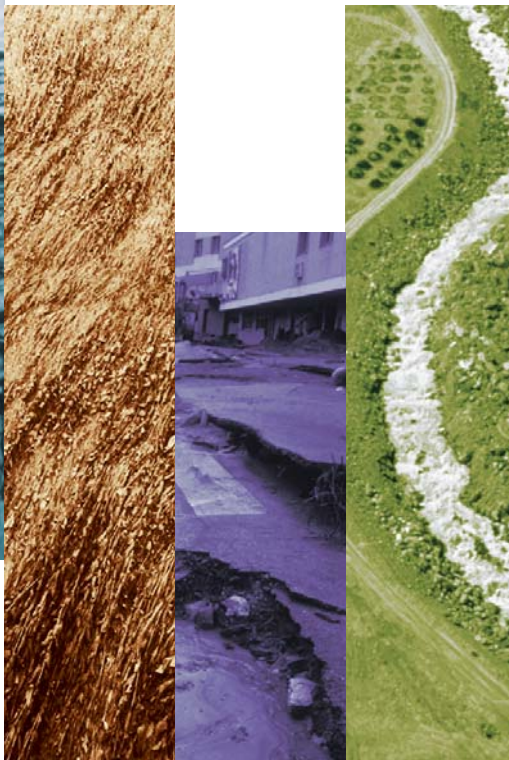




The role of science in the management of natural hazards and major risks

Scientific expertise in Switzerland
and within International Geneva





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Contribution of the Swiss Confederation to the International Disaster Reduction Conference (IDRC) staged in Davos in summer 2006 and presented in the framework of the special session organised jointly by the Swiss National Platform for Natural Hazards (PLANAT) and the Swiss Agency for Development and Cooperation (SDC).



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Abbreviations and acronyms

AGN	Groupe de travail sur la géologie et les catastrophes naturelles/Arbeitsgruppe Geologie und Naturgefahren (working group on geology and natural hazards)
CENAT	Natural Hazards Competence Centre
CERG	Centre d'étude des risques géologiques (Section of Geosciences and Environment, University of Geneva)
CRED	Center for research on the epidemiology of disasters
DDPS	Federal Department of Defence, Civil Protection and Sports
DETEC	Federal Department of Environment, Transport, Energy and Communications
DEWA-GRID	Division of early warning system and assessment – Global resource information database
DFA	Federal Department of Foreign Affairs
DRM	World Institute for disaster risk management
DSIN	Swiss Federal Nuclear Safety Inspectorate
EAWAG	Swiss Federal Institute of Aquatic Science and Technology
ECHO	Humanitarian aid department of the European Union
EM-DAT	Emergency database
EMPA	Federal Laboratories for Materials Testing and Research
ENA/SLF	Swiss Federal Institute for Snow and Avalanche Research in Davos
EPFL	Swiss Federal Institute of Technology Lausanne
ESF	European Science Foundation
ETHZ	Swiss Federal Institute of Technology Zurich
FAO	United Nations Food and Agriculture Organization
FAN	Experts Natural Hazards Switzerland
FOCP	Federal Office for Civil Protection
FOE	Federal Office for Energy
FOEN	Federal Office of the Environment
GEN	Geneva Environment Network
GIS	Geographical information system
HazNETH	Network for Natural Hazards at ETH Zurich
IATF-DR	Inter-agency task force for disaster reduction
ICRC	International Committee of the Red Cross
IFRC	International Federation of Red Cross and Red Crescent Societies
ILO	International labour organization
IRGC	International risk governance council
ISDR	International Strategy for Disaster Reduction

KOVERS	Kompetenzverbund Risiko- und Sicherheitswissenschaften (Competence Centre for Technical Risks)
MAS	Master of advanced studies
MRM	Major Risks Management Programme of the University of Geneva
NCCR	National Centre of Competence in Research
NEOC	National Emergency Operations Centre
NGO	Non-governmental organization
OECD	Organization for Economic Co-operation and Development
OCHA	United Nations Office for the Coordination of the Humanitarian Affairs
PLANAT	National Platform for Natural Hazards
PSI	Paul Scherrer Institute
SDC	Swiss Agency for Development and Cooperation
SFOPH	Federal Office of Public Health
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNITAR	United Nations Institute for training and research
WFP	World Food Programme
WHO	World Health Organization
WMO	World meteorological organization
WSL	Swiss Research Institute for Forest, Snow and Landscape

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I. Introduction

Be they natural in origin or a direct consequence of human activity, for several decades now, the number and frequency of disasters has been increasing at an alarming rate throughout the world. In addition to accidental events, such disasters also occur as a result of intentional acts and armed conflict. The disaster has become an essential signifier of our time (LE POULICHET, 1991).

In the course of the 1990s, confirmation emerged to the effect that not only are disasters on the increase but the crises they trigger are becoming more serious and more prolonged. Their effects sometimes have repercussions far beyond the initial crisis itself and may threaten years of development as was the case, for example, with Hurricane Mitch in 1998 in Central America and, more recently, the Tsunami of 26 December 2004 in South-East Asia.

Awareness has been growing in the face of these developments. It is becoming increasingly obvious that we need to take action in advance of disasters and place greater emphasis on the role of prevention. In the context of natural disasters, this prompted the United Nations to launch an International Decade for Natural Disaster Reduction (1990–1999); this initiative gave rise to the fundamental revision of the concepts that were previously operated in this area and highlighted the fundamental effect that man has on the environment.

Moreover, due to technological development the relationship between man and the environment has changed radically. The attitude towards natural disasters has shifted from one of resigned acceptance to the progressive adoption of a more proactive approach involving attempts to predict and anticipate these events. Science is at the heart of this development. With the increase in the number of crises, not only is research in this area becoming increasingly complex but, more generally, the actual management of risks and crises has also undergone significant change and development.

The central role of Switzerland

Over the decades and in the wake of Henri Dunant and the Red Cross movement, Switzerland has become renowned for its involvement in humanitarian aid and now plays a central role in the area of the prevention of natural hazards. Indeed, Switzerland has not been spared by the recent trend for the increase in natural disasters. It has been affected in particular, by heavy rainfall, avalanches and Storm Lothar and the south of the Alps has also been severely hit by floods, mud flows and landslides. Global warming is not without consequences with respect to these disasters. The temperature of the earth's surface increased by an average of 0.6° C in the course of the 20th century. The corresponding figure

for Switzerland is significantly higher with 1.6 °C being recorded in the country's French-speaking region and 1.3°C in the German-speaking region (PLANAT, 2004b).

Thus, with a view to improving safety in relation to natural hazards, the Swiss Federal Council (i.e. government) established the National Platform on Natural Hazards (PLANAT) which is responsible for the various aspects of hazard prevention on a strategic level.

Through this extra-parliamentary commission, Swiss national strategy in this area advocates an integrated approach to natural hazards involving all of the actors affected with the overall aim of developing a real culture of risk. This corresponds fully with the aims of the International Strategy for Disaster Reduction (ISDR). In addition, Switzerland played an active role at the World Conference on Disaster Reduction in Kobe, Japan, and was one of the five countries most in demand there in relation to the management of risks and emergencies¹ (INFOSUD, 2005).

International solidarity

The principle of solidarity is an essential element of Switzerland's integrated risk prevention strategy. This is implemented in particular through international cooperation and the exchange of information and expertise based on experience. This is demonstrated by the extensive interaction between PLANAT and the Swiss Agency for Development and Cooperation (SDC). The SDC regularly supports bilateral cooperation programmes in the area of disaster reduction, in particular in Central and South America, Turkey, Southern Asia and the Southern Caucasus. These programmes basically aim to strengthen institutional capacities, to raise awareness of risks among local populations and to facilitate the exchange experience and expertise.

Science at the heart of prevention

The battle to reduce disasters primarily involves the acquisition of greater knowledge in the area of risk. Scientific research, which is continuously evolving, opens new areas of knowledge in relation to the identification of the constitutive elements of risk: i.e. the identification of a hazard, its probability of occurrence and the attendant vulnerabilities. This applies to all kinds of risks, be they natural or not. Based on the scientific information gained in this way it is possible to develop preventive measures in a significantly more targeted way. The same applies with regard to disaster preparedness measures, in particular the establishment of effective and efficient warning systems.

¹ Along with France, the USA, New Zealand and Australia.

There are numerous teams of researchers working in areas related to risk reduction in Switzerland. A number of federal initiatives have been launched based on the example of "Disaster Risk Management" (DRM), a network created under the aegis of the Board of the Federal Institutes of Technology (ETH) and through which the skills and expertise of researchers have been focussed in two major networks, CENAT² (a network dealing with natural risks) and KOVERS³ (a network dealing with technological risks). This process prioritizes scientific research and the networking of knowledge and information.

Objective of this publication

Based on aforementioned observations, the objective of this publication is to present a report on the management of natural hazards and major risks in Switzerland with a particular emphasis on the role of science in this context.

This report starts by examining the national strategies created in Switzerland and relates them to the international context. It then presents an overview of the actors involved in the battle for the integrated prevention of disasters – be they natural or technological in nature – by way of background to the introduction of a practical tool which facilitates the identification of specialist institutions and researchers involved in a given area on the levels of research, training (see tables and information sheets) and consulting (see information sheets). This tool is aimed at the university, institutes of technology and scientific institutions and the experts available within the organisations of International Geneva. The internet address is also provided at which it will be possible to access regularly-updated detailed information sheets on the relevant institutions in Switzerland.

² Centre de compétence risques NATurels (Natural Hazards Competence Centre)

³ KOMPETENZVERBUND Risiko- und Sicherheitswissenschaften (Competence Centre for Technical Risks)

II. Assessment and typology of disasters

The year 2005 was marked by an 18 percent increase in disasters as compared with the previous year. The major disaster of the Tsunami of December 2004 in the Indian Ocean marked an important turning point in the way in which major crises are understood and predicted. It basically highlighted the disastrous consequences in terms of the human costs that can arise from the existence of gaps in the identification of hazards, the implementation of warning systems and appropriate information or education.

Moreover, despite the two recent major geological disasters (the Tsunami and the earthquake in Pakistan in autumn 2005), it emerges that the regular increase in the number of disasters is basically due to a significant increase in hydro-meteorological disasters, in particular the number of floods and droughts which affect a significant proportion of the global population.

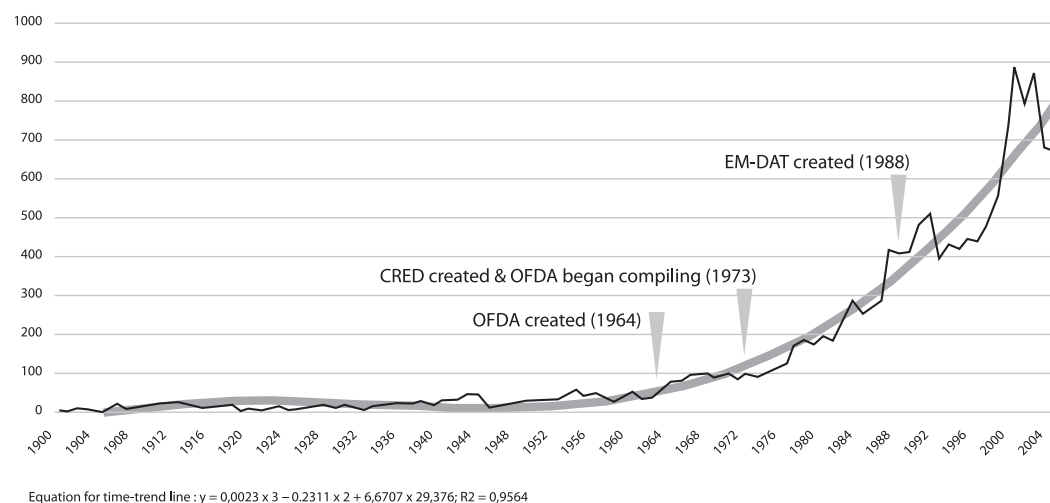


FIGURE 1: Number of disasters in the world (from 1900 to 2004) – Source: EM-DAT, CRED

An intolerable escalation

In addition to the threat of disasters related to natural events, with the growing sophistication of technologies new industrial and technological hazards emerged from the 1980s-1990s. Thus the steady increase in disasters concerns both types of disasters.

Unlike the traditional accident, which is characterised by a known event of limited scope and for which it is possible to avail of long established emergency procedures provided by

known participants with experience in dealing with this type of situation (LAGADEC, 1991), with disasters and crises we move from the realm of the “ordinary” to the “extraordinary”. As acknowledged by P. LAGADEC (2000)⁴, over the course of recent decades we have witnessed a shift in events from the familiar accident to the disaster and, finally, the major crisis which can lead to the complete breakdown of the system.

The first stage in the realm of the “extraordinary” is the **disaster**. The latter may be defined as a major, generally sudden and unpredictable event, which seriously disrupts the structure and functioning of the affected society, provoking human (deaths, injuries), material (destruction of assets, habitats, disruption of economic networks and services) and environmental (destruction of natural resources or ecosystems) loss and/or damage and which exceeds local, regional and even national capacities to remedy it without external assistance.

When these three types of damage accrue under the impact of one and the same event, as was the case with the Tsunami of December 2004 in South-East Asia, the resulting devastation and disintegration triggers a major crisis whose impact may last for several decades.

In terms of intensity and gravity, the **crisis** is the stage that follows the disaster. In accordance with its Greek etymology “*krisis*”, which means decision, is also often equated with a difficult situation or period which a social group must endure.

Thus, a crisis may be defined as a situation of profound destabilisation generally triggered by a brief and violent event or large-scale failure which exceeds ordinary capacities to deal with it and incorporates many unknown aspects with respect to its duration and the hazards it entails. Thus, it necessitates crucial decision making.

As has been shown, in the majority of cases, the central element of the crisis constitutes the advent of disastrous triggering event. However, there are different types of disasters. They are generally classified in three categories: disasters associated with natural events, those associated with technological accidents and those that originate in conflict (FIGURE 2). Based on the example of the terminology used by the researchers of the Major Risks Management Programme (MRM) of the University of Geneva,⁵ the distinction made in referring to disasters associated with natural or technological events and not to natural or technological disasters is intentional: it makes it possible, in effect, to remind us that the vast majority of disasters are anthropic in origin whereas the term “natural disasters” tends to obscure the responsibility of certain actors.

Apart from the criterion of the origin of disasters (i.e. natural or human), that of the mode of occurrence (sudden or progressive) is also widely used. The progressive mode of occurrence,

⁴ Originator of the concept of “major risk” and author of numerous works on risks and crises, in particular in the area of technological and industrial disasters.

⁵ Interdisciplinary research programme which took place from 1998 to 2002.

as occurs in the case of drought, atmospheric pollution or ethnic discrimination, renders the evaluation of risks extremely complex and difficult.

The Center for Research on the Epidemiology of Disasters (CRED) was established in 1973 at the Catholic University of Louvain in Belgium and has become one of the main references in this area. It has developed a database called EM-DAT⁶ which inventories all disasters associated with natural and technological events. To this end, it defines a number of quantitative indicators. For a disaster to be entered into the database at least one of the following criteria must be fulfilled:

- 10 or more people reported killed;⁷
- 100 people reported affected;⁸
- declaration of a state of emergency;
- call for international assistance.

Other databases also exist as, for example, those of the MunichRe⁹ and SwissRe¹⁰ insurance companies.

FIGURE 2 : Typology of disasters

Disasters associated with natural events	Disasters associated with technological accidents	Disasters of a conflictual origin
<p>Hydro-meteorological disasters:</p> <ul style="list-style-type: none"> • Avalanches • Landslides • Droughts (famines) • Cold waves, heat waves • Floods • Forest and bush fires • Storms (hurricanes), cyclones <hr/> <p>Geological disasters:</p> <ul style="list-style-type: none"> • Earthquakes • Volcanic eruptions • Mass movements • Tsunamis <hr/> <p>Biological disasters:</p> <ul style="list-style-type: none"> • Insect infestations • Others 	<p>Industrial disasters:</p> <ul style="list-style-type: none"> • Chemical spills • Collapse of industrial structures • Explosions • Fire • Gas leaks • Poisoning • Exposure to radiation <hr/> <p>Associated with transport:</p> <ul style="list-style-type: none"> • Air • Rail • Road • Water (inland waterways and maritime) <hr/> <p>Miscellaneous:</p> <ul style="list-style-type: none"> • Destruction of domestic infrastructure • Explosions • Fires 	<ul style="list-style-type: none"> • War • Guerrilla warfare • Riots • Terrorist acts <p>which originate in ethnic, social, religious or political conflict</p>

⁶ Emergency Database.

⁷ Killed: persons confirmed as dead or presumed dead and persons portées disappeared.

⁸ Affected: persons who require immediate assistance during the emergency period, emergency food aid, water, shelter, sanitary assistance, urgent medical assistance. This includes injured, homeless and displaced persons and refugees.

⁹ <http://www.munichre.com>

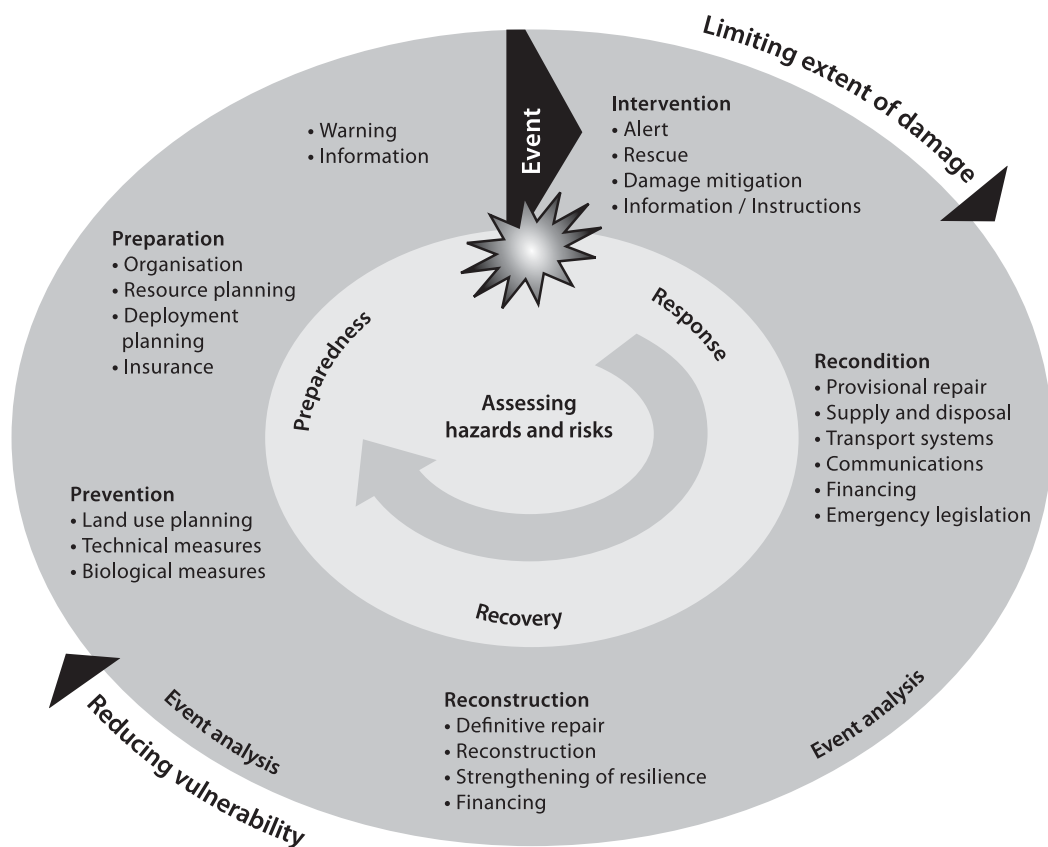
¹⁰ <http://www.swissre.com>

III. The integrated management of risks and crises

A crisis may give rise to the severe functional or structural destabilisation of the society that experiences it. In order to avoid such consequences it is important to act first and foremost on the basis of the risk concept, i.e. the scope and probability of potential damage based on the nature of the hazard and the vulnerabilities arising from it, while taking into account eventual factors of resilience in a given spatial and temporal context.

Planning for protection against risks involves asking a number of questions: i.e. What could happen? What is acceptable? What should be done? The integrated management of risks makes it possible to understand the problem in a global and systematic way while incorporating the three main areas of action, i.e. precaution, response and recovery (FIGURE 3):

FIGURE 3 : The cycle of integrated risk management (FEDERAL OFFICE FOR CIVIL PROTECTION, FOCP)



Reducing vulnerability

Given the scope and the consequences of certain disasters for the societies and individuals affected, the role of prevention is becoming increasingly important. Numerous measures can be taken in advance of the advent of a disaster so as to reduce or negate its impact on society and the environment. This phase of disaster mitigation can be divided into two stages: i.e. prevention and preparation.

1. Prevention:

With respect to the constitutive elements of the idea of risk, the first step is to consider how likely it is that the disastrous event will occur (evaluation of the hazard) and the potential consequences of such an event (evaluation of vulnerability).

Hazard

A threatening event, or the probability of occurrence of a potentially damaging phenomenon, a hazard may be natural (geological, hydrometeorological, biological) or technological in nature. It may also be due to the degradation of the environment. For scientists, understanding the causes of a hazard, its geographical distribution, its probability of occurrence and the physical mechanisms of the destruction it causes involves the implementation of a number of measures such as the monitoring of sites, instrumentation, intensity zoning.

Vulnerability

Despite the difficulty associated with the wide divergence of interpretations behind the definitions of this term, depending on the field of research or specific context in question (natural disasters, climate change, nutrition, social sciences, health etc.) (BRUTSCHIN, 2002), vulnerability could be defined as the degree of exposure to a hazard and to the damage resulting from it, based on the capacities available to the community or individuals exposed to it.

Although the concepts relative to the causes of vulnerability have undergone considerable development in recent years, in effect, the term remains vague and, like the interaction between natural phenomena and social mechanisms, this makes it a complex area to analyse. Thus, it is important, firstly, to analyse vulnerability on different levels (i.e. individual, family, regional and state) and while doing this, to differentiate the types of disasters in a defined temporal context, on the other.

This degree of exposure to a hazard is a function of a multitude of **conditions** in a given context and their interactions. These can be: physical (demographic and urban growth), ecological (types of land use), economic, social, cultural (history of the exposed societies), ideological, educational, political, institutional (communication between actors, scientists, decision-makers, journalists and the population) and technical (expertise and quality of prevention and warning systems). In reference to the vulnerabilities of societies and urbanised locations, R. D'ERCOLE (1994) defined the latter as being like a **system** "connected around a large number of natural and human variables in the dynamic, time or space which may give rise to situations of varying degrees of danger to an exposed society" (see FIGURE 4).

