonesia. The area under SRI could be roughly estimated from various sources to be <15,000 ha, and substantial amount of paddy straw is still being burnt every year (based on interviews). This signifies that there is a huge gap between the technologies that are available off the shelf and their adoption rate. This gap could be attributed to several deficiencies at the policy level which are listed below.

- No financial incentives for adopting GHG mitigation technologies (farmers adopt technologies that are profitable).

- The technologies with high abatement potential don't have high benefits per unit investment which farmers consider more (e.g. SRI).

For enhanced technology adoption, there is a need to introduce carbon credits for agriculture sector (soil carbon sequestration) which could provide additional income to farmers. Currently, the carbon price in the EU carbon exchange (ECX) stand at 13 Euros per ton. At this rate, zero-tillage could provide an additional income of 6 Euros per hectare per season (26 Euros for SRI, 26 Euros for aerobic composting, and 1.7 Euros for leaf color charts). Additional measures could include education and capacity building of farmers through rapid expansion of climate field schools and farmer field schools, a shift from benefit-cost based decision making to marginal abatement cost based decision making (coupled with additional income from the carbon markets), and phasing out agricultural input distorting farm subsidies. Subsidies could be diverted to more carbon-friendly technologies such as soil ameliorants to be applied on peat lands (Setyanto, 2010). Improvement of agricultural infrastructure is essential for better performance of some technologies such as SRI. This could include precision leveling of the fields, construction of water delivery and control structures at the tertiary and quarterly canal levels, and better lining and management of primary and secondary canals that enhances the water transmission efficiency with greater adaptation and mitigation co-benefits.

Since agro-technologies are highly location specific, technology targeting in terms of ecological conditions, socio-economic condition of farmers, etc. is important in order to achieve maximum mitigation technologies. The technology targeting could be done for e.g. by zoning based on irrigated ecosystems, rain-fed lowland ecosystems, upland ecosystems, swampy and tidal swamp ecosystems, peat ecosystems, and different soil properties.
The most obvious approach for reducing the agriculture pressure on land would be through improving the agriculture productivity. An increase in productivity by 0.5 tons per hectare of rice, wheat, maize, soybeans, sugarcane, cassava, oil palm, and coconut would release an estimated 90 Mha in China, India, Indonesia, Malaysia, Thailand and Vietnam. This would be more than the land that is lost to deforestation in the last 15 years in Asia (Asia lost 2.9 Mha of forests during 1990-2005).

6.6 Conclusion

Indonesia has made tremendous progress in productivity gains in agriculture sector in the past decade. However, this progress needs to be sustained if the country needs to gain food and nutritional security which may undermine the possible climate benefits if no policy interventions are made to mitigate GHG emissions. The country has announced a economy-wide mitigation target of 20%. In order to meet this target, a substantial amount of GHG emission reduction should have to come from agriculture sector as well. In order to achieve this, there is a need to identify win-win agriculture technologies that would provide needed

productivity and income gains while mitigating GHG emissions and providing local environmental and developmental benefits. Several technologies are already available either in a ready-to-adopt or at the early stages of adoption. Rapid scaling up of these technologies would have to be achieved through providing sufficient incentives (direct or indirect), capacity building of farmers, enhanced support for infrastructure, and additional investments in the research and development.

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7 Traditional and Emerging Values and Practices to Anchor Sustainable & Low Carbon Development in Asia

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Key Messages

- Traditional values and practices are rich in the tips for designing innovative lifestyle to enable low carbon development, while applicability to the modern context and different locality should be also carefully examined.
- Principles of traditional society, such as 'sufficiency,'' 'co-existence with nature,' and 'cooperation' should be re-vitalized in the current development context.
- Local and indigenous technologies, methods, and wisdom should be fully utilized in promoting Green Growth especially in sectors such as agriculture, fishery and forestry.

7.1 Introduction

Since the 1980's, it has been acknowledged that development policies at the national, local or community levels should be implemented with more attention to the sustainability of the economy, society, and natural environment. Later, rapid economic growth mainly from Asian countries, and awareness of climate change issues presented policy makers and researchers with a new question related to sustainability: i.e. how can each country or society achieve sustainable development without threatening the global climate?

The most straightforward answers to this question involve introducing technologies from developed countries, or arranging institutions so that the private sector has a greater incentive to invest in climate friendly solutions. Considering that developing countries often lack eco-friendly technologies or strong enough institutional frameworks, both technologies and institutions are urgently required in Asia. However, it is often overlooked that societies / communities in Asia have maintained sustainable livelihoods fostered by indigenous values and practices. In fact, retaining such values and practices in Asia is just as important for sustainable and low carbon development as importing new technologies and replicating climate friendly institutions from 'developed' countries.

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Unfortunately those values and practices are severely threatened due to economic development. Natural resources which served as the basis for many livelihoods are becoming increasingly degraded: for instance, forests are enclosed by lumber companies, and river water is allocated for industrial use. Social ties like mutual labour exchange and risk reduction may be weakened when farmers depend too much on commercial crops, or when too many people leave their communities in search of job opportunities.

People in Asia suffer severely from the social and environmental impacts of conventional economic growth policies. In some cases, these impacts led people elaborate alternative values and practices which may enable 'sustainability' on their own. In various parts of Asia, people have tried to re-evaluate and revitalize the values and practices to tackle problems arising during the course of economic development.

Based on such recognition, the overall goals of the study were as follows:

1) identifying the essential elements of traditional and emerging values / practices that anchor sustainable and low carbon development in Asia;
2) examining potential threats to these values and practices such as economic growth / globalisation; and
3) proposing innovative lifestyles and policy measures to support these values and practices.

In other words, the study seeks to revitalise and mobilize values / practices in the hopes of transforming conventional development policies into sustainable and low carbon development policies.

To this end, a series of key questions need to be answered.

- What are the essential elements of sustainability?
- How have recent trends affected these essential elements?
- How can we revitalize these essential elements in an era of rapid economic growth and globalization?
- How can we translate such key findings from this research into messages to target audiences, including policy-makers, private enterprises, and ordinary people?
- What are appropriate research methods for the above issues?

By answering these questions the study is designed to generate inputs into development policies, and lifestyles to ordinary people and thereby contribute to sustainable and low carbon societies.

7.2 Potential fields

Studies focusing on value and practices risk falling into a mere appreciation of the ‘good old days.’ This is because researchers visiting from outside a study site may be overwhelmed by an abundance of ‘good’ values and practices in ‘the backward’ communities. To avoid this pitfall it is essential to set the focal points and factors to be examined an early stage of study. The following points require particular attention.

Firstly, the focus should not be limited to ‘traditional’ things. If a study is designed for merely keeping traditional values and practices intact, it will come up to nothing in the end. It is important to note that the essential elements of such values and practices works when they are interpreted, revitalised, or even regenerated with a view to mobilizing them for redefining and redesignubg of our lifestyles and socio-economic arrangements along more sustainable lines.

Secondly, the dynamics of the values / practices rather than stable features of ‘tradition’ should be carefully examined. Observation and analysis of ‘local’ or ‘indigenous’ things easily turns into mere reproduction of stereotyped images when the observer pays insufficient attention to the interaction between ‘the local’ and the outer world, i.e. the national, regional, and global conditions.

Thirdly, the potential ways and conditions of interpreting the essential elements of values and practice and applying them in today’s context should be envisaged. As a part of research project on Sustainable and Low Carbon Development in Asia, the study will provide proposals for sustainable lifestyle business models, and regional, national, and local policies to promote them.

In view of the above points, the study examines ‘traditional and emerging values / practices’ in the following fields as well as in the ‘indigenous communities.’ More specifically, values / practices can be organized by potential fields plotted along two axes.

In the table below, the geo-political settings of ‘change’ are located on the vertical axis. They can be classified into three categories: rural areas; urban area; and institutional setting either facilitating or hindering ‘change.’ We categorize the locations due to the simple fact that neither values nor practices function without taking root in the people’s daily livelihoods. Naturally the way they take root in the daily lives differs significantly among localities, or between urban and rural areas. Additionally, we can also set another category, the institutional setting (in the broadest sense referring to, political, economic and social conditions) which enable or urge people to maintain their values and practices.

Once we set the above vertical axis, the chronological stages of 'change' are placed on the horizontal axis. They are also classified into three categories: traditional period before rapid economic growth; modern period when people face a rapid transition and become aware of the necessity to 'change'; and the coming (future) period when hopefully sustainable and low carbon development is on track.

Table 7.1: Potential study fields and topics

	Traditional	Modern (non-SLC)	Future (SLC-D)
Rural	Key values & practices fostering sustainable livelihood	Remaining / Emerging values&/ practices	ow to interpret / apply values / practices to SLC-D?
Urban	Key values & practices fostering sustainable livelihood	Remaining / Emerging values & practices	How to interpret / apply values / practices to SLC-D?
Institutional arrangements	Institutions enabled / fostered livelihoods based on values / practices	Institutions suitable for market oriented development	What kind of institutional arrangement fosters them?