However, irrespective of the type of vulnerability at work, it increases with poverty. According to Gallais (1994), poverty engenders vulnerability to crises. In the area of natural disasters, the statistics clearly show that countries of low human development are significantly more vulnerable to disasters.¹¹

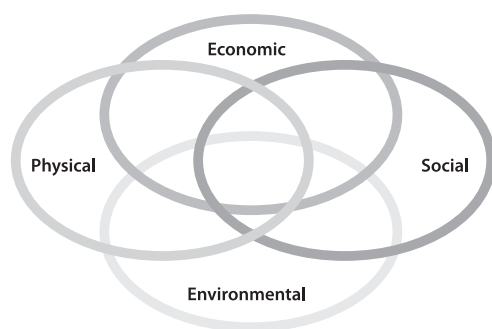


FIGURE 4: The interaction of vulnerability factors (ISDR, 2002)

The evaluation of vulnerability to physical damage concerns, for example, the damage coefficients, the probability of damage and expected losses. In relation to economic and social vulnerability, this will concern in particular the lack of the resources necessary to enable a rapid recovery. Once these factors of vulnerability have been identified, they should be converted into action (D'ERCOLE, 1994).

Resilience

In physics, resilience is the capacity of materials to resist shock. When applied to human beings, the definition goes further than this as it also involves the ability to rebuild oneself. In other words, resilience is not only the capacity to absorb the shock and damage arising from it, but also to adapt to the new situation.

Finally, the parameters of **time** and **space** also play a determining role in the calculation of risk. In effect, the probability that a risk will materialise vary according to the given period and the specific geographical context.

¹¹ Based on the UNDP Human Development Index (HDI), for the period 1994–2003, 52.1 percent of the people killed by natural disasters (EM-DAT, CRED) originated from countries of low human development.

Once the risks have been identified and evaluated, a phase of prevention in the true sense follows which includes all of the actions whose objective it is to provide permanent protection against disasters.

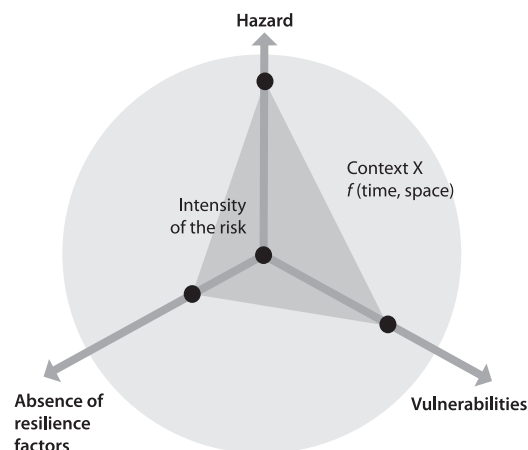
In English, a distinction is made between “disaster prevention” (which refers to the adoption of measures intended to avert the disaster) and “disaster reduction” (which refers to the adoption of measures intended at limiting the severity of a disaster). However, this terminology is often used in a wider sense which incorpo-

rates the different meanings. As opposed to this, in French, the term “prevention” is used in this context. However, some actors¹² adopt this distinction and also use the term “mitigation”.¹³ Thus, whereas **prevention** includes all of the tasks aimed at providing permanent protection against disasters, **mitigation** refers to the measures taken prior to the advent of a disaster with the aim of reducing its impacts on society and the environment. Thus, mitigation may also refer to the reduction of hazards (for example, through the improvement of the water drainage system) and to the reduction of vulnerabilities (for example, microzoning studies to enable the prediction of vulnerable zones or vaccination campaigns).

In other words, if in the majority of cases, it is not possible to prevent the emergence of natural hazards it is sometimes possible to reduce their intensity (floods, mud flows, avalanches), and, above all, act on vulnerability.

Different types of measures are implemented during this phase of prevention: technical-structural measures, i.e. protective structures based on engineering principles (for example, embankments, dikes, dams); spatial planning measures (creation of hazard zones, legislative standards for urban planning) biological measures (forest maintenance); and, finally, measures such as incentive-based taxes or public awareness and information.

FIGURE 5: The constituent elements of risk (M. SCHMID, 2005)



¹² For example, most notably SPHERE, a project launched in 1997 by a group of humanitarian agencies, one of whose aims was to establish a humanitarian charter and minimum standards for intervention during catastrophes.

¹³ Others, for example the United Nations Department of Humanitarian Affairs, use the term “attenuation”.

2. Preparation:

Apart from the implementation of preventive measures, a phase of preparation for the actual disaster must be organised in conjunction with the former. This phase involves all of the measures aimed at predicting the effects of a disaster and at dealing with it through the organization of the evacuation of people and material assets under threat and the facilitation of the operation of the emergency and rehabilitation phases with the aim of minimising the loss of life and damage caused.

What is involved in effect is the definition of an emergency plan comprising all of the concrete emergency measures to be implemented once the disaster has occurred. This involves the development of early warning and evacuation systems (which entails significant tasks with regard to informing and broadcasting to all of the actors involved, in particular the general public), the planning of both financial and human resources, the training of emergency teams and the conclusion of insurance contracts.

Limiting the scope of disasters

Despite all of the mitigation measures that exist, unfortunately it is rarely possible to avoid a disaster. Also, once it has occurred, the disaster response phase, which involves all of the measures, decisions and actions taken during and after the disaster, begins. During this phase, which consists in limiting the scope of the disaster, the procedures planned during the preparation phase will be activated and readjusted on the basis of the actual circumstances unfolding.

The first task will consist in establishing a crisis centre which will facilitate the centralisation of the available skills and expertise. This crisis centre will then have to evaluate the situation and the requirements so as to be able to mobilise the necessary response capacities as quickly as possible. It will operate proactively on the basis of scenarios forecast for this purpose while implementing readjustments where necessary. Thus, the crisis centre must not only control the system throughout the crisis but also manage the post-crisis phase. This involves specifically the implementation of eventual scientific assessments (identification of competent and credible experts) and the management of communication.

Once the diagnosis has been made, this disaster response phase will involve three successive stages: intervention, reconditioning and, finally, reconstruction.

3. Intervention:

This phase of crisis involves all of the emergency measures to be taken to save the maximum number of lives and fulfil the essential needs of the people affected. Concretely, these measures involve alerting, search and rescue, the provision of shelter, distribution of food, medical care, the total or partial evacuation of populations. Given that these are emergency measures, they are generally only implemented for a short time ranging from a few days to a few weeks.

4. Reconditioning:

The phase of provisional repair begins very soon after the extreme emergency: the aim of this phase is to re-establish all of the functions essential for the basic functioning of a society (i.e. vital installations such as the water and electricity supply, sewage disposal, communication and telecommunication channels). This phase, which sometimes begins in the hours following the advent of the disaster, may last from a few weeks to a few months and provides the transition from intervention to reconstruction.

5. Reconstruction:

Reconstruction is the final phase in the response to a disaster. In effect, it involves not only the definitive and complete restoration of the functional situation that existed prior to the disaster but also includes the implementation of preventive measures to ensure that it cannot occur again and elements of modernisation rendered opportune by the destruction endured. This may involve, for example changes to the urban fabric, transport and infrastructure. The reconstruction measures are based on long term objectives and may take from several months to years to complete. This phase acts as an important transition period for all development programmes and can have positive or negative influence on the latter.

As planned by the reconstruction phase, the preventive measures must represent an integral element of disaster response to ensure that the lessons necessary to ensure that there will be no reoccurrence of such a situation are learned. Logically, this leads a generally cyclical view of disaster management that favours a proactive approach (see FIGURE 3).

IV. The international context and national strategies

International mobilisation

International strategy for the prevention of disasters

The gradual increase in disaster awareness has prompted the mobilisation of international organisations, in particular within the United Nations, since the early 1990s. This was the context in which the International Decade for Natural Disaster Reduction (IDNDR) (1990–1999) was established. The first international conference on disaster prevention was held in Yokohama in Japan in 1994. On this occasion, an International Strategy for Disaster Reduction (ISDR) was developed with the aim of constructing a veritable culture of prevention which would henceforth represent an integral element of sustainable development strategies. The guidelines for the prevention, preparation and mitigation of natural disasters proposed by the Yokohama strategy have acted as an international plan for disaster prevention.

The general objective of the strategy is to enable all societies to overcome natural disasters and industrial and environmental disasters in a way that enables the reduction of environmental, human, economic and social losses. Based on this, the following four objectives were identified:

- Increasing the awareness of the public to promote an understanding of risks, vulnerability and prevention of disasters at international level
- The involvement of public authorities in the implementation of policies and action in the area of disaster prevention
- The promotion of multi-disciplinary and intersectoral partnerships, including the extension of prevention networks
- The improvement of scientific knowledge in the area of disaster prevention. Thus, the scientific and academic sectors are directly involved.

To attain these objectives, a number of areas of general interest were defined: some of these concern the evaluation of vulnerability, some concern the management of ecosystems, land, *urbanisme sauvage* etc. and, finally, others concern legal instruments relating to disaster prevention. Thus, new tasks were assigned to the Strategy such as the pursuit of cooperation for the mitigation of the effects of El Niño and the strengthening of capacities for the prevention of disasters by means of early warning systems.

The Strategy is currently implemented by two organisations which are based in Geneva: the Inter-Agency Task Force for Disaster Reduction (IATF-DR¹⁴) and the Inter-Agency Secretariat of the ISDR (ISDR Secretariat). The IATF-DR is chaired by the United Nations Under-Secretary-General for Humanitarian Affairs. It is composed of representatives of the UN and international and regional civil-society organisations.

A Plan of Action for the implementation of the Strategy has also been developed which defines the basic concepts on which it is based and identifies the institutional mechanisms arising from the resolutions adopted by the Economic and Social Council (ECOSOC) and the General Assembly of the United Nations and the decisions of the IATF-DR for the prevention of disasters.

At the end of the International Decade for Natural Disaster Reduction, the United Nations compiled a report based on the information relating to the prevention of natural disasters.¹⁵ The merit of this initiative was that it succeeded in making disaster prevention an internationally acknowledged priority objective. From this point, numerous international organisations started working towards the reduction of disaster risks (see CHAPTER 5).

World Conference on Disaster Reduction – Kobe, January 2005¹⁶

Another important stage in the battle against disasters was marked by the World Conference on Disaster Reduction which was held in Kobe, Japan in January 2005, i.e. exactly ten years after the earthquake which devastated the city. As luck would have it the conference started just a few days after the tragic events of the Tsunami of 24 December 2004 in the Indian Ocean which lent a particular resonance to the event.

At the end of this four-day conference, a final document, the Hyogo Framework for Action 2005–2015, was adopted which provides a reference framework for the measures to be taken over the next decade. A Final Declaration was also adopted at the conference. The measures defined in the Framework for Action involve governments, international organisations and civil society. They also incorporate all levels, i.e. local, regional, national and international. The conference highlighted the urgent need to establish prevention and preparation programmes which are better coordinated at global level.

¹⁴ Inter-Agency Task Force for Disaster Reduction

¹⁵ The Strategy and Plan of Action and the resulting report “Living with Risk: A global review of disaster reduction initiatives” (2002) can be found on the official ISDR website, <http://www.unisdr.org>

¹⁶ UN World Conference on Disaster Reduction

The European level

The programmes of the majority of cooperation and development strategies, be they those of the OECD's Development Cooperation Directive (DAC), the European Union or national cooperation strategies, now include risk and disaster management.

At European Commission level, a humanitarian aid department (ECHO) was created in 1992 for the purpose of providing aid to the victims of humanitarian crises outside of the European Union. In view of the scope and repercussions that natural disasters can have in the most vulnerable countries, ECHO launched its disaster preparedness programme DIPECHO (**Disaster Preparedness ECHO**) in 1996. The basic objective of this programme is to reduce the vulnerability of populations to natural disasters and this is demonstrated, for example in its support of projects targeting the integration of disaster preparedness measures in aid operations and in development programmes.

It is also worth noting that a "**The European and Mediterranean Major Hazards Agreement (EUR-OPA)**" also exists at European level. This is a cooperation platform in the area of major risks between the countries of Central and Eastern Europe, the countries of Southern Europe and the Mediterranean and the other countries of Western Europe.¹⁷ The European and Mediterranean Major Hazards Agreement (EUR-OPA) was established by the Committee of Ministers of the Council of Europe in 1987 for the purpose of improving cooperation between the Member States (which currently number 25) in the areas associated with major natural and technological disasters. However, Switzerland is not party to this agreement.

Swiss national strategies

The competent authorities

Based on the federal legislation which defines the general legal framework in this area, on the level of Switzerland, it is the responsibility of the Swiss Confederation, the cantons and the municipalities to implement effective prevention measures to protect the population against the hazards associated with natural disasters and major accidents.

The main natural hazards that exist in Switzerland are floods, storms, avalanches, landslides and earthquakes. However, other hazards also exist which can have disastrous effects, such as hail, rock avalanche, drought, lightning and forest fires. With regard to major accidents, these may be biological, chemical or radiological in nature.

¹⁷ See internet website: http://www.coe.int/T/DG4/MajorHazards/Default_en.asp

A number of Swiss federal offices are responsible for dealing with these hazards. The task of the prevention of both natural hazards and major accidents (implementation of the Federal Ordinance on Major Accidents) has been assigned to the **Federal Office of the Environment (FOEN)**,¹⁸ which is part of DETEC (Federal Department of Environment, Transport, Energy and Communications). FOEN is the author of multiple recommendations concerning the taking into account of the hazards associated with mass movements, floods and earthquakes in the context of the compilation of hazard maps and microzoning. FOEN has also developed an environmental database for Switzerland called **Envirocat**.¹⁹

The objective of the Federal Office for Spatial Development (**ARE**),²⁰ which is also part of DETEC, is the sustainable development of Switzerland's territory. As part of this task, it is interested in the natural hazards associated with spatial development. ARE has also issued recommendations entitled "Aménagement du territoire et dangers naturels" ("Spatial Planning and Natural Hazards") (OFFICE FÉDÉRAL DU DÉVELOPPEMENT TERRITORIAL, 2005).

Other federal offices, such as the **Federal Office of Public Health (SFOPH)**,²¹ the **Federal Office for Energy (FOE)**,²² and the **Swiss Federal Nuclear Safety Inspectorate (DSIN)**,²³ also have specific powers in the case of major accidents.

In the context of natural disasters, mention should also be made of the **Federal Office of Meteorology and Climatology (MeteoSwiss)**²⁴ (which is part of the Federal Department of Home Affairs – FDHA), which also plays an important role in the area of forecasts and climate change.

The Federal Department of Defence, Civil Protection and Sports (DDPS) also includes the **Federal Office for Civil Protection (FOCP)**.²⁵ The purpose of the latter is to plan and coordinate emergency measures to be implemented in the case of disasters, emergencies or acts of terrorism.

As far back as the early 1990s, FOCP carried out a comparative analysis of disasters and emergency situations in Switzerland (KATANOS, 1995). Eight years later, it published **KATARISK** (2003), which is a revision, update and development of KATANOS from the perspective of the coordinated system for the protection of the population. This comparative analysis of risk situations in Switzerland (FIGURE 6) estimates that around 50 percent of risks are associated with disasters and emergency situations (i.e. class 2 to 5 events such as earthquakes, floods, storms, avalanches, nuclear plant accidents, epidemics) and that the remaining 50 percent involve events considered as unexceptional (i.e. class 1 events, such as fires, road traffic

¹⁸ <http://umwelt-schweiz.ch/>

¹⁹ <http://www.envirocat.ch>

²⁰ <http://are.admin.ch>

²¹ <http://www.bag.admin.ch>

²² <http://www.bfe.admin.ch>

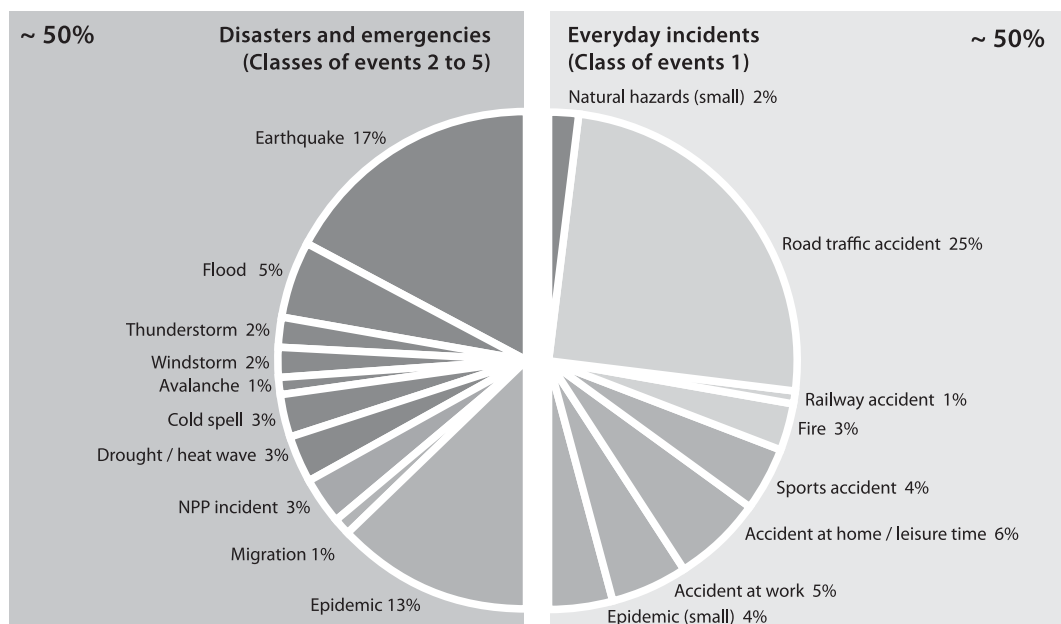
²³ <http://www.hsk.ch>

²⁴ <http://www.meteoswiss.ch>

²⁵ <http://www.bevoelkerungsschutz.admin.ch>

accidents, train accidents, domestic accidents, sport accidents, accidents at work etc.)²⁶. As opposed to this, Katarisk does not take into account the risks associated with the black-mailing of Switzerland, terrorism, extremism) or armed conflict.

FIGURE 6: All risks associated with disasters and emergency situations in Switzerland (reference year 2000). Source: KATARISK, 2003



It should also be noted that early warning in Switzerland is facilitated by a National Emergency Operations Centre (NEOC), which was established in 1984. NEOC is a division of FOCP. In the context of the Cold War, which was still under way when it was created, NEOC's mission was to operate discretely and exclusively in the area of radioactivity. After the fall of the Berlin Wall in 1989, its field of action was extended and it has now become an instrument of civil protection while also remaining a service specialised in extraordinary events, such as increases in radioactivity (due to transport or laboratory-related accidents, incidents at nuclear power plants or terrorist acts), a chemical accident, the rupture of dam or even satellite re-entry. With its integration into the coordinated system for the protection of the population, CENAL's functions were extended from 2003 to include, for example, the immediate and secure transmission to the cantonal police of MeteoSwiss warnings and the earthquake reports issued by the Swiss Seismological Service.

²⁶ Five classes of events are defined: class 2 concerns everyday events; as opposed to this the others involve disasters or emergency situations, at local (class 2), regional (class 3), supraregional (class 4) and national (class 5) level.

In the area of the prevention of and security against natural hazards throughout Switzerland, the objective of the National Platform for Natural Hazards (PLANAT) is to prioritize the concept of risk management, thus taking it beyond a simple sectoral battle against natural hazards.²⁷ PLANAT's mandate is to develop a superior networked strategy aimed at improving the security of the population, significant material assets and the natural environment in the face of natural hazards. It promotes a global and interdisciplinary approach to the problem and, based on the observation that the areas of prevention, risk control and reconstruction are still too separate, tries to avoid redundancies at the level of prevention and to develop existing synergies. The first phase of this strategy, which is entitled "Protection against Natural Hazards – Vision and Strategy" (PLANAT, 2004a) involved the development of a global and coherent culture of risk management. The second stage involved the analysis of the current situation and the proposition of an action plan. The aim of the third phase (2006–08) is to implement this action plan with the collaboration of the federal services involved. The priority elements of action concern the development of the concept of risk, the development of a culture of risk awareness through discussions between all of the actors involved and, finally, the monitoring of the risks associated with natural hazards and the resources invested for the purpose of protection.

Disasters and international solidarity

Disasters and, specifically, natural disasters affect the world's poorest populations in particular, and the impacts on the development of the most vulnerable countries are often significant and long-lived. Accord to, CRED, 52.1 percent of the people killed by natural disasters (in the period 1994–2003) originated from countries with low levels of human development as opposed to 39.7 percent from countries with average levels of human development and 8.1 percent with elevated human development.²⁸

The actions carried out in Switzerland and by Switzerland give out a very clear indication of the will to make disaster prevention the number one priority, not only on the domestic level, but also in the context of development cooperation policy. Thus, apart from DETEC, through its **Swiss Agency for Development and Cooperation (SDC)**²⁹ the Federal Department of Foreign Affairs (DFA) has demonstrated a profound interest in the problem of risks and disasters and prevention has been defined as a priority topic in its 2010 strategy. Based on this, it plays an active role alongside several multilateral partners in the battle to control natural disasters³⁰.

²⁷ PLANAT is a commission comprising 20 specialists, the specialist services of the Swiss Confederation and cantons are also represented on the commission as are research, professional associations, the private sector and insurance companies (www.planat.ch).

²⁸ Classification based on the UNDP Human Development Index (HDI)

²⁹ <http://www.deza.admin.ch>

³⁰ In particular ProVention Consortium, ISDR, OCHA, PNUD-BCPR, FICR, the World Bank Group.

More specifically, with respect to the area of research, the SDC developed a master plan for 2004–2007, in which it revisited the five thematic priorities of its 2010 strategy.³¹ These topics include natural resources and the environment. One of the priority lines of research concerns specifically the prevention of natural disasters and prioritizes a global approach, which means also taking into account the subjective aspects of risk anxiety (DDC, 2005). However, technological disasters have not been forgotten, in particular the risks associated with biotechnologies and the use of toxic substances. Finally the prevention of disasters associated with conflicts is also considered a priority line of research in the context of the topic of governance and conflict resolution. Thus, it is interesting to note that the research on crisis prevention focuses on the following three main areas: disasters associated with a natural event, those of a technological origin and those associated with conflict.

Similarly, in the humanitarian sector, the SDC's Humanitarian Aid division has been running a working group in the area of prevention-preparation for many years now and a natural hazard integrated risk management strategy has been implemented with a degree of success at community and national levels in various projects (Central America, Central Asia).³²

Finally, in terms of intervention, mention should also be made of Swiss Rescue which is made up of eight partner organisations from the fields of public, civil and military law that are active in disaster situations under the aegis of the Swiss Confederation's Humanitarian Aid. Swiss Rescue specialises in the location, rescue and medical care of earthquake victims abroad.

³¹ Specifically: natural resources and environment – jobs and income – social development – governance and conflict resolution.

³² See also its 2005 strategy (DDC, 2002)

V. International Geneva and its areas of expertise

United Nations bodies and specialist agencies

Numerous United Nations agencies focus their attention on the question of risk analysis and disaster prevention in the context of the ISDR. This chapter contains a presentation of the organisations within International Geneva which have specific areas of action with regard to risk management. In terms of their number and diversity, these organisations constitute a very important competence centre in Geneva.