1 2 3 4 5

7.3 Study topics

Once we set the matrix, we can map the key questions with some minor modification on our potential study topics (blue boxes in Table 7.1). Some fit in one of the nine cells, while others cross the borders.

7.3.1 Key values & practices

This topic can be studied in traditional to modern period, either at rural or urban areas. Some fostered / anchored sustainable and low carbon livelihood in the past. Some play the similar role even in the modern days, though threatened by the impact of development.

For instance, *Gotong Royong*, the traditional norm of mutual cooperation is re-evaluated in the context of beneficial relationship between local people and recently relocated enterprises, as well as within the community members.

Similarly, in the rural areas of Thailand there have been emerging alternative ways of agriculture, energy management, forestry management, and tourism promotion based on the values pursuing environmental harmony over a longer time scale.

Thailand is a country where the government itself promoted the sufficiency economic principle after the financial crises in the 1990s. The principle is utilised in the planning and

implementation of local development actions aimed at sustainable resource management at the same time with improvement of lives (Towprayoon 2010).

We could also mention *mottainai*. The concept originates from the word of Japanese Buddhism standing for the feeling of regret on underestimate or insufficiently utilized value of a thing or a person. Recently this concept is applied in a more general context to discourage people against discarding something still of use, or overproduction and over-consumption goods and services.

7.3.2 Potentials for interpreting / applying key values & practices into Low Carbon lifestyle, business, and policy

From the preliminary examination of above values and practices, we may assume that they may be maintained, revitalized or interpreted to be mobilized as guidelines or principles toward enabling development while preventing damages to the natural environment and resources, minimizing carbon emissions and other by-products, and maintaining safety-nets to protect people from the risks of a socio-economic transition.

The potential functions of the values and practices could be studied either in rural or urban areas and analysed as ‘existent values or practices enabling sustainable and low carbon development,’ or as ‘transition of values or practices’ which place emphasis on the future context. Naturally the topic overlaps with the previous one, i.e. Key Values & Practices, though focus is on the more recent period.

A couple of features differentiate these ‘traditional’ values revitalized in Indonesia and Thailand from mere feeling of nostalgia. Firstly, they grabbed spotlights out of regret that they are degraded during the development period. Secondly, people are aware that the ‘traditional’ values and practices do not work in real lives if confined to the ‘original’ areas, as even people in backward areas now depend on economic, social, and cultural sources from outside. Correctly perceiving this reality, people revitalize, refer to, and maintain the values and practices in ways differing from the ‘indigenous’ ones at the crosscutting arenas where they interact with various stakeholders such as the national government, international organizations, and private firms.

7.3.3 Institutional settings which have enabled key values

The third topic can be studied in the past context, either in rural or urban areas. Here the institutional settings (in the broadest sense) which enabled or forced people to live with values and practices categorized in the first topic. For instance, balance of population and remaining

resources, interaction with outside market, political system, and religious issues are worth examining.

7.3.4 Institutional settings enabling / blocking values

This topic can be studied in the modern context, either in rural or urban areas. Unlike the third topic, examination is based on the recognition that the enabling environment has been damaged. The following sub-topics requires particular attention:

Public concerns on Sustainable and Low Carbon Development

In Hong Kong, people are highly aware of the threat of climate change. However they lack trust in the role their government could play. Such an attitude can be ascribed to the unique geo-political condition of Hong Kong as a city state and as a sub system of the Republic of China.

However we would emphasise that public awareness and opinions increase or decrease. In fact, public opinion surveys in Japan showed rising growing concerns over the climate issues in relation to the increased coverage from the mass media.

Political & Economical arrangement

We can guess from Hong Kong's case that geo-political and economic conditions have much to do with the values and practices for or against sustainable and low carbon development. However, such conditions (institutions in the narrower sense) cannot be understood independent of other trends, as they are determined by so many variables such as industrialization, the kind and amount of resources, and the population.

Moreover, as mentioned earlier these conditions vary across localities, particularly between rural and urban areas. Community resource management in Thailand became successful owing much to the interconnection with improvement of people's lives (Towprayoon 2010). However, it is difficult to establish such kind of close connection in the urban area where most of people commute to the work and rely on such diverse range of activities for their livelihoods.

Additionally, it is important to note that the institutional background enabling or inhibiting values and practices are not longer confined within the locality or the community. Therefore the institutional settings are observed and analysed not within one area but at the crosscutting arenas where diverse stakeholders interact.

Potential application and barriers

This can be studied somewhere between the modern and the future, as the issues related to institutional arrangements rather than specific ‘rural’ or ‘urban’ areas. We could, for example, examine the possible measures to improve the modern situation analysed at the fourth topic.

Designing effective pub. campaigns / enhance communication

We wrote that Hong Kong’s case tells us the impact of geo-political and economic conditions on the values and practices for or against sustainable and low carbon development. This can be interpreted that people are blinded by certain geo-political and economic conditions. If this statement is true, we could improve awareness and concern by taking off the blinders to make issues and desirable policies or lifestyles more visible. A publicity campaign on the interaction between climate and people’s daily lives, or on desirable manners of production and consumption may be effective.

At the same time, indicators on sustainable and low carbon lives which are connected with human development index or happiness index will also encourage people to reflect on their activities and their government’s policies (Towprayoon 2010).

institutional reform / financial or material support / tax

Sustainable and low carbon development is successfully rooted in the community scale when operated with good leadership, unity of the members, and responsible and transparent governance. So far such successes are mostly limited to cases demanded and conducted by the marginal groups as alternatives to the conventional development centred to economic aspects. The reason is simple: the threat of economic development has mostly been experienced and made people long for alternatives mostly in the marginal regions. The pursuit of alternatives in the marginal areas are therefore important.

However, looking into success does not suffice our objective to proposing policies and lifestyles for sustainable and low carbon society. First, local societies and economies are closely interconnected with national and global phenomena. Secondly, the climate change issue requires agreement on necessary actions at multiple levels, including the local, national, and global level.

Therefore institutional arrangements such as taxes, subsidies, promotion of community organisations and so on, as well as the publicity campaign to make the issues visible, must be designed to function along crosscutting arenas and to appeal to a diverse range of stakeholders.

In this sense the revival of *Gotong Royong* is worth closer examination as it is mobilised to establish and maintain a relationship between local people and outsiders with a view to benefiting both parties by taking advantage of mutual trust.

7.4 Methods / Analytical tools

While the presenters and the commentators share the overall goal of understanding which 'values and practices' anchor sustainable and low carbon development, they take diverse approaches depending on their areas and methods of study. Conditions of 'change' differs between the rural and the urban settings. Similarly, there is a wide range of possible approaches, from macro level survey to microscopic description possible when we look into 'values' / 'practices'.

The above methods and analytical tools should be selected depending on the attributes of the study topics and fields. In this study we would take the following procedures and elaborate the concept and focus step by step, so as to cover a few (but not all) topics.

In the initial stage the team would obtain a rough picture of public concerns on necessity, potential measures, and obstacles of sustainable and low carbon development in diverse settings (countries, rural / urban, public / private) through a questionnaire survey. Then some of the 'values' and 'practices' in the studied areas will be examined in terms of its interaction with national development and globalisation, and contribution to raising people's awareness and fostering participation in sustainable and low carbon livelihoods either at the community or multi-stakeholders levels.

The analysis would be put out in the form of proposals to policy makers / ordinary people as well as academic papers. To this end the targets, medias and topics of the proposal need to be carefully considered during the study process.

Appendix 1

Community-managed Low-Carbon Development: Traditional, Emerging Values and Practices in Thailand[33]

Opart Panya

Background

Despite advance in science and technology, it becomes apparent that the pace of natural disasters has outrun human's ability to create knowledge and to mobilize the existing resources in response. Not only do we see sustainable development has not worked, we now face more challenges, all of which are to become "Tipple Dividend," including i) sustainable development, ii) natural disasters management, iii) climate adaptation.

The organizer of the workshop reminded policy makers and scientists that global responses known as COP13 in Bali, Indonesia in 2007 followed by COP15 in Copenhagen in 2009 would pave a way to reduction of Greenhouse Gases (GHGs) emissions (25-40% by 2020) by both developed and developing countries. As a result, sustainable Low Carbon Development (LCD) and Green Growth (GG) have emerged as new discourses on the future planned changes. In attempt to address these issues, interdisciplinary research has been developed, and the field of traditional, emerging values and practices will play a part in exploring its contribution to LCD and GG.

At the workshop I attempted to give an overview of the current status of LCD and GG in Thailand, focusing on the grassroots level. The main purpose is to use it as the case of "good" practices in comparison with those of the other countries in Asia and the Pacific. It is hoped that gaps of knowledge could be identified and future research proposal developed. The experiences from 49 networks of community-based management scattered in different part of Thailand form the basis of the presentation (Opart and Sirisai 2007a).