The information presented below on the international organisations originate from the ISDR database.

UNDP – Bureau for Crisis Prevention & Recovery (BCPR)

Location: Switzerland / Western Europe

Mission: While effective emergency management plays a vital role in avoiding loss of life and suffering, it generally fails to make the connection between disaster risk and development. In recognition of this UNDP has adopted a viable approach to disaster reduction which recognises the fact that disasters are unresolved development problems that occur when risks go unmanaged. The mainstreaming of disaster reduction into development and post-disaster recovery has therefore become an essential component of UNDP's approach to building a capacity for sustainable human development. UNDP seeks to ensure that disaster risk considerations are factored into national and regional development programmes and that countries take advantage of recovery following disasters as unique opportunities to mitigate future risks and vulnerabilities.

Address: International Environment House • 11–13, Chemin des Anémones

City: CH – 1219 Châtelaine

Phone: +41 – 22 917 84 33

Fax: +41 – 22 917 80 60

Website: <http://www.undp.org/bcpr>

Mail: bcpr.disasters@undp.org

ILO – Crisis Response and Reconstruction Programme (CRISIS)

Location: Switzerland / Western Europe

Mission: The ILO seeks strategic impact in crisis response. It aims to influence the programmes and policies of crisis actors so they mainstream decent work and related social concerns – so they put these goals at the centre of their activities.

Address: Room 10–29 • 4, Route des Morillons

City: CH – 1211 Geneva 22

Phone: +41 – 22 799 61 32

Fax: +41 – 22 799 61 89

Website: <http://www.ilo.org/public/english/employment/crisis/index.htm>

Mail: ifpcrisis@ilo.org

Intergovernmental Panel on Climate Change (IPCC)

Location: Switzerland / Western Europe

Mission: In 1988, UNEP and WMO jointly established the Intergovernmental Panel on Climate Change (IPCC) as concern over climate change became a political issue. The purpose of the IPCC was to assess the state of knowledge on the various aspects of climate change including science, environmental and socio-economic impacts and response strategies. The IPCC is recognised as the most authoritative scientific and technical voice on climate change, and its assessments had a profound influence on the negotiators of the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. The IPCC continues to provide governments with scientific, technical and socio-economic information relevant to evaluating the risks and developing a response to global climate change.

(<http://www.grida.no/climate/vital/16.htm> <http://www.ipcc.ch>). Working Group II of the IPCC assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.

Address: IPCC Secretariat
c/o World Meteorological Organization (WMO) • 7 bis, Avenue de la Paix • P. O. Box 2300
City: CH – 1211 Geneva 2
Phone: +41 – 22 730 82 08
Fax: +41 – 22 730 82 08
Website: <http://www.ipcc.ch>
Mail: IPCC-Sec@wmo.int

International Committee of the Red Cross (ICRC)

Location: Switzerland / Western Europe

Mission: The International Committee of the Red Cross (ICRC) is an impartial, neutral and independent organization whose exclusively humanitarian mission is to protect the lives and dignity of victims of war and internal violence and to provide them with assistance. It directs and coordinates the international relief activities conducted by the Movement in situations of conflict. It also endeavours to prevent suffering by promoting and strengthening humanitarian law and universal humanitarian principles.

Address: 19, Avenue de la Paix
City: CH – 1202 Geneva
Phone: +41 – 22 734 60 01
Fax: +41 – 22 733 20 57
Website: <http://www.icrc.org>

International Federation of Red Cross and Red Crescent Societies (IFRC)

Location: Switzerland / Western Europe

Mission: IFRC is the world's largest humanitarian organization, providing assistance without discrimination as to nationality, race, religious beliefs, class or political opinions.

Address: P. O. Box 372 • 17, Chemin des Crets • Petit Saconnex

City: CH – 1211 Geneva 19

Phone: +41 – 22 730 42 22

Fax: +41 – 22 733 03 95

Website: <http://www.ifrc.org>

Mail: secretariat@ifrc.org

UN – International Strategy for Disaster Reduction (ISDR)

Location: Switzerland / Western Europe

Mission: The ISDR aims at building disaster resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters.

Address: Palais des Nations

City: CH – 1211 Geneva 10

Phone: +41 – 22 917 25 29

Fax: +41 – 22 917 05 63

Website: <http://www.unisdr.org>

Mail: isdr@un.org

UN-Habitat – Liaison & Information Office Geneva

Location: Switzerland / Western Europe

Mission: Represents the United Nations Human Settlements Programme (UN-HABITAT) at the established inter-governmental and United Nations bodies in Geneva on policy and programme issues related to the field of human settlements; also liaises with the United Nations Office in Vienna and with other United Nations and international bodies and partners based in the European region; Promotes UN-HABITAT's campaigns on Secure Tenure and Urban Governance in Europe; Promotes the Habitat Agenda in Europe, with a focus on post-conflict reconstruction and rehabilitation, disaster mitigation, internally displaced persons (IDPs), safer cities, water and sanitation, housing and water and sanitation rights, and poverty reduction and employment; more recently, the Office started a special programme for the Palestinian people headed by a senior coordinator; Implements UN-HABITAT's information strategy in Europe through Habitat Agenda partners, including local authority associations and civil society organisations.

Address: International Environment House 2 • 7, Chemin de Balexert

City: CH – 1219 Châtelaine

Phone: +41 – 22 917 86 46

Fax: +41 – 22 917 80 46

Website: <http://www.unhabitat.org/offices/geneva>

Mail: unhabitat@unog.ch

Office for the Coordination of Humanitarian Affairs – Geneva Office (UN OCHA)

Location: Switzerland / Western Europe

Mission: Upon receipt of information from the duty officer, and depending on the magnitude of the disaster, OCHA Geneva may activate an emergency operations team to coordinate aspects of disaster response. These interdisciplinary emergency teams may include information management, technology, operations, logistics, administration and communications capacity to coordinate all aspects of response.

Address: 8–14 Palais de Nations
City: CH – 1211 Geneva 10
Phone: +41 – 22 917 12 34
Fax: +41 – 22 917 00 23 / 03 68
Website: <http://ochaonline.un.org/index.asp>
Mail: ochagva@un.org

ProVention Consortium

Location: Switzerland / Western Europe

Mission: Its mission is “to help developing countries build sustainable and successful economies and to reduce the human suffering that too often results from natural and technological catastrophes”. The ProVention Consortium is a global coalition of governments, international organisations, academic institutions, the private sector, and civil society organisations aimed at reducing disaster impacts in developing countries. The Consortium functions as a network to share knowledge and to connect and leverage resources to reduce disaster risk.

Address: ProVention Consortium Secretariat • P. O. Box 372 • 17, Chemin des Crêts
City: CH – 1211 Geneva 19
Website: <http://www.proventionconsortium.org>
Mail: provention@ifrc.org

UNOSAT – Satellite Imagery for All

Location: Switzerland / Western Europe

Mission: The goal of UNOSAT is to make satellite imagery and geographic information easily accessible to the humanitarian community and to experts worldwide working to reduce disasters and plan sustainable development. To do this we acquire satellite images from all commercial providers.

Address: UNOSAT/UNITAR – International Environment House 2 • 7–9, Chemin des Anémones
City: CH – 1219 Châtelaine
Phone: +41 – 22 917 85 17
Fax: +41 – 22 917 80 62
Website: <http://unosat.web.cern.ch>
Mail: info@unosat.org

The Joint UNEP/OCHA Environmental Unit

Location: Switzerland / Western Europe

Mission: The Joint UNEP/OCHA Environment Unit (Joint Environment Unit) is the United Nations mechanism to mobilise and coordinate the international response to environmental emergencies and natural disasters with major environmental impacts.

Address: Office for the Coordination of Humanitarian Affairs (OCHA) • Palais des Nations

City: CH – 1211 Geneva 10

Phone: +41 – 22 917 11 42

Fax: +41 – 22 917 02 57

Website: <http://ochaonline.un.org/ochaunep>

Mail: ochaunep@un.org

UNEP – DEWA/GRID-Europe

Location: Switzerland / Western Europe

Mission: DEWA/GRID-Europe is one of UNEP's major centres for data and information management, with a unique, "value-adding" mandate in the handling of global and regional environmental data, which in turn support the environment assessment and early warning activities of UNEP and its partners. At the same time, GRID-Europe occupies the niche of francophone centre for the global GRID network. DEWA/GRID-Europe is supported by a "Partnership Agreement" between UNEP, the Federal Office for the Environment (FOEN) and the University of Geneva.

Address: 11, Chemin des Anémones

City: CH – 1219 Châtelaine

Phone: +41 – 22 917 82 94

Fax: +41 – 22 917 80 29

Website: <http://www.grid.unep.ch>

Mail: infogrid@grid.unep.ch

United Nations Environment Programme (UNEP Chemicals)

Location: Switzerland / Western Europe

Mission: UNEP Chemicals is the center for all chemicals-related activities of the United Nations Environment Programme. Our goal is to make the world a safer place from toxic chemicals. We do this by helping governments take needed global actions for the sound management of chemicals, by promoting the exchange of information on chemicals, and by helping to build the capacities of countries around the world to use chemicals safely.

Address: International Environment House • 11–13, Chemin des Anémones

City: CH – 1219 Châtelaine

Phone: +41 – 22 917 81 11

Fax: +41 – 22 797 34 60

Website: <http://www.chem.unep.ch>

Mail: chemicals@unep.ch

The centre also houses the temporary secretariat of the Rotterdam Convention (on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade) and Stockholm Convention (on persistent organic pollutants) (see internet website).

PNUE/DEWA Earthwatch

Location: Switzerland / Western Europe

Mission: The United Nations System-wide Earthwatch mechanism is a broad UN initiative to coordinate, harmonise and catalyse environmental observation activities among all UN agencies for integrated assessment purposes. Through Earthwatch, UN agencies work together on global environmental issues, by exchanging and sharing environmental data and information. UNEP provides the Earthwatch secretariat. Earthwatch was established at the 1972 UN Conference on the Human Environment in Stockholm and reinforced by the 1992 UN Conference on Environment and Development in Rio de Janeiro and its Agenda-21 chapter on Information for Decision Making.

Address: International Environment House • 11, Chemin des Anémones

City: CH – 1219 Châtelaine

Phone: +41 – 22 917 81 76

Fax: +41 – 22 917 80 29

Website: <http://earthwatch.unep.net/about/index.php>

World Health Organisation (WHO)

Location: Switzerland / Western Europe

Mission: The World Health Organisation, the United Nations specialised agency for health, was established on 7 April 1948. WHO's objective, as set out in its Constitution, is the attainment by all peoples of the highest possible level of health. Health is defined in WHO's Constitution as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. WHO is governed by 192 Member States through the World Health Assembly. The Health Assembly is composed of representatives from WHO's Member States. The main tasks of the World Health Assembly are to approve the WHO programme and the budget for the following biennium and to decide major policy questions.

Address: 20, Avenue Appia

City: CH – 1211 Geneva 27

Phone: +41 – 22 791 21 11

Fax: +41 – 22 791 31 11

Website: <http://www.who.int>

Mail: info@who.int

World Meteorological Organisation (WMO)

Location: Switzerland / Western Europe

Mission: The purposes of WMO are to facilitate international cooperation in the establishment of networks of stations for making meteorological, hydrological and other observations; and to promote the rapid exchange of meteorological information, the standardisation of meteorological observations and the uniform publication of observations and statistics. It also furthers the application of meteorology to aviation, shipping, water problems, agriculture and other human activities, promotes operational hydrology and encourages research and training in meteorology.

Address: 7 bis, Avenue de la Paix • P. O. Box 2300
City: CH – 1211 Geneva
Phone: +41 – 22 730 81 11
Fax: +41 – 22 730 81 11
Website: <http://www.wmo.ch>
Mail: wmo@wmo.int

GEN/PNUE – Geneva Environment Network

Also worthy of mention in the context of Geneva is the Geneva Environment Network (GEN), a partnership uniting over 45 organisations and public and private bodies active in the field of the environment and sustainable development. A number of these are based at International Environment House. The aim of GEN is to foster synergies and encourage cooperation between these bodies. Its secretariat is provided by the FOEN. The Swiss Confederation (through its Federal Office of the Environment – FOEN) funds a large part of the Geneva Environment Network's costs.³³

Address: International Environment House • 11–13, Chemin des Anémones
City: CH – 1219 Châtelaine
Phone: +41 – 22 917 83 26
Website: <http://www.environmenthouse.ch/francais/reseau.html>

IUCN – The World Conservation Union

The World Conservation Union is the world's largest and most important conservation network. The Union brings together 82 States, 111 government agencies, more than 800 non-governmental organisations (NGOs), and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

Address: IUCN Headquarters • 28, Rue Mauverney
City: CH – 1196 Gland
Phone: +41 – 22 999 00 00
Fax: +41 – 22 999 00 02
Mail: webmaster@iucn.org

³³ See the website of the Swiss Federal Office of the Environment: <http://www.umwelt-schweiz.ch/buwal/eng/index.html>

VI. The role and place of science in the management of natural hazards and major risks

Introduction

The principles advanced in the course of the International Decade for Natural Disaster were basically due to work carried out in the area of science and technology. Significant improvements have been achieved in certain areas. Considerable improvements were achieved in the knowledge available on meteorology, observation and forecasting systems. For example, the capacity for the forecasting of tropical cyclones (forecast deadline and trajectory) was improved by 24 hours in one decade. The forecast deadline which was only 24 hours in the late 1980s was increased to 48 hours just ten years later (WMO / UNESCO 1999).

The role of science in the action framework of the Strategy (ISDR)

At the same time, this important development in scientific knowledge began to meet with a positive response at international level. The International Strategy for Disaster Reduction defined “the improvement of scientific knowledge in the area of natural, industrial and environmental disasters and their impact on societies” as one of its four objectives in Yokohama in 1994 (see CHAPTER 3).

Over the course of the same decade, of the UN specialist organisations, the WMO and UNESCO were among the main scientific contributors to the cause of disaster prevention. In 1999, these two agencies decided to carry out an evaluation of the status of science and technology for the reduction of risks and organised a forum to this end (“Sub-forum on Science and Technology in Support of Natural Disaster Reduction”, Geneva, 6–8 July 1999). This event gave rise to the compilation of a publication (WMO / UNESCO 1999) which takes stock of the evolution of knowledge in relation to each of the main types of natural disasters, be they geological or hydrometeorological in origin.

In general, disaster prevention underwent significant developments over the course of these years in several sectors: first and foremost on the level of the risk awareness and the identification of vulnerabilities; the exchange of information and communication between the different actors involved (scientists, politicians, general public) also intensified. The same applies to the inter-disciplinary dialogue between the natural and social sciences. Also, on the level of disaster preparedness, the number and quality of warning systems available increased. The development of new information and communications technology made a very significant contribution here. Finally, on the level of education, there has also been an

increase in the opportunities available for training in the area of disaster prevention and capacities have been reinforced at all levels. From this point, the objective concerned the creation of a real culture of disaster prevention based on a truly integrated approach.

The **Hyogo Framework for Action for 2005–2015**, which was formulated during the Kobe Conference in 2005, continues to move in this direction and is based on the conclusions of the evaluation of the Yokohama strategy. It reiterates the following five priorities:

1. Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.

With regard to priority 3, the Framework for action specifies: *“Disasters can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience, which in turn requires the collection, compilation and dissemination of relevant knowledge and information on hazards, vulnerabilities and capacities”*.

A number of activities are identified which can help to achieve these objectives:

- Information management and exchange
- Education and training
- Research
- Public awareness

With regard to research, the objective is to *“develop improved methods for predictive multi-risk assessments and socio-economic cost-benefit analysis of risk reduction actions at all level; incorporate these methods into decision-making processes at regional, national and local levels”* and to *“Strengthen the technical and scientific capacity to develop and apply methodologies, studies and models to assess vulnerabilities to and the impact of geological, weather, water and climate-related hazards, including the improvement of regional monitoring capacities and assessments”* (HYOGO FRAMEWORK FOR ACTION).

European research networks

The aim of the **European Science Foundation (ESF)** is to promote science and research and support collaboration on basic research dealing with issues in the areas of science policy, to facilitate scientific exchange and encourage the free circulation of information and ideas. The ESF unites networks of researchers and a number of research programmes in numerous areas in the natural and social sciences (see website: <http://www.esf.org>).

The Swiss National Science Foundation has also established research programmes at international level with the aims of promoting in a targeted way the implementation of scientific research in the regions affected by natural disasters and of supporting scientific cooperation between these regions of the world and Switzerland. For example, it implements the SCOPES programme (Scientific Co-operation between Eastern Europe and Switzerland) in collaboration with the SDC and DFA (see website: www.snf.ch).

Initiatives launched at Swiss level

This trend can also be observed at Swiss level and it is particularly observable in the creation of networks of knowledge and skills. Thus, for example, an important global network came into being through an initiative led by the Board of the Federal Institutes of Technology (ETH), i.e. the "World Institute for Disaster Risk Management" (DRM). As part of this initiative, two major networks have been established and are managed by the Board of the Federal Institutes of Technology; the first concerns natural hazards (**CENAT**) whereas the second involves technological risks (**KOVERS**). The Federal Institutes of Technology benefit from a long tradition in research, teaching and services associated with natural hazards.

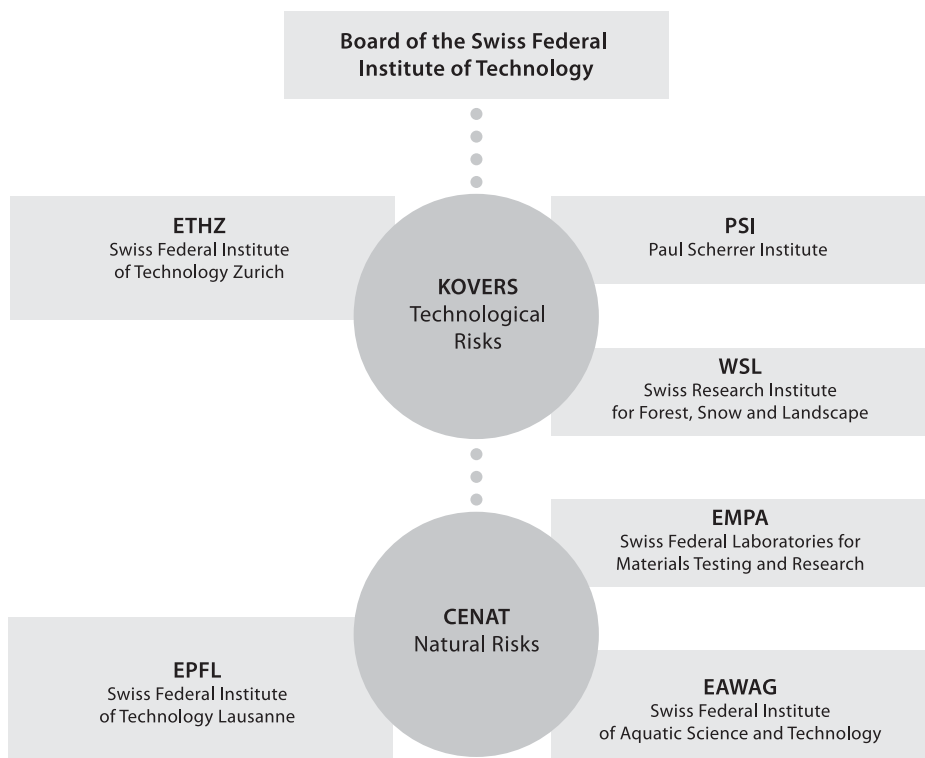
CENAT is a competence centre which was established in 1996 with the aim of bringing together the areas of the natural, engineering and socio-economic sciences that deal with natural hazards within the Swiss Federal Institutes of Technology. Some of the Swiss universities also became associate members of CENAT from 2001.

CENAT aims to promote interdisciplinary research in the area of natural hazards. The centre supports the initialisation, establishment and use of installations, test zones and shared laboratories. It provides a platform for the exchange of information and develops methods and tools for integrated risk management with a view to sustainable development. It also acts as a reference point for schools, the authorities, associations, the private sector and the general public on questions concerning natural hazards. It is also active in the area of

interdisciplinary teaching on natural hazards and participates in particular in the Federal Institutes of Technology further training course “Risiko und Sicherheit technischer Systeme” (“Risks and Safety of Technical Systems”).

In terms of structure, CENAT comprises a Board composed of a President, a Co-ordinator and representatives of the Swiss Federal Institute of Technology Zurich, the Swiss Federal Institute of Technology Lausanne and the universities. CENAT’s members constitute around twenty active researchers representing the main disciplines involved in the area of natural hazards. They come from the two Federal Institutes of Technology, the Swiss Research Institute for Forest, Snow and Landscape (WSL), the Swiss Federal Institute for Snow and Avalanche Research in Davos (ENA) and the Swiss universities. Furthermore, the CENAT network consists of numerous partner institutions at the level of the institutes of technology, the universities, federal authorities and other organisations. The partner at the level of the institutes of technology are: EAWAG, EMPA, Paul Scherrer Institute, Institute of Terrestrial

FIGURE 7: The prevention networks of the Board of the Swiss Federal Institutes of Technology. Source: DRM (www.drmonline.net)



Ecology (ETHZ). At university level, they include: the Institute of Geography (University of Bern), the Department of Geography (University of Zurich), the Institute of Geography (University of Lausanne), the Institute of Geology and Department of Geography (University of Fribourg). In addition to the academic sector, the Federal Office of the Environment (FOEN) is also a member of CENAT as are numerous other organisations including, the National Platform for Natural Hazards (PLANAT), the AGN – Arbeitsgruppe Geologie und Naturgefahren (working group on geology and natural hazards), FAN (Experts Natural Hazards Switzerland), MeteoSwiss, ProClim (Forum for Climate and Global Change) (University of Bern) and the SAS Geosciences Forum (ETH).³⁴

Within the CENAT framework, the Swiss institutions have access to numerous competences in the area of disaster prevention and risk management (i.e. the two institutes of technology, the other institutions of the Board of the Swiss Institutes of Technology or, again, the Swiss universities).³⁵ Among the scientific institutions which come under the Board of the Swiss Institutes of Technology some are particularly active in the area of disaster prevention. These include, in particular:

- The Swiss Research Institute for Forest, Snow and Landscape (WSL) which is based in Birmensdorf and Davos. WSL aims to develop through its research activities suitable strategies and technologies for the sustainable development of Swiss land and for the improvement of natural risk management.
- Swiss Federal Institute for Snow and Avalanche Research in Davos (ENA), which is based in Davos and is part of WSL.

Finally, we should also note the initiative of the Swiss Federal Institute of Technology Zurich (ETHZ) which unites in a network, i.e. HazNETH,³⁶ all of the institute's expertise relating to natural hazards, i.e. 14 sections and 5 departments.

³⁴ See internet website: <http://www.cenat.ch>.

³⁵ See also TABLE 1.

³⁶ See internet website: <http://www.hazneth.ethz.ch> and TABLE 1.