Why Values Matter

Because global climate change is real and critically urgent, a radical change of human behaviors at all levels are needed. Students of social/organizational change believed that human behaviors are shaped by cognition, namely perceptions, values, attitudes, paradigms (for scientist community), and world views (Panya and Sirisai 2004). Thus, the role of traditional emerging values is thought of as a critical mover in contributing to LCD and lifestyle changes. More specifically in the environmental context, value as a cultural/thinking system is perceived

[33] Presented at " Sustainable and Low-Carbon Development in Indonesia and Asia: Dialogues Between Policymakers and Scientists on Green Growth" IPB International Convention Center, Bogor, Indonesia, 16-17 February 2010

of as evolving through time in human history, from anthropocentric (human-centered) to bio-centric (life-centered) and finally to eco-centric (biosphere-centered) meanings and views of the world in which we live. Accordingly, I also proposed that we could use these broad concepts as a starting point in developing qualitative indicators of LCD and GG.

Following this conceptual basis, I argued that there are enough evidences to suggest that Thai rural communities are making a leading change from an anthropocentric to eco-centric value and meaning given to natural resources management.

From Green to Blue Agriculture

Like many developing countries, Thailand since the 1960s has adopted the "Green" revolution agriculture, characterized as chemical- and energy-intensive agriculture, i.e., commercial chemical fertilizer, pesticides, mechanized farming, and so on. The early 1980s witnessed emergence of different forms of agricultural practices under the rubric of alternative agricultures, including nature-based, non-chemical, and organic agricultures. Key attributes of this so-called "Blue" agriculture are the use of organic control by the herbal plants and EMs, "Effective Micro-organisms" propagated by the movement related to Fuguoga. A training school has been established in Thailand and the use of EMs as supplement and, in many cases, replacement of chemical fertilizers is now widespread throughout the rural areas of Thailand.

Energy: From Centralized to Community-based Management

Studies shows that 60 percent of income of a rural household is spent on energy[34]. There have been a number of success stories of energy management in many communities in different parts of Thailand. A community located in a remote area in Western part mobilizes the community-bases revolving fund to pay off the loan used for purchasing solar panels which supply energy for every household in the community.

Charcoal is still being used in rural households, particularly the low-income ones. In the past 20 years, ATA (Appropriate Technology Association), an NGO, has devoted its resources to develop energy-efficient charcoal kilns and to promote biogases to supplement the use of tree woods. A nation-wide training center has been established in Northeast Thailand to offer training to a group of farmers and to personnel of local government agencies.

Forests Are More Than Trees

[34] Personal communication with Charnchai Limpanon, ATA Director, in 2000

Forests are natural habitats for foods, medicines, and added incomes for rural inhabitants. It is literally serves as “super markets” and “pharmacy shops”, all which have no chemical contamination. The late 1980s saw a revival of traditional/natural foods and herbal medicines, due to the rise of popularity of public consciousness on good health and healthy foods. They have in the past ten years been streamlined into the governmental economic policy, known as OTOP, One-Tambon-One-Product, as an attempt to give rural community the opportunity to the mainstream consumer markets.

The 1990s witnessed strong movements of community forestry, putting pressure on the government to grant community rights of access and management to the communities established long before the national-level land and forestry laws. In order to gain public supports, research was used in improving better understanding of high land agriculture and in demonstrating the capacity of the rural communities to manage their forests in a sustainable manner. Decentralized management of forest continues to be a central agenda for Thailand’s civil society movements on community-based natural resource management.

From Mass to Community-managed Tourism

Thailand is experiencing rapid growth of community-based tourism. The tourism authorities revealed that an average stay in the city of Bangkok was less and less, with an average of one day and a half. This shows that rural communities have become the main destination of the majority of tourists. The widespread of small-scale, community-manage tourism is phenomenal. Studies began to show a high degree of positive impacts of back-pack tourists: expenses are distributed to many sectors in local communities; on average, they stay longer than that of group tours; tourists want to see and in some cases participate in real life experience; local communities become the subject rather than object of tourism.

In the Northern highland area where the minority ethnic population lives, community-managed tourism is booming. Revival of traditional foods and healing in the form of healthy living (healthy foods and spa, for example.) gain popularity and generate opportunity to rural investment of community-based enterprises. In the Central flood plain, old residential houses along the main rivers and canals are turned into guest houses, local food restaurants, market places. In the South, community people are seen taking tourists with them on fishing trips in the sea. All of these types of community-managed tourists will in the future change the economic and environmental landscape in the rural areas of Thailand.