National strategy at the level of research programmes

The Swiss National Science Foundation runs several national research programmes. This research is characterised by objectives and topics which have been defined in a political frame. The programmes are limited in duration. They are interdisciplinary in nature and involve collaboration with partners originating from outside the academic milieu. At present it has three types of research programme:

- **National Research Programmes (NRP)**

NRP 31 "Climatic Changes and Natural Hazards" was completed in 1997. This programme pioneered the taking into account of the effects of climate on natural hazards. An important series of reports was published.³⁷

NRP 48 which concerns the topic of "Landscapes and Habitats of the Alps", is currently being carried out and also touches on the area of risk (<http://www.pnr48.ch/>).

- **Priority Programmes (PP)**

For example, the PP on biotechnology (see http://www.snf.ch/SPPBiotech/Home_e.html) or that on environment (completed in 2002).

- **National Centres of Competence in Research (NCCR)³⁸**

In their contribution to environmental research, the following National Centres of Competence in Research (NCCR) are directly related to the issue of disaster prevention:

- NCCR "Climate Variability, Predictability and Climate Risks": the main aim of this NCCR is to acquire better understanding of climate system processes, variability and predictability, and the complex inter-relationships of climate, economic and societal driving factors. (http://www.snf.ch/fr/rep/nat/nat_ccr_wanner.asp)
- The NCCR "North-South: Research Partnerships for Mitigation Syndromes of Global Change" aims to improve the understanding of the repercussions of global change, the causes of the negative syndromes triggered in the different regions and cultures and the different geographical and economic contexts and to evaluate in detail the potential reactions of societies and population groups. In order to find concrete ways of alleviating the problems arising from global change, the NCCR is exploring, inter alia, the potential of social systems in relation to innovation and conflict resolution. Moreover, it aims to contribute to the improvement of cooperation between Swiss research institutions and those of developing and transition countries. (http://www.snf.ch/fr/rep/nat/nat_ccr_hurni.asp)

³⁷ See: http://www.snf.ch/fr/rep/nat/nat_nrp_31.asp

³⁸ See: http://www.snf.ch/fr/rep/nat/nat_ccr.asp

Strategies adopted within the Federal Offices

In the area of the environment, the former Swiss Federal Office of the Environment, Forests and Landscape (SAEFL)³⁹ formulated its new “Masterplan for Environmental Research 2004–07” in 2003 (OFEFP, 2003). It defined the priority topics for activities in the area of environmental research for the years to come and the development of the strategy for the implementation of research priorities. The four categories of priority topics identified in the master plan include the risks associated with pollutants, the problem of climate change and the question of risk and society. This Masterplan for Environmental Research acts as a basis for the granting of loans by the relevant authorities. It also defines the future direction of environmental research in Switzerland

Prevention in relation to industrial or technological disasters

Apart from the prevention of natural hazards, the Council of the Swiss Federal Institutes of Technology launched the initiative of the KOVERS network and centre of competence in the area of technological risks (FIGURE 7),⁴⁰ which is interested, in particular, in the analysis of the technological risks associated with industrial processes, warehousing/storage and transport. Its aim is to improve the coordination of research and to model the risks and scenarios. Thus, it has developed a number of methodological tools which support decision-making and multicriteria analyses, in particular with the help of Geographical Information Systems (GIS).

More recently, a new organization entitled the “International Risk Governance Council” (IRGC)⁴¹ was established in Geneva in June 2003. The IRGC is an independent organization which constitutes a “platform for global risk management”. It is particularly interested in the risks associated with new technologies. Its aim is to develop strategies with a view to the identification and control of such risks. In an international context which is undergoing significant change, the IRGC sets itself the task of detecting as quickly as possible the risks associated with new technologies and of adapting the tools available for the analysis and management of risks to new situations. An international circle of individuals from different areas of science, politics and business has been consulted as part of this process. The organization's inaugural conference took place in June 2004 in Geneva.

³⁹ Became the Federal Office of the Environment (FOEN) in January 2006

⁴⁰ http://www.kovers.ethz.ch/First_site.htm

⁴¹ <http://www.irgc.org>

The prevention of human disasters or disasters arising from conflict

Also worthy of mention is the fact that an increasing number of institutions are becoming interested in the prevention of so-called human disasters, i.e. in particular – armed and unarmed – conflict, be they of an ethnic, religious or other origin (HOFFMANN, 2000). The culture of peace has become a paradigm to which the majority of international organisations and national cooperatives now subscribe. For example, the Swiss Peace Foundation is an institute of research on peace with a particular emphasis on practice. Its areas of activity are the civil promotion of peace, the scientific analysis of violent conflict and the promotion of peace policy at national and international level. Swiss Peace is also responsible for one of the individual projects (IP7⁴²) of the “North-South” NCCR on the topic of “environmental change and the transformation of conflict”. For its part, the ETHZ has created a centre specialised in security issues, i.e. the “Centre for Security Studies”.⁴³ This centre carries out research in three different sectors: international security policy, Swiss security policy and research on conflict.

⁴² Individual Project

⁴³ The Centre was established in 1986; apart from research it also provides teaching.
See internet website: http://www.css.ethz.ch/about/index_EN

VII. Scientific skills and expertise within the Swiss universities and third-level institutions

This chapter presents the main skills and expertise available within Swiss scientific institutions in the areas associated with the management of natural hazards and major risks.

TABLE 1 presents the main Swiss universities, institutes of technology and scientific institutions with their respective areas of expertise.

The remaining tables present a synthesis of these skills and expertise based on areas of activity:

TABLE 2: Expertise in the area of teaching

TABLE 3: Expertise in the area of research

(only available on the following website: <http://www.planat.ch> > **Services** > **Publications**)

Each of the tables contain references which refer to detailed data sheets on the institutions in questions and their research units. These data sheets specify the areas of specialisation, the types of disasters involved; they present the main activities carried out in the areas of research, teaching and consulting; they also provide practical information (contact information for the human resources, internet addresses, references, bibliographies). All of these data sheets as well as the tables will be completed and updated regularly and can be consulted on the following website:

<http://www.planat.ch> > **Services** > **Publications**

TABLE 1⁴⁴: Profile of the main Swiss universities, institutes of technology and scientific institutions with their respective areas of expertise

Institutions	Competences	Units involved	Website	Refer to data sheet ⁴⁴
A. Swiss universities				
University of Basel	Urban social geography: impact of natural disaster on livelihood and relief	Faculty of Science: Department of Environmental Science : Institute of Geography: - Human Geography / Physic Geography Institute of Protection of Environment, Nature and Landscape (NLU) Institute of Meteorology, Climatology and Remote Sensing (MCR) Institute of Environmental Geosciences	www.unibas.ch www.humgeo.unibas.ch	H 1
University of Bern	Geomorphology, hydrology, meteorology, soil sciences, natural hazards Social geography Thematic, topographic and rapid mapping services Local disaster risk management	Faculty of Science: Institute of Geography: - Physical Geography - Climatology and Meteorology - Applied Geomorphology and Natural Hazards - Hydrology - Remote Sensing - Social Geography - Soil Science - Centre for Development and Environment (CDE)	www.giub.unibe.ch www.cde.unibe.ch	G 1, 2
University of Fribourg	Climate, climate change, climate impacts	Faculty of Science: Department of Geosciences	www.unifr.ch www.unifr.ch/geoscience/	C 1
University of Geneva	Prevention and mitigation of natural disasters Geological disasters Volcanic eruptions, earthquakes Analysis of anthropogenic hazards (waste management,...)	Faculty of Science: Section of Geosciences and Environment Centre d'étude des risques géologiques (CERG) (Center of geological risks studies) Institut Forel	www.unige.ch www.unige.ch/hazards	D 1
University of Lausanne	Analysis of natural hazards (causes, processes, risks)	Faculty of Earth Science and Environment: - Institute of Geomatics and Risk Analysis (IGAR) - Institute of Geography (IGUL) - Institute of Geology and Paleontology (IGP) - Institute of Geophysics (IG) - Institute for Land Management Policy and the Human Environment (IPTEH)	www.unil.ch www.unil/igar	B 1
University of Zurich	High-mountain, climate-change impacts, glacier and permafrost hazards	Faculty of Science: Department of Geography: - Glaciology and Geomorphodynamics Group	www.unizh.ch www.geo.unizh.ch	F 1

⁴⁴ The tables as well as the data sheets will be completed and updated regularly and can be consulted on the following website: <http://www.planat.ch> > Services > Publications

Institutions	Competences	Units involved	Website	Refer to data sheet
B. Universities of applied sciences				
University of Applied Sciences, Rapperswil	Coping with risks due to both natural hazards and offending against sustainability in the context with infrastructures and landscape	Faculty of Civil Engineering; Institute of "Bau und Umwelt", with its sections: - Geotechnical Engineering - Hydraulical Engineering - Environmental Engineering - Structural Engineering	www.bau.hsr.ch	
Swiss College of Agriculture, Zollikofen	Mountain forests and natural hazards		www.shl.bfh.ch/	
University of Applied Sciences, Wädenswil	Natural resources sciences	Centre of expertise for Life Sciences and Facility Management	http://hsw.ch/english	
University of Applied Sciences, Winterthur	Civil engineering, hydraulics	School of architecture, design and civil engineering	www.zhwin.ch/en/index.php	

Institutions	Competences	Units involved	Website	Refer to data sheet
D. Scientific institutions of Swiss Federal Institute of Technology domain				
EAWAG: Swiss Federal Institute for Environmental Science and Technology	Water, chemical pollutants, environmental engineering, environmental microbiology, env. toxicology		www.eawag.ch	
EMPA: Structural Engineering Research Laboratory	Air pollution, environmental technology	Advanced material and surfaces Materials and systems for civil engineering Protection and wellbeing of the body Information, reliability and simulation technology Mobility and environment	www.empa.ch	
PSI: Paul Scherrer Institute	Nuclear energy and safety, life sciences, nanotechnology		www.psi.ch	
WSL: Swiss Federal Institute for Forest, Snow and Landscape Research	Hydrology, geomorphology, landslides, bed load transport, snow physics, process initiation debris flows, avalanche dynamics, rock fall Avalanche warning, risk management Counter measures, protection forest, land use planning Forest management	Research Units: Mountain hydrology and torrents Snow and permafrost Avalanches, debris flows and rock fall Warning and prevention Economic and social sciences Soil science Ecosystem boundaries Swiss Federal Institute for Snow and Avalanche Research (SLF)	www.wsl.ch www.slf.ch	K 1 I 1 - 3
E. Other scientific institutions				
KOHS: Flood Protection Commission of the Swiss Association of Water Management	Hydrology, flood protection		www.swv.ch	
AGN-DNG: Working Group on Geology and Natural Hazards	Geology	GSGI : Groupement suisse de la géologie de l'ingénieur (Swiss Experts on engineering geology)	www.planat.ch www.sfig-gsgi.ch	
FAN: Experts Natural Hazards Switzerland	Natural hazards, forest		www.fan-info.ch	

TABLE 2⁴⁵: Expertise in the area of teaching

Discipline	Institutions, addresses	Degree					Courses recommended	refer to data sheet ⁴⁵
		Bachelor	Master	MAS	Doctoral	Others		
Natural disasters and risks	NAHRIS, Swiss virtual campus (the project is coordinated by CENAT) www.nahris.ch						<ul style="list-style-type: none"> • “Dealing with Natural Hazards and Risks”, interdisciplinary online course. In cooperation with EPFL, ETHZ, UNIFR, UNIBE, UNIZH, WSL, SLF 	E 2
Climate	University of Fribourg, Faculty of Science www.unifr.ch/geosciences/geographie/Teaching/teachf.html	•	•		•		Academic courses in: - Earth science - Geography Master “Global change and sustainability”	C 1
Environmental Sciences, Geology, Earth sciences, Hydrology	EPFL, Faculty ENAC http://enac.epfl.ch/ http://water-eng-mas.epfl.ch/index.htm	•	•		•		Academic courses in: - Environmental sciences and engineering EPFL, - Civil engineering EPFL MAS in water resources management and engineering, hydrology and hydraulic schemes specialisations	A 2–7
	ELSTE: Ecole lémanique des Sciences de la Terre et de l’environnement (School of Earth and environmental Sciences) (UNIGE-UNIL)		•				Master of geology Master of geological engineering	B 1 D 1
	University of Geneva, Faculty of Science www.unige.ch/sciences/terre Centre d’étude des risques géologiques (CERG) www.unige.ch/hazards	•	•		•		Academic courses in Earth Sciences (Master ELSTE of geology and geological engineering) <ul style="list-style-type: none"> • Additional certificate for studies and management of geological risks (CERG) 	D 1
	University of Lausanne, Faculty of Earth Science and Environment www.unil.ch/gse	•	•		•		Academic courses in geology, geography (human and physical) and environment (human and physical) (Master ELSTE of geology and geological engineering)	B 1
	ETHZ Department of Earth Sciences (ERDW) Department of Environmental Sciences (UWIS) Department of Civil, Environmental and Geomatic Engineering (BAUG) www.ethz.ch/education/courses/index_EN	•	•		•		Bachelor and Master Courses in: - Earth Sciences - Environmental Sciences - Environmental Engineering - Civil Engineering	E 1–8
	University of Basel www.unibas.ch	•	•		•			H 1

⁴⁵ The tables as well as the data sheets will be completed and updated regularly and can be consulted on the following website: <http://www.planat.ch> > Services > Publications

Discipline	Institutions, addresses	Degree					Courses recommended	refer to data sheet
		Bachelor	Master	MAS	Doctoral	Others		
Environmental Sciences, Geology, Earth sciences, Hydrology	University of Zurich, Faculty of Science, Department of Geography	•	•		•		Bachelor and Master Courses in geography	F 1
	Swiss College of Agriculture, Zollikofen www.shl.bfh.ch/	•					Bachelor Courses in Forestry	
	University of Applied Sciences, Wädenswil http://hsw.ch/english/	•					Bachelor Courses in Natural resources sciences	
	University of Applied Sciences, Winterthur	•					Bachelor course in Civil Engineering	
	University of Bern Institute of Geography www.giub.unibe.ch	•	•		•		Bachelor and Master courses in Geography	G 1,2
	University of Applied Sciences, Rapperswil (HSR) www.bau.hsr.ch	•	•				<ul style="list-style-type: none"> Bachelor and Master (planned) courses in: <ul style="list-style-type: none"> Civil engineering, covering <ul style="list-style-type: none"> Earth Sciences Environmental sciences Hydraulics Triple Risk Management 	
Geoinformation, GIS	University of Bern Institute of Geography, Centre for Development and Environment (CDE)					•	Training on request basis	G 1
	EPFL, ENAC, LASIG					•	Continuing training in geoinformation, processing of numeric models of altitude and of remote sensing image on request of professional associations	A 8
	ETHZ, Institute of Cartography					•	“Vom GIS Daten zur Interaktiven Web-Karten”, NAHRIS “Dealing with Natural Hazards and Risk”	E 2
Security policy, risk management	ETHZ Center for Security Studies (CSS) www.zfw.ethz.ch/services/master Group Risk and Safety			•		•	<ul style="list-style-type: none"> MAS in: <ul style="list-style-type: none"> Master of Advanced Studies in Security Policy and Crisis Management (MAS-SPCM) E-learning course: The International Relations and Security network (ISN) Basis Statistics & Probability Theory Risk and Safety (in Civil, Surveying and Environmental Engineering) 	E 4–5

TABLE 3⁴⁶: Expertise in the area of research

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet ⁴⁶
Risk management, risk assessment of natural hazards	Earthquake, Rockfall, Tsunami, Drought	ETHZ, Institute of Structural Engineering (IBK), Group Risk and Safety, Wolfand-Paulistr. 15, 8093 Zurich	Risk Management and Risk Assessment of Natural Hazards (Alpine Valley), Risk-Based Decision Making, Decision Theory, Structural Reliability, Sustainability, Risk Based Inspection Planning, Spatial Variability of Concrete Structures, Design of Timber Structures, Risk and Acceptance Criteria for Infrastructure Facilities	E4
Climat, changements et impacts climatiques	Extrêmes climatiques, vagues de chaleur et de froid, tempêtes de vent, pluies extrêmes, sécheresse, grêle	Université de Fribourg, Département de Géosciences, ch. du Musée 4, 1700 Fribourg Prof. Martin Beniston	Recherches sur les extrêmes climatiques et leur évolution dans le courant du 20 ^e siècle, par le biais de l'observation ; et sur l'évolution de ces mêmes extrêmes au 21 ^e siècle dans un climat influencé par l'augmentation des gaz à effet de serre dans l'atmosphère, par le biais de la simulation numérique.	C1
Atmospheric Dynamics, Weather Prediction, Climate Variability	Severe Weather Events	ETH Zurich, Department of Environmental Sciences (D-UWIS), Institute for Atmospheric & Climate Science Universitätsstrasse 16, 8092 Zürich Huw C. Davies	Diagnostic analysis, predictive skill assessment.	E8
Geological risks	Volcanic eruptions, terrain unstabilities, earthquakes	Université de Genève, Faculté des sciences, sciences de la terre, CERG, 13, rue des Maraichers, 1205 Genève, Prof. Costanza Bonadonna	- Volcanic hazards and risks with specialization in modelization, - Integral "natural" risk management - Unstable terrains - Seismic microzonation	D1
Gravitationally driven rapid mass movements.	Snow avalanches, debris flows, rockfalls and rock slides	SLF, Department Snow Avalanches, Debris Flows and Rockfalls, Flüelastrasse 11, 7260 Davos Dorf Dr. Perry Bartelt	The Research Unit investigates the formation, movement and deposition of these three complex geophysical processes to support the development of sound engineering and economically feasible defense strategies. Snow avalanches, debris flows and rockfalls are rapid, gravitationally driven mass movements that threaten mountain communities in Switzerland and throughout the world.	I2

⁴⁶ The tables as well as the data sheets will be completed and updated regularly and can be consulted on the following website:
<http://www.planat.ch/Services/Publications>

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet
Risques géologiques et hydro-géologiques	Glissements de terrain, Eboulements, coulées boueuses, effondrement de cavités, séismes, pollution des eaux souterraines	EPFL , Laboratoire de géologie de l'ingénieur et de l'environnement (GEOLEP), ENAC, ICARE, station 18, 1015 Lausanne, Prof. Aurèle Parriaux	Hydrogéologie des versants instables. Typologie des matériels géologiques en regard des risques géologiques. Détection de mouvements de terrain par analyse géomorphologique de couvertures laser. Reconnaissances géophysiques sur les glissements de terrain. Les flux passagers free surface des suspensions concentrées - Application aux Flux géophysiques. Méthodologie de cartographie systématique du micro zonage sismique. Détection avancée de pollution des eaux souterraines au moyen des traces chimiques. Infiltration des eaux de ruissellement des routes	A4
Hydrological modelling, soil physics, soil mechanics, protective measures against slope instabilities and bedload transport	floods, landslides, bedload redistributions	Swiss Federal Research Institute WSL, Research Unit Mountain Hydrology and Torrents Zürcherstrasse 111, 8903 Birmensdorf, Switzerland Manfred Stähli	The Research Unit investigates hydrologic processes in mountainous catchments and related processes resulting in floods, erosion, slope instabilities and sediment transport. Further, it examines impacts and needs with regard to protective measures. The unit studies the generation and propagation of surface and subsurface runoff, surface erosion, shallow landslides, sediments and woody debris as well as the interaction of these processes. A particular focus of the unit is on snow hydrology. Process studies on the scale of channels and catchments also form the basis for the development of simulation models and of hazard assessment procedures and for the design of countermeasures, including investigating the protective function of various vegetation covers (eco-engineering). Damage and damaging processes due to frequent and extreme events are assessed as prerequisites for the risk-based and sustainable management of natural hazards.	K1
Climate Dynamics, Hydrology, Applied geomorphology, North-South issues	Hydrometeorological and geological (gravitational) disasters	University of Berne , Institute of Geography, Hallerstrasse 12, 3012 Berne Prof. Dr. H. Wanner, Prof. Dr. M. Grosjean, Dr. J. Luterbacher Prof. Dr. Ch. Pfister Prof. Dr. R. Weingartner Prof. Dr. P. Germann Prof. Dr. H. Kienholz Prof. Dr. H. Hurni	<ul style="list-style-type: none"> - Climate Dynamics (variability and trend analysis of Alpine precipitation, paleoclimate variability and extreme events, flood frequency analysis and public risk management in a historical perspective) - Hydrology (Methods and models for flood estimation) - Applied geomorphology (natural hazard and risk assessment, risk perception and appraisal) - North-South issues (syndromes of global change, pressures on different resources (human, natural, economic), and of the responses of different social groups and society as a whole. 	G2
Analyse et gestion des risques	Catastrophes industrielles (technologiques) et naturelles.	EPFL , Faculté ENAC (Environnement Naturel, Architectural et Construit), Laboratoire de Systemes Energétiques (LASEN) Station 18, Ecublens, 1015 Lausanne Dr. Pierre-André Haldi	Analyse des modes de défaillances et de leurs effets. Méthode du diagramme de succès. Arbre des causes. Arbre des événements. Méthode de l'espace des états. Réseaux de Petri.	A10

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet
Engineering Geology	Landslides, rock fall, earthquake-induced slope failures	ETH Zurich, Geological Institute, Wolfgang-Pauli Str.15 8093 Zurich Prof. Simon Loew	Geomechanical and geohydraulic processes in near-surface environments <ul style="list-style-type: none"> - Underground constructions and hydromechanical processes in fractured rocks - Hydraulic and hydrochemical processes in regional groundwater systems - Geological hazards (mainly rock slope failure mechanisms) - Earth stresses in technical systems 	E1
Glaciology, Geomorpho-dynamic	Climate-change impacts, high mountains, glacier and permafrost hazards	University of Zurich, Department of Geo-graphy, Glaciology and Geomorpho-dynamics Group. Winterthurerstr. 190, 8057 Zurich. Prof. Wilfried Haerberli	Natural hazards: glacial, geological, geomorphic, hydrometeorological, in cold mountain areas. High-mountain monitoring and modeling methods, application of research in practice	F1
Snow, Snow avalanches, Formation of alpine natural hazards, Snow climatology, Permafrost	Snow avalanches, Debris flows, Floods, Slope instabilities, Permafrost degradation	SLF, Research Unit Snow and Permafrost Fluelastr. 11, 7260 Davos Dorf	This Research Unit investigates the physical properties of snow, soil and permafrost and the surface exchange with the atmosphere in order to understand: a) the formation of natural hazards such as avalanches, floods and slope instabilities; and b) the interaction of the cryosphere with climate change. Modelling, measuring snow microstructure, fluid dynamics, wind tunnel technology, monitoring of weather and snow, slope stability evaluation, statistics, hazard prediction, climate assessment, engineering in permafrost, GRID technology	I3
Triple Risk Management, optimizing sustainability of infra-structures & landscape	Hazards, Chances, Monetization, Valuediscussion, TripleBudgetierung	HSR / University of Applied Sciences, Rapperswil, Institut "Bau und Umwelt", Oberseestrasse 10, 8640 Rapperswil Prof. Speerli, Hardegger, Schiegg	The sustainability focussed method of TripelBudgetierung [®] generates the maximum durable return on investments (ROI), based on the monetarized risks (hazards and chances) from i) economic, ii) ecologic and iii) social point of view and not only applied to infrastructures. A systemic approach is necessary for representative solutions.	
Mécanique des sols	Glissements de terrain, modélisation, auscultation, risques	EPFL, Laboratoire de mécanique des sols (LMS), ENAC, ICARE, station 18, 1015 Lausanne Prof. Laurent Vulliet	Modélisation géomécanique. Mesures des mouvements en continu.	A5
Mécanique des roches	Instabilités rocheuses. Propagation. Zonage du danger. Mesures de protection	EPFL, Laboratoire de mécanique des roches (LMR), ENAC, ICARE, station 18, 1015 Lausanne Prof. Zhao Jian	Modélisation physique et numérique de la propagation.	A5