“Small People”: A Leading Change

A study of 49 networks of community forestry scattered in all regions of Thailand demonstrates that qualitative changes came from the “small people”, particularly a small section of rural

inhabitants and marginalized ethnic minorities (Panya and Sirisai 2007a). This is because these sections of the population are the first who experienced the change in natural resources upon which they largely depend for their survival. Women, in particular, are often documented to be the first who have a sense of urgency from the threat of degradation of natural resources nearby their communities. To them, degradation of natural resources would mean that the wellbeing and survival of their children in terms of food sources and additional income.

Some movement leaders stand up for the challenges exerted from the unsustainable and inequitable development. As their traditionally recognized ownership and access to was taken away by the centralized authority of the state, they had no choice but to contest the established "paradigm" of development, i.e. the "spill-over effect" economic policy, expansion of agricultural at the expense of richness of forest, and so on. Thus, the shift to the "Green Growth" in the rural communities of Thailand is a result of contestation of the mainstream value given to sustainability of nature and the wellbeing of community livelihoods.

Others have experienced the global climate change in the form of seasonal change and the frequent occurrence of natural disasters, especially typhoons, floods, landslides, and the 2004 Tsunami (Panya and Sirisai 2007b). These natural catastrophes have raised environmental and natural resource awareness of the majority of the Thai population.

Discussion and Summary

What we see in Thailand is clearly a trend of change in the rural communities. It shows evidence of qualitative changes: a shift away from the mainstream, conventional resource practices. Elsewhere, I argued that the rural communities have felt that natural resources around them have dramatically changed and became a threat to their survival and wellbeing. In response, they created an alternative economy on the basis of sustainability of the community-based natural resources and equitability in access to and ownership of them. I called this a new development discourse—equitable and sustainable development.

What the Thai case suggests to us is that we all need to change the way we view the community. Without it I believe we can not appreciate the way in which "small people" have pioneer a new value (adapted from the traditional value and practice) given to nature and society in which we all live. We could view the emerging network of new value and practice as a new form of the community—a network of the people who practice a new way of seeing and treating nature and societies.

This brings an important implication to research. The fact is that the shift from the anthropocentric to eco-centric value and practice on community-based natural resources involves a deeper level of consciousness, especially inspiration, attitudes, mental models, paradigms (world view of the scientist community), and world views, all are held by different

sectors of the people in society towards nature and society within which they live. This suggests a trans-disciplinary approach to research and understanding, by which each discipline must “include and transcend” his/her trained specialization into a better future world shared by the people from all the walk of life.

Appendix 2

Weak Carbon Concern and a Soft Carbon Policy in Hong Kong: A Research Agenda [35]

Yok-shiu Lee[36]

Introduction

This presentation reported the findings summarized in two study reports produced by the private sector—one study is Hong Kong-specific and the other is cross-country comparative in nature.

Degrees of awareness and commitments

One report says that Hong Kong people are highly aware of the problems of climate change/ global warming. They are willing to do something to act against it but feel that their government is less proactive compared to others. At least 7 out of 10 Hong Kong people are aware of the problems. They associate the problems mainly with dramatic meteorological events. More than half of retirees (55%) and two-thirds (67%) of working people are willing to change habits to act against climate change. However, Hong Kong ranks the lowest (along with India/ Philippines) regarding the proportion of people willing to change behaviour or pay more for ecological solutions and products. Despite the willingness to fight against climate change, only 1 in 10 believes individual effort can act against it.

In another study, the concern for climate change among Hong Kong respondents is also found to be relatively high (46%), in comparison with more developed countries such as France (37%), UK (22%), Germany (26%) and the USA (32%). In contrast to the above report, however, this comparative study asserts a relatively high degree of commitment among the Hong Kong respondents to combat climate change. Up to 37% of Hong Kong respondents report that they are "personally making a significant effort to help reduce climate change through how they live their lives," only 19% of UK respondents and 23% of USA respondents say the same thing. And Hong Kong respondents are a lot more optimistic about the prospect of stopping climate change (at 30%, compared with 5% in France, 6% in the UK, and 11% in Germany). This high degree of optimism has to do with the fact that in Hong Kong, a large proportion of respondents (38%) believe that "the people and organizations who should be doing something about climate change are doing what is needed," as opposed to a much smaller

[35] Presented at " Sustainable and Low-Carbon Development in Indonesia and Asia: Dialogues Between Policymakers and Scientists on Green Growth" IPB International Convention Center, Bogor, Indonesia, 16-17 February 2010

[36] Presented at " Sustainable and Low-Carbon Development in Indonesia and Asia: Dialogues Between Policymakers and Scientists on Green Growth" IPB International Convention Center, Bogor, Indonesia

proportion of respondents who believe so in the other jurisdictions (5% in the UK; 6% in Germany; and 7% in France).