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet
Hydrologie, gestion et ingénierie des ressources en eau, physique du sol , contamination des eaux souterraines	Inondations, érosion, salinisation des sols, pollution des sols et des eaux souterraines, impacts des changements climatiques	EPFL , Laboratoire d'Hydrologie et Aménagements (HYDRAM), ENAC, ISTE, GR-C1, station 2, 1015 Lausanne Prof. André Mermoud	L'HYDRAM vise, à travers ses activités de recherche, d'enseignement et d'expertise, à relever de nouveaux défis au niveau scientifique et sociétal dans le domaine des eaux et des aménagements par: la gestion durable des hydrosystèmes naturels et anthropisés ; la gestion des ressources hydriques ; l'étude prospective des impacts des changements potentiels globaux d'ordre physique, sociétal et environnemental.	A6
Constructions hydrauliques	Inondations, aménagements des cours d'eau, prévision et simulation des crues.	EPFL , Laboratoire de constructions hydrauliques (LCH), ENAC, ICARE, GC A3 504, station 18, 1015 Lausanne Prof. Anton Schleiss	Simulation des crues extrêmes, prévision des crues	A3
Water related hazards	Floods	ETHZ , Dept. of Civil, Environmental and Geomatic Engineering (BAUG), Laboratory of Hydraulics, Hydrology and Glaciology (VAW) Gloriastrasse 37/39, ETH-Zentrum, VAW E31, 8092 Zürich Prof. Dr..H. E. Minor Prof. Dr. W. Hager Dr. R. Weichert	Bed erosion, lateral erosion, steep open channels, sediment deposit, drift wood, impulse waves, bridge pier scour, modelling flood inundations.	E6
Geotechnical Engineering , geotechnical aspects of natural hazards	Landslides, rock-fall, rock avalanches, debris flows, mitigation of earthquake damage, effects of flooding and extreme rainfall on geo-structures	ETHZ, Institute for Geotechnical Engineering , Department for Civil, Environmental & Geomatic Engineering, Wolfgang Pauli Str. 15, Höggerberg, 8093 Zürich Prof. Sarah Springman	Soil structure interaction; flood protection measures, geotechnical earthquake engineering Physical, analytical & numerical modelling, laboratory testing, geotechnical centrifuge modelling & testing, application of complex soil models, advanced field testing including in alpine environments etc.	E3
Seismic assessment and retrofitting of existing structures.	Earthquake, wind	EMPA, Structural Engineering Research Laboratory , Ueberlandstrasse 129, 8600 Dübendorf	Application of advanced materials and technologies for repair and seismic upgrading of existing structures. Development of wireless sensor networks and smart seismic accelerometers for structural health monitoring . Ability to conduct large scale static and dynamic laboratory as well as field tests.	J1
Mécanique des fluides , rhéologie, Hydraulique Hydrologie statistique	Avalanches, crues torrentielles	EPFL, Laboratoire d'Hydraulique Environnementale (LHE) , ENAC, ICARE, Station 18, Ecublens, 1015 Lausanne. Prof. Christophe Ancey	Etude des écoulements rapides sur forte pente : physique des écoulements en masse (de type avalanche) et des écoulements biphasiques (transport de sédiments dans les cours d'eau). Travaux théoriques, au labo (expériences), et numériques	A2

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet
Forecast and warning Systems, Natural hazard protection systems	Avalanches, Small catchment hydrological hazards	SLF, Research Unit Warning and Prevention, Flüelastrasse 11, 7260 Davos	Operational forecast and warning systems, Forecast models, Snowcover modelling, Risk analysis and evaluation methods, Observation and measurement networks, Training and education	I1
Géomatique, SIG, analyse et modélisation des dangers naturels	Mouvements de versants, laves torrentielles, inondations, tremblements de terre, phénomènes météorologiques extrêmes.	Université de Lausanne, Institut de Géomatique et d'Analyse du Risque (IGAR), Fac. des géosciences et de l'environnement, Amphipôle 1015 Lausanne Prof. Michel Jaboyedoff	Le groupe d'analyse du risque de l'IGAR est principalement orienté vers l'étude des risques naturels et environnementaux notamment sous l'angle de la morphodynamique et plus particulièrement la quantification des phénomènes de dégradation, d'altération et de démantèlement de la chaîne alpine ainsi que des dangers générés par ces phénomènes. Description de dangers naturels par méthodes informatiques. Description physique, géométrique et spatial des phénomènes de danger naturel	B1
Géomatique, navigation	Catastrophes qui affectent le relief du terrain ou la couverture du sol	EPFL, Laboratoire de topométrie (TOPO), ENAC, INTER, station 18, 1015 Lausanne Prof. Bertrand Merminod	Positionnement satellitaire, navigation d'inertie, géo référence directe	A7
SIG, création et exploitation, traitements d'image	Outil de gestion pour tout type de catastrophe	EPFL, Laboratoire de systèmes d'information géographique (LASIG), ENAC, INTER, station 18, 1015 Lausanne Prof. François Golay	SIG : modélisation spatiale du territoire, technologie de l'information, analyse spatiale. Traitement d'image de télédétection satellitaires et aériennes. Interaction Homme-Machine pour les applications Web	A8
Geodesy , Geodynamics, Satellite-Geodesy, GPS Meteorology, Navigation	Hydrometeorological, geological, tectonic	ETH Zurich, Department of Civil, Environmental and Geomatic Engineering (BAUG), Institute of Geodesy and Photogrammetry, Geodesy and Geodynamics Lab ETH Zürich, Schafmattstr. 34, 8093 Zürich Prof. Dr. H.-G. Kahle, Dr. Beat Bürki, Prof. Dr. Alain Geiger	Geodetic approaches, geodetic measurements and monitoring, modelling and system identification, data analyses, deformation modelling, GPS-tomography, spectrometry for atmospheric water vapour determination, precision navigation.	E7
Visual analysis and visualisation of hazards	Natural hazard and risk visualisation and analysis, information systems	ETH Zurich, Institute of Cartography, Wolfgang-Pauli-Str. 15, 8093 Zurich, Prof. Lorenz Hurni	Geo-spatial hazard and risk information systems	E2

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet
Fluides surcritiques comme alternatives aux solvants dangereux. Détermination des stratégies adaptées aux risques de laboratoires jusqu'aux tailles industrielles	Catastrophes technologiques, chimiques, physiques, procédés industriels	EPFL, Faculté des Sciences de base : - Institut des Sciences et Ingénierie Chimiques / Groupe des procédés macromoléculaires - Service de sécurité et santé au travail (SB-SST) Station 6, 1015 Lausanne MER Dr. Th. Meyer	Le service de sécurité et santé au travail développe des concepts et méthodologies de réduction des risques au niveau du laboratoire pouvant être exportés aux dimensions industrielles dans le domaine de la chimie et de la physique. Procédés chimiques, procédés utilisant des radiations non-ionisantes ou ionisantes, processus sous hautes-pressions, développement de procédés intrinsèquement sûrs, analyses de risques.	A9
Political risks and threats Technological disasters (infrastructures)	Critical infrastructure protection. Political violence movements. Terrorism. Risk analysis. Methodology. ABC proliferation. Crisis management.	ETH Zurich, Centre for Security Studies (CSS), SEI, Seilergraben 45-49, 8092 Zürich Prof. Andreas Wenger,	The Comprehensive Risk Analysis and Management Network (CRN), run by the Center for Security Studies, conducts theoretical research on risk prevention and preparedness and aims to create and generate knowledge in the fields of risk analysis, vulnerability analysis, crisis management, and critical infrastructure protection (CIP) vulnerabilities and consequences	E5
Technological risk assessment	New technologies: (ICT, nanotechnology, new energy systems, converging Technologies.	EMPA, Technology and Society Lab, Lerchenfeldstr. 5 9014 St-Gallen	Qualitative risk assessment, Life Cycle Assessment, Socio-Economic Modeling.	J2
Technical / industrial risks	Critical infrastructure system failures. Electronic, telecommunication	EMPA / Electronics, metrology, Reliability Lab, Ueberlandstr. 129, Duebendorf	Microelectronic and optical components and systems, telecommunication networks, interconnection technologies, power electronics, nanoelectronics, -photonics, and – systems : Reliability, risk, safety and failure analysis, assessment, modelling, and testing of technical components, systems, networks and infrastructure. Infrastructure monitoring, remote sensing, non-destructive evaluation	J3
Nanotoxicology	Exposition to nanomaterials	EMPA / Lab of Materials – Biology Interactions, Lerchenfeldstr. 5, 9014 St-Gallen	Molecular biology, cell-biology, in vitro toxicology	J4
Social Sciences	Flooding and other natural disasters. New technology	University of Zurich, Department of Psychology, Social psychology, Plattenstrasse 14, 8032 Zurich	Perception of risk. Risk communication. Behaviour and human decision processes.	F2

Research areas	Keywords	Institutes, addresses	Description	refer to data sheet
Human Geography (urban social and economic geography)	Natural disaster. Livelihood affecting risks. Society at risk.	University of Basel. Department of Environmental Sciences. Human Geography / Urban and Regional Studies, Klingelbergstrasse 27, 4056 Basel	GIS-based research: GIS-maps as quasi-cadastral base survey of slums communities. GIS-maps of socio-economic, demographic and environmental factors that determine health and well-being	H1
Ingénierie de crise, gestion de risque, prévention et développement	Prévention des catastrophes hydrométéorologiques	EPFL, VPRI, Cooperation@epfl, Station 10, 1015 Lausanne	Recherche dans le domaine de l'ingénierie de crise et de la prévention des catastrophes hydrométéorologiques. Liens entre prévention et coopération au développement.	A1

Summary

The aim of this chapter was to provide a summary of the situation in 2006 with regard to the wide variety of skills and expertise available in Switzerland in the area of the natural hazard and major risk management. However, these sectors are dynamic and the information about them evolves quickly. Thanks to the regular updating of the data sheets and the tables available on the internet (address: <http://www.planat.ch> > **Services** > **Publications**), it is possible to obtain up-to-date information on the activities carried out by teams of researchers working at the universities, institutes of technology and scientific institutes mentioned in this chapter and on the courses available there.

In terms of the current situation, the following conclusions may be drawn:

Firstly, extensive research is being carried out as part of the battle against natural disasters be it on geological, hydrological risks or in relation to climate change: the research involves all of the stages in the process of integrated risk management:

- On the level of the analysis of risks and hazardous situations through the development of detection and monitoring systems; through the description of these phenomena and the modelling or use of information technology methods such as numerical simulation.
- On the level of actual prevention, with the help of the engineering for the protection of structures and also through the development of zoning systems.
- Finally, during the preparedness phase, through the development of increasingly effective and sensitive warning systems.

Through the strategic directions adopted, national policy on scientific research has give a clear signal in support of the extensive and integrated evaluation of risk. Of course, this is not limited to natural hazards but also targets the major risks associated with technology and, to a lesser extent, those of a conflictual origin.

With regard to technological risks, a wide variety of skills and expertise are available within the institutions of the Boards of the Swiss Federal Institutes of Technology (in particular the two institutes of technology and the EMPA). The challenges associated with the development of new technologies are enormous and based on the principle of precaution, scientists find themselves on the front line and must adopt a proactive role in the battle to reduce risk.

Finally, it would appear that much research is being carried out on a multi-disciplinary basis, on the one hand, and through networks, on the other, thus improving the exchange of information and knowledge. The social and human sciences are also becoming increasingly interested in factors of vulnerability which will play a crucial role in the degree of gravity of the damage associated with disasters. This leads to an integrated understanding of risk management with a more global vision which, in turn, provides significant assistance in decision-making.

VIII. Conclusion

Thanks to the Swiss National Strategy which was established with the help of the national research programmes, the conditions for the launch of new research projects which aim to achieve scientific excellence in the area of disaster prevention are most favourable. These projects are based on multiple partnerships, be they national, European or even inter-continental in origin.

As demonstrated, whether they take the form of research or consultancy, the projects carried out by the various teams of Swiss researchers and partners are numerous; collaboration with the relevant authorities and the private sector is also of primordial importance.

One other key sector remains, i.e. that of education. The first step towards the creation of a culture of prevention starts with the generation of a greater awareness of risk. Education works on all levels here: i.e. informing the general public, raising the awareness of political decision-makers, encouraging the private sector to take responsibility and, most importantly, the generation of scientific expertise. The promotion of young researchers is crucial in this context. Academic courses, be they at bachelors, masters or doctoral level, will offer these young researchers the possibility of becoming involved in turn in the cutting-edge areas of research. The same applies to further education and training through the MAS (Master of Advanced Studies). Moreover, thanks to the development of new information and communications technologies, new options are emerging such as e-learning as provided, for example, by the NAHRIS virtual campus. All of these initiatives have one major asset: that of facilitating access to training not only for Swiss and European researchers but also those from the countries which are more seriously affected by the problem of disasters, i.e. developing countries.

Finally, at international level numerous organisations under the aegis of the United Nations' International Strategy for Disaster Reduction (ISDR) have sections assigned to the battle against disasters. International Geneva, in particular, constitutes an extraordinary breeding ground of skills and expertise which add to those available within the Swiss scientific milieu. Based on their areas of specialisation (emergencies, health, food, climate etc.), these international organisations make it possible to gain a broad perspective on the problem of disaster prevention.

All of these initiatives promote the decompartmentalization of disaster prevention and foster the understanding of the management of risk in a way that is truly integrated and thus subscribe to a strategy of sustainable development. Needless to say, the road to be travelled in the battle for optimum protection against natural hazards and major risks remains a long one, however these initiatives represent encouraging signs of increasing involvement and commitment to ensure a more secure future for the populations of our planet.

Glossary

Crisis	Situation of profound destabilisation generally triggered by a brief and violent event or large-scale failure that exceeds local capacities to overcome it and involves a significant number of unknown quantities with respect to its duration and the hazards it entails, thus necessitating crucial decision-making.
Disaster	Major event, generally unforeseen and sudden in its onset which seriously disrupts the structure and functioning of the affected society, gives rise to human, material and/or environmental loss and/or damage and overwhelms local capacities to remedy it without external assistance.
Hazard	Threatening event, or probability of occurrence of a potentially damaging phenomenon within a given time period and area.
Intervention	All of the immediate measures required to ensure the survival and subsistence of persons affected by a disaster.
Mitigation	Alleviation of the damage associated with a major risk thanks to the implementation of measures intended to reduce either the intensity of the hazard or the vulnerability of the population, material assets or the environment involved.
Preparation	All of the measures intended to predict and remedy the effects of a disaster through the organization of the evacuation of people and material assets while facilitating the operations of the emergency and rehabilitation phases with the aim of minimising the loss of human life and material damage.
Prevention	All of the measures aimed at providing permanent protection against disasters.
Reconstruction	All of the measures undertaken after a period of reconditioning enabling a society to re-establish fully the situation that prevailed prior to the disaster while incorporating new elements of prevention, on the one hand, and modernisation, on the other, and from a perspective of sustainability.
Reconditioning	All of the measures intended to restore the former living conditions of the society affected by a disaster while incorporating adjustments or changes rendered necessary as a result of the disaster.
Resilience	The capacity not only to absorb the shock and damage associated with a disaster or major event, but also to adapt to the new situation.
Risk	Scale and probability of potential damage based on the nature of the hazard, the vulnerabilities arising from it, eventual factors of resilience and all within a given spatial and temporal context.
Vulnerability	Degree of exposure to a hazard and the damage resulting from it based on the capacities of the individual and community exposed to the hazard to cope with it.

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Appendices

Data sheets on the institutions



Vice-Présidence pour les relations internationales (VPRI)

Fiche A.1

Cooperation@epfl
Adresse : Station 10, Ecublens, 1015 Lausanne. Tél. +41 21 – 693 60 12

RECHERCHE

Ingénierie de crise. Gestion des risques et des crises. Prévention des catastrophes hydrométéorologiques.

Types de catastrophes
Catastrophes naturelles, en particulier hydrométéorologiques.

Compétences disciplinaires
Prévention des risques. Gestion de crises. Prévention et coopération au développement.

Description
L'unité Cooperation@epfl a pour objectif d'organiser la coopération scientifique au développement au sein de l'EPFL, que ce soit au niveau de la formation comme de la recherche, et de la valoriser au plan national et international.

Pour y parvenir, l'une de ses activités porte sur le lancement de « projets Ecole », projets de coopération scientifique au développement, interfacultaires et interdisciplinaires, en partenariat avec des institutions scientifiques de pays émergents ou en développement. Ces projets concernent les domaines suivants : la santé, les technologies appropriées pour les villes du Sud, les TIC pour l'environnement, l'énergie, ainsi que l'ingénierie de crise, en particulier la prévention des catastrophes hydrométéorologiques.

Objectifs du « projet Ecole » dans le domaine de l'ingénierie de crise :

- Mise en place d'un centre de compétence international dans le domaine des catastrophes hydro-météorologiques, en particulier les inondations et glissements de terrain.

MAS en prévention des catastrophes hydrométéorologiques (voir ci-dessous)

Personne de référence
Prof. Jean-Claude Bolay, directeur de la Cooperation@epfl, jean-claude@bolay@epfl.ch

Magali Schmid, project leader du projet Ecole « Ingénierie de crise ». magali.schmid@epfl.ch

Ouvrages de référence
Schmid M., Ingénierie de crise : vers une culture du risque et de la prévention, Cahiers de la coopération N°2, EPFL, juillet 2005 (traduction en anglais à paraître)

EPFL, CFRC-Coopération (2001), Actes du séminaire-atelier du 13 décembre 2000 : Ingénierie de crise, quelle ingénierie pour quelle crise ?

Sites internet, liens
- cooperation@epfl.ch

FORMATION

Formation proposée	MAS Développement, technologies et société, en partenariat avec le Groupe EIER-ETSHER, a lieu tous les 2 ans au Burkina Faso. Voir information complémentaire : http://cooperation@epfl.ch
	En projet : MAS sur les catastrophes hydrométéorologiques. Formation proposée en partenariat avec des institutions scientifiques de pays du Sud.

CONSULTING

Dans le domaine de la prévention des catastrophes :
Mandat de la DDC et de PLANAT pour la rédaction de la présente publication.

Faculté ENAC (*Environnement architectural, naturel et construit*)

Institut des Infrastructures, des ressources et de l'environnement (ICARE)

Fiche A.2

Laboratoire d'Hydraulique Environnementale (LHE)

Adresse : Station 18, Ecublens, 1015 Lausanne. Tél. + 41 21 – 693 23 75

RECHERCHE

Hydraulique des cours d'eau : mesure de la turbulence. **Transport solide** : étude des processus physiques.

Écoulements géophysiques (avalanches, laves torrentielles, etc.) : rhéologie, simulations numériques, expériences de laboratoire.

Hydrologie statistique : théorie des valeurs extrêmes en hydrologie de montagne

Types de catastrophes

Avalanches, crues torrentielles (laves torrentielles, crues avec fort transport solide)

Compétences disciplinaires

Mécanique des fluides (mesure, théorie, simulation numérique), rhéologie, hydrologie statistique, mathématiques appliquées

Description

Le LHE est un laboratoire de mécanique des fluides environnementale, dont les recherches visent à une meilleure compréhension des processus hydrauliques dans l'environnement, avec un accent particulier sur les problèmes rencontrés dans les Alpes. L'équipe du Prof. Christophe Ancey s'intéresse aux différentes formes de transport de matériaux dans de l'eau (sous ses différents états) du point de vue rhéologique. De nombreux écoulements générateurs de risques pour les activités humaines sont induits par les écoulements d'eau : les crues des cours d'eau sûr, mais également les laves torrentielles (forme très concentrée de transport de sédiment) et les avalanches. Comme application de ces recherches, il faut citer le développement d'outils de gestion du risque et de planification : zonage des risques, conception des ouvrages de protection, évaluation du comportement sur le long terme des bassins-versants et cours d'eau.

Projets de recherche

Projets nationaux :

- 1) Dynamique des écoulements fortement transitoires - Soutien : VPR (EPFL) – 01.01.04-31.12.2006
- 2) Transient free-surface flows of concentrated suspensions - Support : NSF proposal – 01.04.05-31.12.2007

Real-time avalanche and landslide analysis through sensor networks - Support : MICS – 01.0.1.06-31.12.2008 - Collaboration: Edoardo Charbon (AQUA, EPFL)

Projets européens :

Code de calcul géophysique des écoulements rapides : Soutien : projet avec financement interne (ENAC, LHE) – 01.01.06-31.12.2008 : Avec l'équipe de Richard Iverson et Roger Denlinger (USGS), l'objectif est de développer un code de calcul commun pour simuler des écoulements en masse rapides sur des topographies irrégulières.

Réseau de chercheurs

Réseaux d'échanges et de contact forts (hors EPFL) amenant à une production scientifique ou des manifestations en commun : Suisse : SLF (Perry Bartelt), WSL (Brian McArdell) ; France : Cemagref (Philippe Frey) ; Italie : université de Trente (Luigi Fraccorollo) ; Allemagne : université de Bonn (Michael Griebel) ; Grande Bretagne : université de Manchester (Nicolas Gray) ; Canada : université de Vancouver (Neil Balmforth, Ian Frigaard) ; Etats Unis : USGS (Richard Iverson).

Personne de référence

Prof. Christophe Ancey. Depuis 2004, il est professeur de mécanique des fluides à l'EPFL et dirige le Laboratoire d'Hydraulique Environnementale. Il est éditeur associé de *Water Resources Research*, une des revues clés en hydraulique. Il est membre de la Society of Rheology, de l'American Geophysical Union, du comité éditorial de la revue « Neige et avalanches » publiée par l'Association nationale d'étude de la neige et des avalanches, et de l'International Advisory Committee of the Debris-Flow Hazards Mitigation Society (subcommittee of the American Society of Civil Engineers).

Ouvrages de référence

Ancey, C., *Dynamique des avalanches et gestion du risque*, Presses Polytechniques Universitaires Romandes -- Cemagref editions, Lausanne, 2006.

Sites internet, liens

- 3) <http://lhe.epfl.ch> (site du labo)
<http://www.toraval.fr> (site privé -> consultance en ingénierie des risques)

FORMATION

Formation proposée	Hydrologie statistique (cours « risques hydrologiques et aménagements)
Degré	master 3 et 5° semestre
Description	Introduire aux concepts liés à la gestion des risques naturels, principalement les risques hydrologiques - Donner une vue d'ensemble sur les phénomènes impliqués - Présenter des outils de calcul déterministes et stochastiques pour les calculs de propagation - Développer les stratégies de protection possibles

CONSULTING

Consulting à titre privé en France au sein d'un groupement appelé Toraval (avalanche, hydraulique à forte pente)
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Laboratoire de constructions hydrauliques (LCH)

Adresse : GC A3 504, station 18, Ecublens, 1015 Lausanne. Tél. +41 – 21- 693 23 85

RECHERCHE

Constructions hydrauliques, interaction des écoulements avec le transport solide, modélisation des crues extrêmes, modèles de prévision des crues, modélisation des inondations et des érosions

Types de catastrophes

Hydrométéorologiques: crues, inondations, érosions, laves torrentielles, vagues due au vent

Compétences disciplinaires

Écoulements à surface libre - Modélisation physique et numérique des écoulements et leur interaction avec le transport solide - Simulation des événements extrêmes

Projets de recherche

Projets nationaux :

MINERVE 2003 – 2007 : Projet lancé par le Canton du Valais dont l'objectif est le développement d'un modèle de gestion des crues. Le bassin versant du Rhône à l'amont du lac Léman constitue l'exemple idéal où le potentiel de protection des aménagements hydroélectriques pendant les crues est très important. Le système est constitué de composants qui doivent permettre tout d'abord l'acquisition et l'archivage en temps réel des données hydrologiques et météorologiques provenant des stations de mesure existantes ainsi que des prévisions météorologiques fournies par MétéoSuisse. Ces données alimentent ensuite un modèle hydrologique dont le concept a été développé à l'HYDRAM-EPFL. Recherche financée par le canton du Valais et par l'Office fédéral des eaux et de la géologie (OFEG).

Synergie 2004 – 2007 : Cette recherche s'oriente vers le développement de conceptions innovatrices ainsi que de méthodologies et de stratégies pour l'analyse des synergies qu'offrent les aménagements hydrauliques à buts multiples (production électrique, protection contre les crues, création de biotopes, ...). La démarche envisagée consiste à répertorier l'ensemble des paramètres liés à ces ouvrages, à en analyser et en qualifier leurs interactions réciproques et à les modéliser en un même système. Le Rhône, avec ses importants travaux liés à sa Troisième Correction, servira de base pour les cas d'étude. Ce projet est mené par une équipe multidisciplinaire interne à l'EPFL, formée des Laboratoires de Constructions Hydrauliques, de Gestion des écosystèmes ainsi que de Paysage et Architecture. De plus une étroite collaboration existe d'une part avec les bureaux rivières STUCKY SA et VA TECH Hydro SA, ainsi que d'autre part avec des partenaires financiers, FMV-VS, OFEG, État du Valais et Schweizerischer Wasserversbandsverband.

DIFUSE 2001 – 2006 : Le projet de recherche multidisciplinaire de protection contre les crues DIFUSE (Digues Fusibles et Submersibles) repose sur une collaboration entre des partenaires publics (Office Fédéral des Eaux et de la Géologie (OFEG), Berne; Service des Routes et Cours d'Eau du Canton du Valais (SRCE), Sion), des partenaires industriels (Etablissement Cantonal d'Assurances des Bâtiments (ECAB), Fribourg; Hydronat SA, Vétroz) et quatre laboratoires de recherche. L'objectif de ces instituts de recherche est d'établir des critères de conception pour les fusibles (EIF), d'étudier la stabilité du revêtement des digues submersibles ainsi que l'érosion en pied (EIVD), d'étudier l'influence géométrique (EIG) et les effets d'un débordement latéral sur le transport solide. Ce dernier aspect est traité par le Laboratoire de Constructions Hydrauliques. Recherche financée par la Commission pour la Technologie et l'Innovation (CTI) avec le soutien des partenaires mentionnés ci-dessus.

EROSEE 2002 – 2006 : Erosion des rives et le choix de mesures de protection adaptées. L'objectif de la thèse est d'étudier d'une manière détaillée l'interaction des mesures de protection avec les vagues et d'évaluer leur effet sur le transport de sédiments, grâce à une modélisation physique et numérique. Les résultats expérimentaux serviront au développement des bases utiles au choix et au dimensionnement de mesures protectrices, respectueuses de l'environnement. Recherche financée par la Commission pour la technologie et l'innovation (CTI).

Personne de référence

Prof. Dr. Anton Schleiss. Dr. Jean-Louis Boillat. Dr. Giovanni De Cesare. Dr. Erik Bollaert. Dr. Jérôme Dubois

Ouvrages de référence

Communication no 21 du Laboratoire de constructions hydrauliques, ISSN 1661-1179, Nouveaux développements dans la gestion des crues. Conférence sur la recherche appliquée en relation avec la troisième correction du Rhône. Martigny, jeudi 9 juin 2005
+ Cf bibliographie

Sites internet, liens

<http://lchwww.epfl.ch>

FORMATION

Formation proposée	Master of advanced studies (MAS) en gestion et ingénierie des ressources en eau spécialisation en hydrologie ou en aménagements hydrauliques
Description	<p>Le MAS en Gestion et Ingénierie des ressources en eau offre deux spécialisations:</p> <p>I) Hydrologie : Cette spécialisation met principalement l'accent sur les méthodes actuelles d'estimation, de prévision et de modélisation des crues et des étiages résultant des précipitations, de la fonte des neiges et des glaciers. Les principaux sujets abordés sont la modélisation déterministe et stochastique, les méthodes statistiques en hydrologie, la prévision et les risques hydrologiques, et l'hydrologie nivale et glaciaire.</p> <p>II) Aménagements hydrauliques : Cette spécialisation est orientée vers la maîtrise du cycle de l'eau au travers de l'ingénierie des aménagements hydrauliques dans un souci de développement durable et de respect de l'environnement. Les principaux sujets sont la conception intégrée et l'impact des aménagements hydrauliques, le dimensionnement et la réalisation des aménagements hydrauliques, les aménagements hydroélectriques et les barrages.</p> <p>Des cours communs complètent la formation de chaque spécialisation. Ils traitent, entre autres, de la gestion intégrée des eaux de surface, les aménagements de cours d'eau, la maîtrise des crues, et les systèmes hydrauliques urbains. Les participants sont également initiés aux mesures et au traitement des données, aux bases de données hydrométéorologiques, aux systèmes d'information géographique (SIG) et à l'usage de logiciels statistiques adéquats</p>
Partenaires académiques	Ecole nationale des ponts et chaussées, Paris ; Institut national polytechnique de Grenoble ; Technische Universität München; Université de Liège ; Université d'Innsbruck ; Université du Québec – Institut national de recherche scientifique ; ETH Zürich
Informations pratiques	<p>Exigences requises : Diplôme de master en ingénierie (préférence génie civil), expérience pratique</p> <p>Coûts : 9000 CHF y inclus le travail de master</p> <p>Dates de la formation : Octobre 2007 – Juillet 2009</p> <p>Coordonnées pratiques : http://water-eng-mas.epfl.ch</p>

CONSULTING

<p>Modélisation physique et numérique des événements extrêmes et leur interaction avec les ouvrages, expertises.</p> <p><u>Partenaires</u> : communes, cantons, confédération, sociétés d'électricité</p>

Laboratoire de géologie de l'ingénieur et de l'environnement (GEOLEP)

Adresse : Station 18, Ecublens, 1015 Lausanne. Tél. + 41 21 – 693 23 55

RECHERCHE

Risques géologiques et hydrogéologiques

Types de catastrophes

Eboulements, glissements de terrain, coulées boueuses, effondrement de cavités, séismes, pollution des eaux souterraines

Compétences disciplinaires

Sciences de la Terre

Projets de recherche

Projets nationaux :

Hydrogéologie des versants instables
 Typologie des matériels géologiques en regard des risques géologiques
 Détection de mouvements de terrain par analyse géomorphologique de couvertures laser
 Reconnaissances géophysiques sur les glissements de terrain
 Transient free-surface flows of concentrated suspensions - Application to Geophysical Flows
 Méthodologie de cartographie systématique du microzonage sismique
 Détection avancée de pollution des eaux souterraines au moyen des traces chimiques
 Infiltration des eaux de ruissellement des routes

Projets européens :

Projet européen ESPON 2006

Personne de référence

Prof. Parriaux Aurèle, Dr Tacher Laurent, Dr Turberg Pascal, Dr Fang Jiannong, Dr Bensimon Mike

Ouvrages de référence

Parriaux A. : Géologie : bases pour l'ingénieur. PPUR 2006

Sites internet, liens

<http://geolepwww.epfl.ch>
<http://geolepwww.epfl.ch/publications/publications.htm>

FORMATION

Formation proposée	ENAC avec l'ELSTE (Ecole Lémanique des Sciences de la Terre et de l'environnement) : Génie civil - Sciences et ingénierie de l'environnement - Géologie de l'ingénieur
Degré	Master : en génie civil EPFL, en sciences et ingénierie de l'environnement EPFL, en géologie de l'ingénieur ELSTE) Ecole doctorale

CONSULTING

Stabilité des versants - Modélisation des écoulements souterrains dans les glissements - Diagnostic sur la pollution des nappes souterraines - Mesures géophysiques sur les glissements de terrain
Partenaires : Confédération, cantons, pays étrangers

Laboratoires des mécaniques des Sols et des Roches (LMS / LMR)

Adresse : Station 18, Ecublens, 1015 Lausanne. Tél. +41 21- 693 23 15 / 25, Fax. + 41 21 – 693 41 53

E-mail : lms@epfl.ch , lmr@epfl.ch

RECHERCHE

Mécanique des sols et des roches. Instabilité de pente

Types de catastrophes

Glissements de terrain (lents et rapides). Instabilités de falaises (blocs et éboulements). Laves torrentielles. Effets des mouvements de terrain sur les constructions.

Compétences disciplinaires

Identification des phénomènes – Modélisation – Auscultation - Evaluation des aléas - Zonage du danger - Ouvrages de protection.

Description

Cartographie des glissements de terrain - Développement et exploitation des dispositifs d'auscultation des mouvements de terrain - Suivi et analyse de données d'auscultation - Modélisation des mouvements au cours du temps et analyses de stabilité - Modélisations physique et numérique de la propagation de blocs rocheux et d'éboulements - Méthodologie de zonage du danger - Evaluation des aléas et des risques, expertises post-catastrophes - Dimensionnement et détermination de l'efficacité des ouvrages de protection.

Projets de recherche

Projets nationaux :

FNS-PNR 31 : Grands glissements de versants et climat : Comportement passé, présent et futur des grands versants instables subactifs en fonction de l'évolution climatique, et évolution en continu des mouvements en profondeur (1993-1997).

KTI-MUMOSY : Multi Sensor based Monitoring System for Disaster Prevention :Développement d'un équipement d'auscultation automatique piloté à distance pour mesurer les déplacements des glissements de terrain ou des ouvrages (2003-2005).

ETAT de VAUD – CADANAV : Etablissement d'une méthodologie de mise en œuvre des Cartes de Dangers Naturels du Canton de Vaud (2001 – 2002).

OFROU – CFF : Etude expérimentale de la chute de blocs impactant une dalle en béton armé recouverte par des matériaux amortissants (1992 - 1996).

Projets européens :

European Commission – Fifth Framework Program

IMIRILAND Project : Identification and Mitigation of Large Landslide Risks in Europe : Advances in Risk Assessment (2001-2004).

Union Européenne - Programme Interreg II C

Prévention des mouvements de versants et des instabilités de falaises - Confrontation des méthodes d'étude des éboulements rocheux dans l'arc alpin (1999-2001).

Union Européenne - Programme Interreg III - ALCOTRA

ROCSLIDETEC : Développement d'outils méthodologiques pour la détection et la propagation des éboulements de masse (2003-2006).

Réseaux de chercheurs

EPFL / ENAC ; EPFZ ; Université de Lausanne (UNIL), Institut de Géomatique et d'Analyse du Risque (IGAR) ; Centre de Recherche sur l'Environnement Alpin (CREALP) ;

Université Joseph Fourier, Grenoble ; Laboratoire Régional des Ponts et Chaussées (LRPC), Lyon ; Politecnico di Torino ; Universitat Politècnica de Catalunya (UPC), Barcelona ; Isle of Wight Council, UK.

Personne de référence

Professeur Dr L. Vulliet. Ch. Bonnard. Dr V. Labiouse. Dr L. Laloui.

<http://people.epfl.ch/lyesse.laloui>,

<http://people.epfl.ch/vincent.labiouse>,

<http://people.epfl.ch/christophe.bonnard>

Ouvrages de référence

Identification and mitigation of large landslide risks in Europe : advances in risk assessment., Bonnard Ch., Forlati F., Scavia C. (eds) , 2004, IMIRILAND Project. 317 p. Ed. Balkema, ISBN 90 5809 598 3

Impact Load by Rock Falls and Design of Protection Structures. Masuya, H., Labiouse, V. (eds), 1999. Séminaire nippon-suisse : Kanazawa, Japon : 163 pp.

Etudes trajectographiques. Labiouse, V., Heidenreich, B., Desvarreux, P., Viktorovitch, M., Guillemin, P., 2001. Chapitre 4 du livre : Prévention des mouvements de versants et des instabilités de falaises – Confrontation des méthodes d'étude des éboulements rocheux dans l'arc alpin. Interreg IIC Project, Aoste: 155-205.

Coupled Multi-Physics Processes in Geomechanics. Guest Editors: L. Laloui, R. Charlier, G. Pijaudier-Cabot, 2005. Special issue, REGC (European Journal of Civil Engineering), Volume 9, N°5-6, 280 pages

Environmental Geomechanics. Editors: L. Vulliet, L. Laloui & B. Schrefler, 2002, Publisher EPFL-Press. 423 pages ; ISBN 2-88074-515-2.

+ voir bibliographie

Sites internet, liens

<http://lms.epfl.ch/>, <http://lmr.epfl.ch/>, <http://geolepwww.epfl.ch/home.htm>

FORMATION

Formations proposées	<p>Doctoral School :</p> <ul style="list-style-type: none">- Doctoral Program Environnement EDEN : Prévention, Control and Management of Environmental Risks and Crisis Situations (Ch. Bonnard). Informations pratiques : Mme Sylvette Renfer, 021 – 693 45 49- Doctoral Program Mechanics : Mechanics of porous media (L. Laloui). Informations pratiques : http://phd.epfl.ch/Jahia/site/phd/op/edit/lang/en/pid/56253 <p>Formation continue : (programme du Conseil de l'Europe) Organisation of four European summer schools on natural hazards on: Landslide Identification (Sion 1990), Landslide Hazard (Auron, 1994), Landslide Management (Bossolasco, 1998; C. Bonnard was responsible of the pedagogical project) and Cliff Instabilities and Landslides (Sion 2002; V. Labiouse organised the scientific program and the rockfall field work). Informations pratiques : Pôle Grenoblois Risques Naturels, Maison des Géosciences, BP 53, FR – 38041 Grenoble Cedex 9, 0033-04-76 82 80 47</p> <p>Bachelor : Gestion des territoires affectés par des dangers naturels en zone de montagne. Informations pratiques : http://semaineenac.epfl.ch/</p> <p>Advanced masters : Post Graduate Certificate on Study and Management of Geological Risks, Université de Genève, Faculté des Sciences (en association avec LMS notamment). Informations pratiques : CERG – Mme F. Grondahl, Section des Sciences de la Terre, 13 rue des Maraichers, CH-1205 Genève, +41-22-379 66 02</p>
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CONSULTING

<p>Activités de consulting :</p> <ul style="list-style-type: none">- Modélisation hydromécanique des mouvements des grands glissements de terrain en cas de crise- Expertises en relation avec des mouvements de terrain et les dommages induits- Expertises en relation avec la propagation des blocs rocheux et les mesures de protection- Essais de laboratoire pour la détermination des caractéristiques géomécaniques des matériaux <p>Partenaires : De Céréville Géotechnique SA, Ecublens ; Bureau Technique Norbert SA, Lausanne ; Riccardo Bernasconi, géologue, Sargans ; Centre d'Etudes Techniques de l'Equipement (CETE) de Lyon, France</p>

Laboratoire d'Hydrologie et Aménagements (HYDRAM)
 Adresse : GR-C1, station 2, Ecublens, 1015 Lausanne. Tél. +41 – 21- 693 37 25

RECHERCHE

Hydrologie. Gestion et ingénierie des ressources en eau. Physique du sol, contamination des eaux souterraines	
Types de catastrophes	
<p><u>Catastrophes naturelles</u> : hydro-météorologiques, inondations, érosion, salinisation des sols, pollution des sols et des eaux souterraines, impacts des changements climatiques</p> <p><u>Catastrophes industrielles</u> : contamination des sols et des eaux souterraines</p> <p>Intégration et approches multi-dangers</p>	
Compétences disciplinaires	
Hydrologie de surface et gestion des ressources hydriques. Hydrologie de subsurface, transports de matière et de polluants. Gestion intégrée et ingénierie des ressources en eau.	
Description	
<p>L'HYDRAM vise, à travers ses activités de recherche, d'enseignement et d'expertise, à relever de nouveaux défis au niveau scientifique et sociétal dans le domaine des eaux et des aménagements par:</p> <ul style="list-style-type: none"> - la gestion durable des hydrosystèmes naturels et anthropisés - la gestion des ressources hydriques - l'étude prospective des impacts des changements potentiels globaux d'ordre physique, sociétal et environnemental 	
Projets de recherche	
Projets nationaux :	
<p>CADANAV - Cartographie des dangers naturels du Canton de Vaud (inondations, glissements de terrain, éboulements, avalanches, etc.). 1999 - 2004</p> <p>CONSECRU - CONcept de Sécurité (protection) contre les risques liés aux CRUes. Estimation de crues de projet sur le Rhône à l'amont du Léman. 2003 - en cours.</p> <p>MINERVE - Modélisation des Intempéries de Nature Extrême des Rivières Valaisannes et de leurs Effets. 2002 - en cours</p> <p>OFENCC - Changements climatiques et hydroélectricité en Suisse. 2004 – 2005</p>	
Projets européens :	
<p>FLAMOR - Flood Analysis and Mitigation on the Orlice River. DDC / Aide humanitaire – CSA, projet terminé</p> <p>FLAMIS - Floods Analysis and Mitigation on the Luznice river in South Bohemia; Validation de la méthodologie FLAMOR sur la rivière Luznice et développement des aspects de préparation aux cas d'inondations.</p> <p>SWITCH - Objectif: to develop scientific, technological and socio-economic solutions that contribute to sustainable urban water management principles. 2006-2011, 32 partenaires, coord: UNESCO-IHE.</p> <p>PEGASE - GW contamination by pesticides: processes involved and simulation. EU project, 11 partners. 2000-2004</p>	
Personne de référence	
Prof. André Mermoud, Marc Soutter, Benoit Hingray	

FORMATION

Formation proposée	Cours et expertise dans les domaines de compétences de l'HYDRAM, à savoir: <ul style="list-style-type: none"> - Hydrologie - Gestion et ingénierie des ressources en eau - Physique du sol, contamination des eaux souterraines
Degré	Bachelor, Master et Master d'études avancées (en Gestion et ingénierie des ressources en eau)
Partenaires académiques	LCH: Laboratoire des constructions hydrauliques, EPFL. Institut für Umweltingenieurwissenschaften, ETHZ. Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie, ETHZ
Informations pratiques	http://water-eng-mas.epfl.ch/

CONSULTING

<p>Plusieurs expertises réalisées dans les domaines de compétences de l'HYDRAM, à savoir:</p> <ul style="list-style-type: none"> - Hydrologie - Gestion et ingénierie des ressources en eau - Physique du sol, contamination des eaux souterraines

Laboratoire de topométrie (TOPO)

Adresse : Station 18, Ecublens, 1015 Lausanne. Tél. +41 21 - 693 27 55. Fax: +41 21 - 693 57 40

RECHERCHE

Géomatique, navigation

Types de catastrophes

Toutes celles qui affectent le relief du terrain ou la couverture du sol.

Compétences disciplinaires

Satellite positioning, inertial navigation, direct geo-referencing

Projets de recherche

Projets nationaux :

CCES- Centre for Competence in Environmental Sustainability (en démarrage)

Projets européens :

LIAISON navigation pédestre (toutefois peu lié aux risques naturels)

Personne de référence

Prof. Bertrand Merminod

Dr. Jan Skaloud

Sites internet, liens

<http://topo.epfl.ch/>

FORMATION

Formation proposée	Dans le cadre des plans d'études de l'ENAC Formation continue : cours ponctuels en partenariat avec des associations professionnelles
Degré	Bachelor – master Formation continue

CONSULTING

Contrôle géodésique de déformation des barrages

Laboratoire de systèmes d'information géographiques (LASIG)

Adresse : Station 18, Ecublens, 1015 Lausanne. Tél. + 41 21 - 693 57 85

RECHERCHE

Système d'information géographique : modélisation spatiale du territoire, technologie de l'information, analyse spatiale.
Traitement d'image de télédétection satellitaires et aériennes. Interaction Homme-Machine pour les applications Web.
 Le LASIG intervient, dans la grande majorité des cas, comme partenaire d'équipes spécialisées dans un ou des types de catastrophes.

Types de catastrophes

La modélisation du territoire et la base de données géographiques qui en découle permet d'accueillir toute information concernant la prévention de catastrophe (aléas et risques) et, le cas échéant d'une catastrophe, de fournir un outil de gestion des interventions.

Compétences disciplinaires

Création et exploitation de SIG. Traitement d'image.

Projets de recherche

Projets nationaux :

CADANAV (Cartes de DAngers NATurels du canton de Vaud). *Partenaires* : Administration cantonale vaudoise, Laboratoire d'Hydrologie et d'Aménagement de l'EPFL, bureaux d'ingénieurs. *Durée* : 2 ans

Cultural Landuse Analysis (CLAN)

Partenaire : Banque interaméricaine de développement

Durée : 3 ans

CICR : Développement d'une base de données de type SIG pour les interventions du CICR, notamment pour son unité.

Eau et Habitat. *Durée* : 3 ans

Etablissement de la Carte conservative des sols (Risques géologiques)

Partenaires : Laboratoire de géologie de l'Ecole polytechnique (GEOLEP), Etablissement cantonal contre les incendies (ECA). *Durée* : 2 ans

Projets européens :

Floodgen : Flood risk reduction by spaceborne recognition of indicators of excess runoff generating areas. *Partenaires* : Bureau de Recherches géologiques et minières (BRGM), Université de Sherbrooke (Québec), Centre de recherche européen (JRC) d'Ispra (It). *Durée* : 3 ans

Agence universitaire de la Francophonie

Utilisation de la télédétection et de l'analyse spatiale pour l'aide à la gestion des risques d'incendie de forêt *Partenaires*: Institut national d'agronomie de Tunis, CEMAGREF de Tunis, Institut National de la Recherche Agronomique (INRA) d'Avignon. *Durée* : 3 ans

Personne de référence

Prof. François Golay (francois.golay@epfl.ch),

Régis Caloz, Abram Pointet.