Implications for governments

The second study report concludes that consumers are giving government a clear mandate to take the lead to combat climate change. Consumers are waiting for government actions to ensure that their individual interventions have sufficient scale to be effective. The challenge for governments in the developed countries is to take up this mandate in a way that engenders trust. Governments will need to explain better that their real motive is not to levy more or higher taxes. They should aim for revenue-neutral tax initiatives, which shift tax explicitly to another area without increasing it overall. Governments in all economies should be aware of the strength of feeling voiced by people in the developing economies. Governments in developed economies are the direct target of criticism. Governments in developing economies are not so criticized as those in developed economies, but are none the less under pressure from their people to take the local lead.

Implications for the private sector

The second study report further notes that the number of people saying that the private sector should take the leading role is relatively small. Nevertheless, the research also indicates that there is a desire for companies to do more. In most economies, both developed and developing, people say that the private sector should take more of a leading role than it does today. The report suggests that the private sector can help people to take action, given their high level of commitment. The challenge is that people are least ready to spend money on helping to reduce climate change, compared with other actions. In terms of climate-friendly choices that companies could offer to customers, the imperative is therefore either solutions with no additional cost to the customer, or solutions with a direct value beyond the benefit to the planet. The continuing growth of premium-prices organic food is an example of what can be achieved when there is a direct and immediate benefit to the consumer, as well as a longer-term sustainability benefit.

Implications for future research

The research design for future research on the questions of climate values, climate commitment and climate actions has to be carefully formulated so that the right kind of data is collected to ascertain the actual extent of these variables among the targeted study populations. In terms of understanding climate values, the “Most Important Problem” question should be used to measure respondents’ actual degree of concern over climate change problems. The measurement of climate commitment should be conducted by asking “trade-off” questions,

instead of the usual type of willingness-to-pay question. On climate actions, questions should be tailor-made for different groups of stakeholders who hold very different views on what they could and should do to tackle climate change problems.

Moreover, in examining the issue of climate values, it is important to clarify the question of "whose values matter the most?" because it has implications for the design of the action agenda. In understanding how climate values might shape voluntary actions, it is important to ask the question of "what kind of values matter the most?" because the answer to this question would provide useful clue on how to structure the repertoire of voluntary actions for people to consider. In this connection, it is also important to examine the issue of how institutional settings, not values, shape individual behaviour because this understanding will help inform the necessary institutional reforms needed to bring forth collective climate-friendly actions.

Appendix 3

Public responses for the Low Carbon Society in Japan[37]

Midori Aoyagi-Usui

Introduction

This presentation reported Japanese public's responses towards the government's policy making on climate change issues, especially setting the mid-term green house gas reduction target.

Japanese mid -term greenhouse gas emission reduction target

Then Prime Minister Aso announced 15% against 2005 level in June 10. In August, the government has changed from Liberal Democratic Party to Democratic Party. New Prime Minister Hatoyama announced 25% target against 1990 emission level in September 22 at the UN conference.

Data

To investigate public responses, we used following data.
1)Monthly public opinion survey.
We have been carrying out monthly public opinion survey from June 2005 to September 2009. We asked two questions every month. One is "Most important issues in Japan" and another is "Most important issues in the world.".
2) Public Opinion Survey that focused on the mid-term reduction target.
This survey has been fielded April, June, and July in 2009 by NIES, following the discussion of the former Prime Minister Aso's 15% target level.
3)Mass media coverage .
To investigate the factors that affect public opinion we investigated the mass media coverage of climate change issues on Japanese major newspaper articles and major TV program.

Monthly public opinion survey.

Our monthly opinion survey indicated that Japanese public's awareness on the environmental issues and also, climate change issue is quite high, especially after January 2007. It kept high level until September 2008, then it rose again after June 2009, when mid-term reduction target has been hot issue in Japan.

[37] Presented at " Sustainable and Low-Carbon Development in Indonesia and Asia: Dialogues Between Policymakers and Scientists on Green Growth" IPB International Convention Center, Bogor, Indonesia

Public Opinion Survey that focused on the mid-term reduction target.

1)High risk perception, recognize responsibility.

People supported:

- "sufficient reduction target against climate change consequences";
- because, "developed countries have a responsibility for historical greenhouse gas emission" and "developing countries/regions do not have enough money, enough human power for tackling this issue at this moment"; however
- "countries who are achieving rapid economic growth should share the mid-term target with industrial countries."

2)"sufficient reduction target against climate change consequences

The response to the question "How should Japanese respond to tackle Climate Change issues?" was as follows. 32.4% responded as "early as possible, unless otherwise other countries will respond and we will miss the opportunity." , 8.4% chose "we have to consider bad effect for the economy, if the implementing cost is large." 43.2% chose "Even if the implementing cost is large, we have to response as early as possible and take sufficient measures."

Also, 34.3% responded to "developed countries have a responsibility for historical greenhouse gas emission.", 17.6% chose "Marginal reduction cost in each country", 31.3% chose "GNP(GDP) or per capita GNP(GDP) , as there are huge gaps among countries, developing countries/ regions do not have enough money, enough human power for tackling this issue at this moment."

Mass media coverage

The coverage of mass media shared their peak with monthly public opinion survey. This means that international big events such as IPCC and Al Gore's Nobel prize award, COP14, COP15, are very much influential to mass media coverage and people's recognition of climate change issue.

Conclusion

Our results are as follows.

1)Increasing Awareness in this three years:

2)Heavy exposure by the mass media, both TV program and Newspaper coverage.

Those might be the reason for…

- High Risk Perception of Climate Change.
- High feeling of Responsibility of emissions,

Need for sufficient reduction target.

Appendix 4

REVITALIZING THE SPIRIT OF GOTONG ROYONG FOR CARBON EMMISION LEVEL REDUCTION: INTERNATIONAL VISION OF LOCAL INSTITUTION AND REGIONAL COLLECTIVE ACTION[38]

Lala M. Kolopaking

"...Indonesia must build as a state of *gotong royong*..."

Ir. Soekarno – one of Indonesian founding fathers, Jakarta, June 1st 1945

Gotong Royong is the basic value that has been institutionalized in community groups in Indonesia. Almost every indigenous people have their own spirit of *gotong royong*. As a norm, *gotong royong* could guide the community in behaving and interacting to achieve common goal in all things including religion, cultural, social and economic. The institution of *gotong royong* contains ideology inherent value of social life. The spirit of collective action and mutual respect (collective mutual trust), and the organization of cooperation that could encourage the development of community. Although, lately, *gotong royong* ceased to be a prominent feature of the nation, primarily due to strong shift in the pattern of subsistence economy into the public commercially, but as a fixed value of *gotong royong* can not be separated from the life of Indonesian society. In the content of efforts to decrease the level of carbon emissions is a global issue, the strengthening of the spirit of *gotong royong* is expected to encourage of collective action that will benefit all parties. This is because the spirit of *gotong royong* with its own characteristic that could bring mutual benefits that also will be able to bring the efforts not only at community level, but it can penetrate further and continuous with area of development work compatibly between the parties --- the collective community, state, private and even internationally.

As a concept, function of *gotong royong* is only as the basic norm which becomes the foundation of community institution to work together in gaining the mutual target. The process is have to be upscale into the framework of inter community mutual activity by the facilitation from regional government. Then, the process can be brought to higher level which involves broader community and stakeholders, including private sector and international community. Finally, there is a creation of multistakeholder partnership with the *gotong royong* as the essential spirit.

In order to revitalize the spirit of *gotong royong* which can bond and create partnership involves the grass roots community for carbon emission level reduction, the process should not

[38] Submitted to "Sustainable and Low-Carbon Development in Indonesia and Asia: Dialogues Between Policymakers and Scientists on Green Growth" IPB International Convention Center, Bogor, Indonesia

stop only in community level. The community is only taking role as the basic institution for a sustainable development pattern which developed synergically multi-stakeholders.

This idea is being developed in three locations in Indonesia. First, the District of West Sumbawa, West Nusa Tenggara Province, with the activity named Comunity Based Sustainable Integrated Area Development cooperation involving local Government, mining company --- through Corporate Social Responsibilty activities, NGOs and communities. The second location, in Musi Rawas, South Sumatra Province to develop REDD Activity. Thirdly, located in Sambas District, West Kalimantan province with the same activities as the activities developed in the West Sumbawa regency. These three location can be consider as a location to research of low carbon development.

The development process itself has to be able to strengthening the people economic to make the spirit and institutions of *gotong royong* can be meaningful for the community and the environment. It is because in local Indonesia, the discussion of economics and culture are two aspects which cannot be separated. Discussing community economics have to consider their culture, and also discussing community culture have to consider their pattern of economics.

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