Sites internet, liens

<http://lasig.epfl.ch/presentation/fgolay.shtml>

<http://lasig.epfl.ch/presentation/rcaloz.shtml>

<http://abram.ch>

FORMATION

Formation proposée	Formation continue sur demande d'Associations professionnelles Dans les domaines de la géoinformation, du traitement des modèles numériques d'altitude et d'image de télédétections
Degré	postgrade

SB – Institut des sciences et ingénierie chimiques / Groupe des procédés macromoléculaires

SB - Service de sécurité et santé au travail (SST)

Adresse : SB – SST, station 6, Ecublens, 1015 Lausanne. Tél. + 41 21 693 36 14

RECHERCHE

Fluides surcritiques comme alternatives aux solvants dangereux.

Détermination des stratégies adaptées aux risques de laboratoires jusqu'aux tailles industrielles.

Types de catastrophes

Techniques, chimiques, physiques, procédés industriels

Compétences disciplinaires

Procédés chimiques, procédés utilisant des radiations non-ionisantes ou ionisantes, processus sous hautes-pressions, développement de procédés intrinsèquement sûrs, analyses de risques.

Description

Le service de sécurité et santé au travail développe des concepts et méthodologies de réduction des risques au niveau du laboratoire pouvant être exportés aux dimensions industrielles dans le domaine de la chimie et de la physique.

Projets de recherche

Projets nationaux :

Projet FN 20020-109051, Calorimétrie surcritique, durée de 3.5 ans

Réseaux de chercheurs

Réseau de compétences en matière de sécurité et santé au travail avec ETHZ (Prof. K. Hungerbuhler), avec la CUSSTR (Commission Universitaire pour la Santé et la Sécurité au Travail Romande).

Personne de référence

MER Dr Thierry Meyer, EPFL : Ingénieur chimiste diplômé EPFL (1985), Dr ès Sciences techniques (1989), Maître d'enseignement et de recherche (1999), Chargé de sécurité reconnu OFAS (2005). Il est un expert officiel auprès du « International chamber of commerce, The world business organization » en matière de procédés et sécurité des procédés chimiques. Il fonctionne occasionnellement comme expert auprès du CNRS (France) lors d'audits de laboratoires de recherche.

Sites internet, liens

<http://sb.epfl.ch/securete>

FORMATION

Formation proposée

- a) Formation continue dans le domaine de la sécurité et santé au travail (10 modules de formation)
- b) Risk management & european and swiss rules (chimistes et police scientifique), en collaboration avec l'IST : Master.
- c) Partenaire dans la formation des chargés de sécurité (reconnus OFAS) dispensé par SECURETUDE SA.

CONSULTING

Activités dans le domaine de la réduction des risques pour les procédés chimiques, physiques et biologiques par l'approche systémique des procédés intrinsèquement sûrs. Analyses de risques. Analyses de situations dangereuses.

Partenaires :

Comme exemple on relèvera les partenariats avec : CIBA SC, Monthey et Bâle ; DeBioPharm, Lausanne et Gland ; Techpowder SA, Lausanne ; TECOST SA, Technology consulting, Fribourg ; SECURETUDE SA, Bureau de consultants en matière de sécurité, Aigle.

Laboratoire de Systèmes Energétiques (LASEN)

Adresse : Station 18, Ecublens, 1015 Lausanne. Tél. + 41 21 - 693 24 90

RECHERCHE

Analyse et gestion des risques

Types de catastrophes

Catastrophes industrielles (technologiques) et naturelles.

Compétences disciplinaires

Analyse des modes de défaillances et de leurs effets. Méthode du diagramme de succès. Arbre des causes. Arbre des événements. Méthode de l'espace des états. Réseaux de Petri.

Projets de recherche

Pas d'activité de recherche spécifique dans ce domaine actuellement, en raison d'autres priorités

Personne de référence

Dr. Pierre-André Haldi (pierre.haldi@epfl.ch)

FORMATION

<p>Formation proposée</p>	<p>Sécurité et fiabilité II</p> <p>Objectifs : Donner aux étudiants les connaissances indispensables concernant l'analyse et l'évaluation de la sécurité et de la fiabilité des systèmes civils, dans une optique probabiliste et en tenant compte du caractère aléatoire des données à disposition et des incertitudes de dimensionnement. A la fin du cours, les étudiants doivent être capable d'aborder les questions de sécurité et fiabilité des systèmes civils de manière correcte et en utilisant les outils méthodologiques appropriés.</p> <p>Gestion des risques :</p> <p>Objectifs : Rappel des notions de danger et risque ; Compréhension des divers mécanismes intervenant dans la gestion des risques ; Capacité à mettre en application une approche globale et Méthodologique en gestion des risques</p>
<p>Degré</p>	<p>Master</p>

**Institut de Géomatique et d'Analyse du Risque (IGAR)**

Adresse : Amphipôle, 1015 Lausanne. Tél. + 41 21 – 692 35 32, Fax : + 41 21 – 692 35 35

RECHERCHE

Analyse de dangers naturels (causes, phénomènes, risque) : Mouvement de versants, dangers liés aux versants, analyse du risque appliquée aux dangers naturels, modélisation de dangers naturels, SIG et dangers naturels, développement de méthodes et concepts d'analyse et de description.

Types de catastrophes

Mouvements de versant (éboulements, chutes de pierres et glissements de terrain); laves torrentielles, inondations, tremblements de terre, phénomènes météorologiques extrêmes.

Compétences disciplinaires

Description de dangers naturels par méthodes informatiques (notamment Modèles Numérique de Terrain, MNT); description physique, géométrique et spatial des phénomènes de danger naturel; acquisition, traitement et interprétation de MNT de haute résolution (Lidar)

Description

Le groupe d'analyse du risque de l'IGAR est principalement orienté vers l'étude des risques naturels et environnementaux notamment sous l'angle de la morphodynamique et plus particulièrement la quantification des phénomènes de dégradation, d'altération et de démantèlement de la chaîne alpine ainsi que des dangers générés par ces phénomènes.

Projets de recherche**Projets nationaux :**

- Analyse des MNT Laser (Collaboration avec le Système d'information du territoire Neuchâtelois (SITN) et le Service de l'information sur le territoire vaudois (SIT)
- Vectorisation des cartes géologiques de plusieurs cantons suisses (en collaboration avec Swisstopo et les services cantonaux).

Projets internationaux :

- Analyse et interprétation géomorphologiques dans la région Projets de recherche européens : de Stranda (Tafjord, Aknes) en Norvège (Collaboration avec le Service Géologique de Norvège, NGU)
- Analyse du risque Bd. Champlain (Québec) et d'autres instabilités et glissements en Canada (Collaboration avec le Prof. J. Locat, Université Laval (Qc), Dr. R. Couture, Commission géologique du Canada)
- Collaboration sur le glissement de Frank slide avec le service géologique d'Alberta

Personne de référence

Prof. Michel Jaboyedoff, michel.jaboyedoff@unil.ch,
Dr. François Baillifard, francois.baillifard@unil.ch,
Dr. Eric Bardou, eric.bardou@unil.ch,
Dr. Richard Metzger, richard.metzger@unil.ch,
Thierry Oppikofer, thierry.oppikofer@unil.ch

Ouvrages de référence

Voir biblio

Sites internet, liens

www.unil.ch/igar, www.quanterra.org

FORMATION

Formation proposée	Cursus universitaire (Bachelor-Master-Doctorat) en Géologie, Géographie (humaine et physique) et Environnement (humain et physique)
Degré	Bachelor (BSc), Master (MSc), Master of Advanced Sciences (MAS), Doctorat (PhD)
Description	<p>Les enseignements du groupe de l'analyse de risque de l'IGAR comprennent:</p> <p>Niveau BSc: Risques géologiques alpins (pour l'orientation Géologie), Risques environnementaux, Risques et dangers naturels, Destruction de chaînes orogéniques (pour les orientations Géographie et Environnement)</p> <p>Niveau MSc: Instabilité des falaises (pour l'orientation Géologie): Monitoring de mouvements de versant, Cours avancé sur les risques et dangers naturels, Analyse des risques, vulnérabilité et communication, Risques et dangers naturels, détection et simulation, bases de programmation (pour l'orientation Environnement)</p>
Informations pratiques	<p>Titre obtenu : Bachelor of Science (BSc), Master of Science (MSc), Docteur en Géologie (PhD)</p> <p>Partenaires académiques : Les autres instituts de la Faculté des Géosciences et de l'Environnement (FGSE) de l'UNIL.</p> <p>Exigences requises : Maturité Suisse ou équivalent, ou sur admission</p> <p>Coûts : Droits d'inscriptions UNIL: CHF 580.- (BSc, MSc)</p> <p>Dates de la formation : annuel</p> <p>Coordonnées pratiques : Prof. Michel Jaboyedoff, michel.jaboyedoff@unil.ch, Tél. +41 (0)21 692 35 32, Fax +41 (0)21 692 35 35, www.unil.ch/igar, Université de Lausanne, Service des Immatriculations et Inscriptions, Unicentre, CH-1015 Lausanne, Tél. +41(0)21 692 21 00, Fax +41 (0)21 692 21 05, www.unil.ch/immat</p>

CONSULTING

Divers mandats de recherche en collaboration avec des bureaux d'études géologiques privés. Partenaire : CREALP
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UNIVERSITE DE FRIBOURG (UNIFR)

Faculté de Sciences

Fiche C1

Département de Géosciences

Adresse : ch. du Musée 4, 1700 Fribourg . Tél. +41 26 – 300 90 10, Fax : + 41 26 – 300 97 46

RECHERCHE

Climat, Changements climatiques, Impacts climatiques.

Types de catastrophes

Extrêmes climatiques : vagues de chaleur et de froid, tempêtes de vents, pluies extrêmes et sécheresses, grêle.

Compétences disciplinaires

Environnement, climat

Description

Recherches sur les extrêmes climatiques et leur évolution dans le courant du 20^e siècle, par le biais de l'observation ; et sur l'évolution de ces mêmes extrêmes au 21^e siècle dans un climat influencé par l'augmentation des gaz à effet de serre dans l'atmosphère, par le biais de la simulation numérique.

Projets de recherche

Projets nationaux :

NCCR-Climat, Pôle de Recherche sur le Climat

Coordonné par l'Université de Berne (Prof. Heinz Wanner). Partenaires : Université de Fribourg, Université de Berne, ETHZ, EPFL, Université de Genève, PSI, Phase 1 : 01.04.2001-31.03.2005 ; Phase 2 : en cours depuis le 01.04.2005

Projets internationaux :

5^e Programme cadre : Projet PRUDENCE, Coordonné par la Danish Meteorological Institute à Copenhague (Danemark), entre le 01.11.2001 et le 31.10.2004 ; 21 partenaires essentiellement en Europe de l'Ouest

6^e Programme cadre : Projet ENSEMBLES, Coordonné par la UK Met Office à Exeter (Grande Bretagne), en cours depuis le 01.09.2004 ; 72 partenaires (Europe de l'Ouest, nouveaux pays de l'Union Européenne, Europe de l'Est, ainsi que le Canada, les USA, l'Australie et l'Inde)

Réseaux de chercheurs

Outre les réseaux NCCR (Suisse) et européens, accords d'échange de chercheurs et d'étudiants entre l'Université du Québec à Montréal et l'Université de Fribourg dans le domaine de la simulation du climat et de ses extrêmes.

En cours de ratification : un accord semblable avec la National University of Singapore.

Personne de référence

Prof. Martin Beniston (Martin.Beniston@unifr.ch)

Dr. Stéphane Goyette (Stephane.Goyette@unifr.ch)

Ouvrages de référence

Beniston, M., 2004: *Climatic change and its impacts. An overview focusing on Switzerland*. *Kluwer Academic Publishers, Dordrecht/The Netherlands and Boston/USA, 296 pp.*

Beniston, M., 1997: *From Turbulence to Climate*. *Springer-Verlag, Heidelberg/Berlin/New York, 328 pp.*

+ cf bibliographie

Sites internet, liens

www.ipcc.ch

www.meteo.fr

www.meteosuisse.ch

FORMATION

Formation proposée	Cours sur les changements climatiques et impacts Cours sur les changements globaux Séminaires sur les risques naturels
Degré	Bachelor et Masters
Informations pratiques	http://www.unifr.ch/geosciences/geographie/Teaching/teachf.html Partenaires académiques : Universités de Berne et de Lausanne ; ETHZ

CONSULTING

Intergovernmental Panel on Climate Change (IPCC), organisme de l'ONU pour l'étude de l'évolution du climat qui établit à intervalles réguliers des rapports pour la Convention-cadre des Nations Unies sur les Changements Climatiques et les négociateurs de ses instruments divers, notamment le Protocole de Kyoto.

UNIVERSITE DE GENEVE (UNIGE)

Faculté de Sciences

Fiche D1

Section des Sciences de la terre

Adresse : Université de Genève, 13, rue des Maraichers, CH – 1205 Genève. Tél. + 41 22 – 379 66 02

RECHERCHE

Prevention and mitigation of natural disasters

Types de catastrophes

Geological : Volcanic eruptions, terrain unstabilities, earthquakes

Compétences disciplinaires

- Volcanic hazards and risks with specialization in modelization,
- Integral "natural" risk management
- Unstable terrains
- Seismic microzonation

Personnes de référence

Prof. Costanza Bonadonna (PAD), CERG director
 Prof. Jean-Jacques Wagner (P. honoraire)
 Christophe Bonnard (Chargé d'enseignement)
 Dr Olivier Lateltin (Chargé d'enseignement)
 Dr Patrick Smit (Chargé d'enseignement)
 Dr Corine Frischknecht (Maitre assistant)
 Dr Franco Romero (Maitre d'Enseignement et de Recherche, CUEPE)
 Dr Mario Sartori (Chargé de cours)

Sites internet, liens

www.unige.ch/hazards

FORMATION

Formation proposée	Study and management of the geological risks (It includes also the hydrometeorological risks) : The objective is to train (future) decision makers in natural disaster reduction trough the development of an expertise in an integral natural risk evaluation and management. The principal aim being to lower the number of victims and the limitation of the direct costs (damage), indirect costs (monetary losses, loss of markets) from disasters. The training will focus on a multidisciplinary approach to risk management in the frame of a sustainable development.
Degré	Post grade with 30 ECT credits
Description	Risk assessment and management management, related to : slope instabilities, earthquakes, volcanic eruptions, hydrometeorological phenomena, project report
Informations pratiques	<p>Titre obtenu : Certificat complémentaire en étude et management des risques géologiques CERG</p> <p>Partenaires académiques : Soil Mechanics Laboratory (LMS) , Institute of Infrastructures, Resources and Environment (ICARE) School of Architecture, Civil and Environmental Engineering (ENAC), Federal Institute of Technology, Lausanne, University of the United Nations (UNU) in Tokyo</p> <p>Partenaires institutionnels : SDC</p> <p>Exigences requises : All applications are based on CV, furthermore all candidates must hold a master in geology (earth sciences) or a diploma in engineering geology from a Swiss University or Institute of Technology or an equivalent title ; In addition other University titles are considered with a high standard professional experience. The course is in english</p> <p>Coûts : CHF 3'200.-</p> <p>Dates de la formation : April to June (8 weeks, exact dates to be confirmed each year)</p> <p>Coordonnées pratiques : CERG Secrétariat, Section des Sciences de la terre, Université, 13, rue des Maraichers, CH 1205 Genève / Suisse. Tél. + 41 2 379 66 01. Fax + 41 22 379 32 10. Email : cerg@unige.ch. Web : www.unige.ch/hazards</p>



ETH
Edgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

SWISS FEDERAL INSTITUTE OF TECHNOLOGY - ZURICH (ETHZ)

Department of Earth Sciences

Fiche E1

Geological Institute

Wolfgang-Pauli-Strasse 15, CH -8093 Zürich. Phone : +41 – 44 – 632 36 65

RESEARCH

Geomechanical and geohydraulic processes in near-surface environments

Types of disaster

Landslides, rock fall, earthquake-induced slope failures

Specialised skills

In-situ investigations and borehole monitoring, HM coupled, discontinuum and fracture mechanical modeling, tracer testing in fractured rocks, hydrochemical analyses.

Description

Underground constructions and hydromechanical processes in fractured rocks
 Hydraulic and hydrochemical processes in regional groundwater systems
 Geological hazards (mainly rock slope failure mechanisms)
 Earth stresses in technical systems

Research projects

- Large Scale Ground Settlements Above Tunnels in Fractured Crystalline Rocks
- Behaviour and Implications of a 3-D Fluid-Controlled Earthquake Model
- Rockslide Processes and Mechanisms: Progressive Development of Shear/Slide Surface in Rock Slopes.
- Fluid Flow and Stimulation in Enhanced Geothermal Systems.
- HM coupled processes around repository drifts in the Opalinus Clay
- Isotope investigations of thermal water systems in Western Turkey
- Hydro-geophysical investigations in coastal aquifers

Research networks

ETH Network for Natural Hazards (HazNETH), CENAT, Centre for Environment and Sustainability.

Contact people

Prof. Simon Loew - Dr. Keith Evans - Dr Werner Balderer - Dr Frank Lemy - Dr. Edward Button - Dr Martin Herfort - Dr Andrew Kos - Dr. Fanny Leuenberger - Dr Heike Willenberg

Internet sites, links

www.engineering-geology.ethz.ch : www.rockslide.ethz.ch www.erdw.ethz.ch/loew

EDUCATION

Courses offered	<p>Bachelor: Introduction to natural hazard management, Engineering Geology, Hydrosphere, Hydrogeology and Quaternary Geology.</p> <p>Masters: Masters of Earth Sciences (Majoring in Engineering Geology) : Rock Mechanics and Rock Engineering, Soil Mechanics and Foundation Engineering, hydrogeological and Engineering Geological Field Courses, Site Investigations, Landslide Analysis, Underground Constructions, Landfills and Deep Geological Disposal.</p>
Level	Undergraduate, postgraduate and doctoral postgraduate

CONSULTING

Consulting activities: Nuclear Waste Disposal, Landslide Hazards, Tunnelling, Deep Geothermal Energy

Institute of Cartography (IKA)

Wolfgang-Pauli-Strasse 15, CH -8093 Zürich. Phone : + 41 44 – 633 30 33, Fax : + 41 44 - 633 11 53

RESEARCH**Visual analysis and visualisation (including using web services) of hazards****Types of disaster**

all (see project descriptions)

Specialised skills

Hazard visualisation and analysis techniques

Research projects**National projects:****“Correlated hazard assessment studies within an alpine valley: establishing a geo-spatial system for data management, modelling, visualisation, and analysis”**

A geo-spatial hazard and risk information system is currently developed for handling, pre-processing, and analysing the existing huge and variable data sets from different natural hazards. Duration: 2005-2008

“Development of a Combined Assessment and Representation Procedure for Multiple Natural Hazards in a GIS”

This project aims at combining quantification as well as representation procedures for multiple natural hazards within a GIS. The GIS framework is intended to serve as a guide which shows requirements, problems, and possibilities in multi hazard analyses and representation. Duration: 2005-2008

“Swiss Virtual Campus – NAHRIS”

The e-learning course NAHRIS provides a cross-disciplinary approach to natural hazards, which will be available to a large number of students. The course includes technical, environmental and social aspects that are connected to dangerous natural hazards and risk management. Duration: 2001-2006

International projects :**ORCHESTRA project description**

Recent events have underscored the need to be able to consolidate information from disparate systems to support citizen protection and security, disaster management, criminal justice, and other missions, crossing pan-European agency boundaries and extending into National, State and local government areas. One of the most urgent and important challenges currently facing governments is to get these systems to interoperate and share information. ORCHESTRA is responding to this challenge. The overall goal of ORCHESTRA is to design and implement an open service oriented software architecture that will improve the interoperability among actors involved in Multi-Risk Management. Some of the results of ORCHESTRA will be used as input to the INSPIRE and GMES initiatives. Orchestra is an Integrated Project partly funded by the European Commission's 6th framework program, under the priority 2.3.2.9 “Improving Risk Management”. Duration: 2004-2007

Research networks**Geo-spatial system for natural hazard assessment studies in Switzerland, HazNETH**

HazNETH is the Research Network on Natural Hazards at ETH Zurich. HazNETH that joins 14 professorships from five departments (D-UMNW, D-BAUG, D-FOWI, D-ERDW, D-GESS) with combined expertise in Atmospheric physics, Climatology, Hydrology, Hydraulic engineering, Water management, Risk engineering, Construction engineering, Forest engineering, Engineering geology, Geotechnics, Seismology, Geodynamics, Geodesy, Cartography, Environmental social sciences and Economics. It represents a part of a larger research framework, co-ordinated under the umbrella of the Swiss Competence Centre on Natural Hazards (CENAT).

“Swiss Virtual Campus – NAHRIS”

This project is coordinated by the CENAT-Competence Center for Natural Hazards. The main goal is to create a common educational and course program that brings together the 'state-of-the-art' knowledge concerning natural hazards. The project involves several Higher Education Institutes in Switzerland (ETHZ-ERDW-EngGeol, ETHZ-ERDW-SED, ETHZ-BAUG-IKA, EPFL-Hydran, EPFL-LMS, UniBE-GIUB-Agnat, UniZH-GIUZ-PhysGeo, UniFR-Geomorph, WSL, SLF).

Contact people

Lorenz Hurni, Professor and head of institute

Ionut Iosifescu Enescu, PhD student, co-worker in the ORCHESTRA project. "Cartographic Web Services".

Christophe Lienert, PhD student, co-worker in the NAHRIS project. "Real-time Cartography in Operational Hydrology - A web-based Prototype Application for Decision Support in Flood Risk Management With Data Visualizations for Monitoring, Retracing and Comparing Hydrological Information"

Jörg Trau, PhD student, co-worker in the HazNETH project.

"Correlated hazard assessment studies within an alpine valley: establishing a geo-spatial system for data management, modelling, visualisation, and analysis" and

"Development of a Combined Assessment and Representation Procedure for Multiple Natural Hazards in a GIS"

{hurni,iosifescu,lienert,trau}@karto.baug.ethz.ch

Reference works

Cf bibliography

Internet sites, links

<https://www.rdb.ethz.ch/search/>

<http://www.hazneth.ethz.ch/>

http://www.karto.ethz.ch/index_EN

<http://www.nahriss.ch>

EDUCATION

Courses offered	Vom GIS Daten zur Interaktiven Web-Karten", NAHRIS „Dealing with Natural Hazards and Risk“
Description	Vom GIS Daten zur Interaktiven Web-Karten", Das NDK-Modul «Von GIS-Daten zur interaktiven Web-Karte» zeigt die Arbeitsschritte, mit welchen GIS-Daten kartografisch aufbereitet und im Internet visualisiert werden. Die Teilnehmer/innen sind am Ende des Kurses fähig, eine einfache interaktive Webkarte selbst zu entwickeln. NAHRIS „Dealing with Natural Hazards and Risk“
Other information	Further information may be obtained contacting : For "Vom GIS Daten Interaktiven Web-Karten" : Ionut Iosifescu Enescu, Institut für Kartografie, ETH Zürich, 8093 Zürich Mail: iosifescu@karto.baug.ethz.ch , Tel: 044 - 633 30 28 For Nahriss : Christophe Lienert, Institut für Kartografie, ETH Zürich, 8093 Zürich Mail: lienert@karto.baug.ethz.ch , Tel: 044 - 633 30 36

CONSULTING

Hazard data visualisation, visual analysis of hazards

Institute of Geotechnical Engineering (IGT)

Wolfgang-Pauli-Strasse 15, Höggerberg, CH -8093 Zürich. Phone : +41 – 44 – 633 25 25

RESEARCH

Geotechnical engineering, geotechnical aspects of natural hazards (slope stability, liquefaction, seepage, permafrost, rock-fall impact), **soil structure interaction** (shallow and deep foundations, ground improvement, bridge abutments, retaining walls), **flood protection measures, geotechnical earthquake engineering**

Types of disaster

Landslides, rock-fall, rock avalanches, debris flows, mitigation of earthquake damage (liquefaction, site amplification), effects of flooding and extreme rainfall on geo-structures

Specialised skills

Physical, analytical & numerical modelling, laboratory testing, geotechnical centrifuge modelling & testing, application of complex soil models, advanced field testing including in alpine environments etc.

Description

Tools: Geotechnical drum centrifuge (440g, 880 g-tonnes), standard and development version of commercial Finite Element programs, well equipped soil mechanics laboratory including specialist triaxial stress path testing devices for soft and frozen soils, 25 tonnes dynamic 25 cm diameter triaxial testing apparatus, ring shear apparatus, dynamic bi-directional Hollow Cylinder Apparatus, oedometer equipment with diameters up to 20 cm, swelling tests with free and no displacement, climate chamber (temperatures down to -18°C), field testing apparatus (field direct shear apparatus, cone penetration testing device, instrumentation for unsaturated soil conditions, weather station)

Research projects**National projects:**

Modelling the behaviour of soft Swiss clay - theoretical and practical approaches, Strength characteristics and liquefaction potential of sandy and silty soils subject to earthquake loading. **Merci Project** (SNF funded network on Management of Earthquake Risks using Condition Indicators), **Micromechanical analyses of sturzstroms** (rock avalanches) **on Earth & Mars**, **Earthquake Shaking in Alpine Valleys** (SHAKE-VAL 2), Transition of RAPid Mass Movements, rock-falls on slopes and structures, Shear strength of moraines, Integrated experimental and numerical approach for the analysis of rainfall induced landslides, **Microzonation for Earthquake Risk Mitigation** (DEZA), **Unstable Alpine Permafrost**: a potentially important natural hazard International projects:

Advanced Modelling of Ground Improvement in Soft Soils (EU 6th Framework Programme).

Research networks

HazNETH & CENAT: Natural Hazard Networks at ETHZ and in Switzerland. Advanced Modelling of Ground Improvement in Soft Soils (EU 6th Framework Programme). Merci Project (SNF funded network on Management of Earthquake Risks using Condition Indicators), VSS/ASTRA Design of geosystems reinforced with geosynthetics, DEZA-Disaster Risk Management Institute Microzonation for Earthquake Risk Mitigation, PACE21 Network: Permafrost and Climate Change in the 21st Century (EU Network), PLANET-Z (ETHZ+). ASTRA Working Groups on Stützbauwerke, COST C7 Soil Structure Interaction in Urban Civil Engineering, Arbeitskreis Baugrunddynamik der DGGT, ETHZ/AIT Tsunami Initiative, Chair of International Society of Soil Mechanics & Geotechnical Engineering Technical Committee 2 for Physical Modelling, ETH Research Networks for Environmental Sustainability (CCES): INHARM; APUNCH; TRAMM; COGEAR

Contact people

Professor Sarah Springman OBE FICE CEng SIA, Dr Jan Laue, Dipl. Ing. Pierre Mayor, Dipl. Ing. Tom Ramholt

Reference works

See publications on www.igt.ethz.ch also www.rdb.ethz.ch

Books: Constitutive and centrifuge modelling: Two Extremes, at Centro Stefano Franscini, Monte Verita, Ascona, Ticino. 8.-13. Juli 01, Swets and Zeitlinger 2002. 379 p. ISBN 90 5809 361 1.

Proceedings: 8th International Conference on Permafrost 2003. Zurich, 21-25 July 2003, Permafrost. (eds. Marcia Phillips, Sarah M. Springman, Lukas U. Arenson). 2 Volumes. 1322 p. Swets and Zeitlinger, Lisse.

Internet sites, links

www.igt.ethz.ch

EDUCATION

Courses offered	Soil mechanics (Bachelors), Theoretical and Experimental Soil Mechanics, Design and Construction in Civil Engineering, Modelling in Geotechnics, Soil Dynamics
Level	Bachelor & Masters plus Further Education Courses (e.g. Ground Improvement in 2005; FE Analysis in Geotechnics in 2006)
Description	calice.igt.ethz.ch ; igtcal.ethz.ch/tebm ; igtcal.ethz.ch/mig ; igtcal.ethz.ch/ekg2 , igtcal.ethz.ch/bd
Other information	Regular IGT Colloquium are webcast to a world audience via our website

CONSULTING

Expert to Linth Canal Correction (2005-), Expert to the Rhone River Correction (2005-), Expert to Zurich City Council on Remediation to Quaibrücke, Expert for ASTRA on behaviour of anchored walls under earthquake loading conditions, Expert to VSS on Retaining Walls, Expert to DIN Commission in Germany, NAGRA on constitutive modelling of Opalinus clay.

Group Risk and Safety, D-BAUG

HIL E 23.3, Wolfgang-Pauli-Strasse 15, CH -8093 Zürich. Phone : + 41 44 – 633 31 17, Fax : + 41 44 - 633 10 64

RESEARCH

Risk Management and Risk Assessment of Natural Hazards (Alpine Valley), Risk-Based Decision Making, Decision Theory, Structural Reliability, Sustainability, Risk Based Inspection Planning, Spatial Variability of Concrete Structures, Design of Timber Structures, Risk and Acceptance Criteria for Infrastructure Facilities

Types of disaster

Earthquake, Rockfall, Tsunami, Drought

Specialised skills

Risk Management and Risk Assessment, Decision Theory, Life-cycle Costing, Structural Reliability Theory, Probabilistic and Statistical Modelling and Assessments

Description

The group on "Risk and Safety in Civil Engineering" at ETH Zurich was initiated in April 2000. The research mission for the group is to develop new theories, techniques and procedures for the enhancement of decision making in the area of civil engineering with the perspective of improving the quality of life for the individuals of society. The group is leading and participating in several activities related to management of risks due to natural hazards as well as hazards in a broader context.

Research projects

National projects:

SNF: Management of Earthquake Risks using Condition Indicators (MERCİ): 01.06.04 – 31.05.07.

ASTRA, AGB1: Residual risks and acceptance criteria for accidental loading on infrastructural facilities: 01.06.04 – 31.07.07.

ASTRA, AGB2005-TP102: Safety of the road traffic system and its civil engineering structures: uniform evaluation of risks: 01.06.06 – 31.12.07.

ASTRA, AGB2005-TP103: Safety of the road traffic system and its civil engineering structures: network safety of roads: 01.06.06 – 31.12.07.

International projects :

SAFERELNET: Safety and Reliability of Industrial Products, Systems and Structures,

EU-Forschungsprogramm, 2001-2006.

COST-Aktion E24: Reliability of Timber Structures – TP: Basis for the Design of Timber Structures, EU-Forschungsprogramm, 2001-2005.

Research networks

ETH-Post-TSUNAMI-Initiative: Sustainable Management of Natural Hazards in the Region of South-East Asia with NIDECO (Network for International Development and Cooperation) at ETH Zurich, Member of the NIDECO steering committee

JCSS: The Joint Committee on Structural Safety, President

IFED: The International Forum on Engineering Decision Making, Founder

Contact people

Michael Havbro Faber, born 1961, received his Ph.D. in structural reliability theory in 1989 at the University of Aalborg, Denmark. Since 2000 he is "Chair of Risk and Safety" at ETH Zurich. He is active in research related to rational decision making in civil engineering problems subject to uncertainty. This includes all aspects of probabilistic modeling, risk based optimal design, experiment planning, maintenance planning, life cycle analysis, acceptance criteria and recently also sustainability. He is actively involved in JCSS, ISO, ESRA, IFED, IABSE, CERRA, fib, Swiss Dam Committee and Swiss Code Committee.

Reference works

Lecture Notes: Risk and Safety in Civil, Surveying and Environmental Engineering (400 pages, 2006, 5th ed.).

Publications: over 90 reviewed journal and conference papers on the issues of Risk, Reliability and Decision Theory.

Internet sites, links

www.ibk.baug.ethz.ch/fa - www.tsunami.ethz.ch - www.jcss.ethz.ch - www.ifed.ethz.ch - www.merci.ethz.ch.

EDUCATION

Courses offered	1) Basis Statistics & Probability Theory (in Civil, Surveying and Environmental Engineering) 2) Risk and Safety in Civil, Surveying and Environmental Engineering
Level	1) Bachelor Sc. (2 nd sem.) 2) Master Sc. (7 th sem.)
Description	1) Introduction on basic statistics, probability theory and uncertainty modeling in the context of engineering decision making. Emphasis is given to the aspects of probabilistic model building, hypothesis testing and model verification. Basic tools are introduced for assessing probabilities as needed in risk analysis. Finally the concepts of decision theory are provided. 2) Risks Hazards and Causes of Failures, Basic Probability Theory, Descriptive Statistics, Uncertainty Modelling, Estimation and Model Building, Hazard Identification and Logical Trees, Reliability of Technical Components, Methods of Structural Reliability, Time Variant Reliability, Reliability Analysis of Structural Systems, Bayesian Decision Analysis and Probabilistic Nets, Aspects of Experiments Planning, Assessment of Existing Structures, Risk Based Inspection Planning, Risk Acceptance Criteria.

CONSULTING

Consulting activities on the issues of: Civil, Naval, Aeronauts and Offshore Engineering.

The Comprehensive Risk Analysis and Management Network (CRN)

Prof. Andreas Wenger, ETH Zürich, SEI, Seilergraben 45-49, CH-8092 Zürich. Phone : +41 44 – 632 40 25

RESEARCH**Critical Infrastructure Protection - Political Violence Movements/International - Terrorism - Risk Analysis Methodology - ABC Proliferation - Crisis Management****Types of disaster**

Political risks and threats
 Technological disasters (infrastructures)

Specialised skills

Risk prevention. Preparedness. Risk analysis, vulnerability analysis. Crisis management. Critical infrastructure protection (CIP) vulnerabilities and consequences.

Description

The Comprehensive Risk Analysis and Management Network (CRN) is run by the Center for Security Studies. CRN works on the premise that national security can be achieved best through international cooperation. Therefore, it builds up and maintains an international partner network to exchange knowledge on risks and risk analysis methodology, and to share and review national experiences in an open, non-hierarchical dialog. The CRN shares, exchanges, and distributes research and knowledge via Internet-based information services and an international conference cycle. The CRN's research further helps security policy analysts, researchers, and practitioners to gain a better understanding of risks, equipping them with the basic knowledge needed to compile and implement vulnerability reduction strategies.

CRN is a Specialized Network, a subject-focused platform through which experts explore common aims and interests, share content and ideas, and serve the interests of a common audience.

CRN has two interrelated pillars:

- 1) The New Risks Research Unit, one of five major research teams at the Center for Security Studies (CSS);
- 2) A Swiss-Swedish Internet and workshop initiative for international dialog and cooperation between governments, academics, and the private sector.

The New Risks Research Unit focuses on the socio-political context of new risks and analyzes political mechanisms and processes that lead from the perception of risks to national countermeasures.

Research projects**National projects:**

"Risiko- und Verwundbarkeitsanalyse Schweiz": project run by the Swiss Federal Department of Defense, Civil Protection and Sports (DDPS) by providing the project with scientific expertise, methodological research, and assistance with international contacts in the context of the Partnership for Peace (PfP). The project is engaged in the ongoing process of risk identification and evaluation. Duration: since 1999, ongoing.

Crisis Management and Biological Terrorism: Since the Anthrax incidents in the United States in autumn 2001, biological terrorism has become a major concern in the United States and around the world. Thus, Switzerland decided to carry out a study on its own preparedness for biological terrorism within the framework of NFP 49. The study presents theories on optimal crisis management in the event of a bioterrorist incident. The gaps in Switzerland's preparedness identified in the study form the basis for recommendations on the management of future bioterrorist incidents. Duration: 2002-2004 (concluded)

Contact people

Prof. Dr. Andreas Wenger is Professor of International and Swiss Security Policy and Director of the Center for Security Studies at ETH Zurich. He holds a doctoral degree from the University of Zurich and was a guest scholar at Princeton University (1992-94), Yale University (1998), the Woodrow Wilson Center (2000), and, recently, at the George Washington University (2005). His research team is part of the Center for Security Studies, which is integrated in the Center for Comparative and International Studies (CIS) at the ETH and University of Zurich.
wenger@sipo.gess.ethz.ch

Dr. Victor Mauer (Deputy Director, Head of Research, Center for Security Studies): mauer@sipo.gess.ethz.ch

Dr. Myriam Dunn (Head CRN, Center for Security Studies): dunn@sipo.gess.ethz.ch

Reference works

Cf bibliography

Internet sites, links

<http://www.css.ethz.ch> ; <http://www.crn.ethz.ch> ; <http://www.isn.ethz.ch> ; <http://www.ssn.ethz.ch>

EDUCATION

Courses offered	1) Master of Advanced Studies in Security Policy and Crisis Management (MAS-SPCM) http://www.spcm.ethz.ch/ 2) The International Relations and Security Network (ISN) has a range of e-learning courses for everyone for free and materials to support education and training in the field of international relations and security policy. These e-learning courses include: International Security Risks; Security in the Information Age; - Combating Trafficking in Human Beings; European Security and Defence Policy (ESDP); Chemical and Biological Weapons Nonproliferation
Level	Master of Advanced Studies in Security Policy and Crisis Management (MAS-SPCM) ISN e-learning courses are non-accredited
Description	Executives need to cope with multiple risks, diverse threats, and manage complex crisis situations under severe resource constraints. The accredited MAS-SPCM program has the following objectives: to teach participants to analyze and manage complex problems, crises, and emergencies; to develop content expertise in contemporary risks and threats, in security policy, and in grand strategy; to enhance experience through a professional and interdisciplinary exchange of expertise.
Other information	Academic partners : The Master of Advanced Studies in Security Policy and Crisis Management (MAS-SPCM) originated as a joint initiative of the Center for Security Studies (CSS) at the Swiss Federal Institute of Technology (ETH Zurich), the Swiss Federal Department of Defence, Civil Protection and Sports (DDPS), and the Swiss Armed Forces College (HKA). The main academic partners are King's College London and the Military Academy at the Swiss Federal Institute of Technology (MILAK/ETH Zurich). Requirements for acceptance : The program is intended for senior management executives with university degrees (or equivalent) who have acquired leadership experience for five years or longer. Dates, duration of course : September 2005 – April 2007. Next start: September 2007 – April 2009 For applications please contact : Office for Continuing Education, ETH Zurich, ETH Zentrum HG F 67, Rämistrasse 101, CH-8092 Zurich, Switzerland, +41 (0)44 632 56 59, Fax : +41 (0)44 632 11 57 - info@zfw.ethz.ch , www.zfw.ethz.ch For further information : Center for Security Studies (CSS), ETH Zurich, Prof Dr Andreas Wenger, Director, Dr Michel Hess, ETH Zentrum SEI, Seilergraben 45 – 49, CH-8092 Zurich, Switzerland, Tél. : +41 (0)44 632 40 25, fax : +41 (0)44 632 19 41, hess@sipo.gess.ethz.ch , www.spcm.ethz.ch

CONSULTING

The CRN was launched in 1999 as a Swiss-Swedish initiative. The CRN applies research and methods at the national, sub-national (cantonal), and local levels and assists the policy process by providing scientific and methodological expertise, particularly the practical use of the methodologies, procedures, and tools. The CRN shares, exchanges, and distributes research and knowledge via Internet-based information services and an international conference cycle. The CRN's research helps security policy analysts, researchers, and practitioners to gain a better understanding of risks, equipping them with the basic knowledge needed to compile and implement vulnerability reduction strategies. The CRN team does consulting for all its partners (see below) but also for the Swiss government (mainly Swiss Federal Department of Defense, Civil Protection and Sports) and international organizations such as NATO (NATO Working Group on Critical Infrastructure Protection (CIP); NATO Counter Terrorism Working Group (CTWG) and the UN (International Telecommunications Union (ITU)).

Partners :

The CRN network consists of seven partners from six countries: Bundesamt für Bevölkerungsschutz und Katastrophenhilfe (BBK), Deutschland; Danish Emergency Management Agency (DEMA), Denmark; Directorate for Civil Protection and Emergency Planning (DSB), Norway; Federal Office for Civil Protection (FOCP) at the Swiss Federal Department of Defense, Civil Protection and Sports, Switzerland; Federal Office for National Economic Supply (NES) at the Federal Department of Economic Affairs, Switzerland; Ministry of Interior and Kingdom Relations, Netherlands; Swedish Emergency Management Agency (SEMA), Sweden

Laboratory of Hydraulics, Hydrology and Glaciology (VAW)

Gloriastrasse 37/39, ETH-Zentrum, VAW E31, CH -8092 Zürich. Phone : +41 44 632 40 91, Fax : +41 44 632 11 92,

RESEARCH

Water related hazards

Types of disaster

Floods

Specialised skills

Bed erosion, lateral erosion, steep open channels, sediment deposit, drift wood, impulse waves, bridge pier scour, modelling flood inundations.

Research projects

Research project "Morphological dynamics in braided rivers", 3 years, ETH Zurich

Research project "Bed morphology and stability in steep open channels", 3 years, Federal Office for the Environment.

Research project "Self-widening by lateral erosion", 3 years, Federal Office for the Environment

Research project "BASEMENT - basic simulation environment for computation of environmental flow and natural hazard simulation", 3 years,

Federal Office for the Environment", 3 years, Federal Office for the Environment

Research project "Bridge pier scour", 3 years, Swiss national Science foundation

Research project "Impulse waves", 3 years, Swiss national Science foundation

Contact people

Prof. Dr..H..E..Minor

Prof. Dr. W..Hager

Dr. R. Weichert

Reference work

PhD thesis: Marti, C. Morphodynamics of braided rivers

PhD thesis: Unger J. Bridge pier scour

VAW-report 192: Weichert, Roman: Bed morphology and stability of steep open channels

VAW-report 188: Lange Daniela Schwemmholz - Probleme und Lösungsansätze

VAW-report 186: Zweifel Andreas Impulswellen: Effekte der Rutschdichte und der Wassertiefe

VAW-report 178: Fritz, H.: Initial phase of landslide generated impulse wavesmodelling

VAW-report 173: Bezzola Gian Reto: Fliesswiderstand und Sohlenstabilität natürlicher Gerinne unter besonderer Berücksichtigung des Einflusses der relativen Überdeckung

Internet sites, links

info@vaw.baug.ethz.ch

EDUCATION

Courses offered

Flood protection
River Engineering
Physical and numerical modelling



Department of Civil, Environmental and Geomatic Engineering (BAUG)

Fiche E7

Institute of Geodesy and Photogrammetry Geodesy and Geodynamics Lab

ETH Zürich, Schafmattstr. 34, CH 8093 Zürich, Tel: 0041 44 633 26 61

RESEARCH

Geodesy , Geodynamics, Satellite-Geodesy, GPS Meteorology, Navigation

Types of disaster

Hydrometeorological, geological, tectonic

Specialised skills

Geodetic approaches, geodetic measurements and monitoring, modelling and system identification, data analyses, deformation modelling, GPS-tomography, spectrometry for atmospheric water vapour determination, precision navigation.

Research projects

GANUWE Assimilation of GPS-tomography data in weather model

WATEC: Small scale GPS meteorology (precipitation)

TECVAl: Small scale tectonique monitoring in the Valais

SEAGAL: Seatotography in the Aegean and satellite altimetry

GEODEM: Geodynamic deformation analysis in the eastern Mediterranean.

GAVDOS: Establishment of a European radar altimeter calibration and sea-level monitoring site for JASON, ENVISAT and Euro-GLOSS (recently terminated)

OSTM: Ocean Surface Topography Mission, Next altimetry satellite validation

Research networks

Contacts and/or co-operation national/international: swisstopo, MeteoSwiss, BAFU, scnat, Geoforum, HaznETH, EPFL, AIUB, few industries / EU, NASA, CNES, SPP(DFG), div. Univ.

Contact people

Prof. Dr. H.-G. Kahle, Tel: ++41 44 633 32 55, Fax ++41 44 633 10 66, Mail: kahle@geod.baug.ethz.ch

Dr. Beat Bürki, Tel: ++41 44 633 26 44, Fax ++41 44 633 10 66, e-mail: buerki@geod.baug.ethz.ch

Prof. Dr. Alain Geiger, Tel: ++41 44 633 32 44, Fax ++41 44 633 10 66, Mail: geiger@geod.baug.ethz.ch

Reference work

List of peer-reviewed publications 2003-2006 Prof. Dr. Hans-Gert Kahle, Dr. B. Bürki, and Prof. A. Geiger .

See « Bibliographie : Ouvrages sélectionnés par les instituts de recherche ».

Internet sites, links

www.ggl.ethz.ch

Institute for Atmospheric & Climate Science
Universitätstrasse 16, 8092 Zürich

RESEARCH

Atmospheric Dynamics, Weather Prediction, Climate Variability

Types of disaster

Severe Weather Events

Specialised skills

Diagnostic analysis, predictive skill assessment.

National projects

- NCCR project on climate variability (on-going)
- SNF Project on extratropical weather systems (on- going)

International participation

Leadership role in the THORPEX International Programme

Research networks

THORPEX

Contact people

Huw C. Davies

Internet sites, links

http://www.env.ethz.ch/index_EN



UNIVERSITY OF ZURICH (UNIZH)

Department of Geography

Fiche F1

Glaciology and Geomorphodynamics Group

Winterthurerstrasse 190, CH – 8057 Zurich, Phone : + 41 44 – 635 51 21, Fax + 41 44 – 635 68 48

RESEARCH

High mountains, climate-change impacts, glacier and permafrost hazards

Types of disaster

Natural hazards : glacial, geological, geomorphic, hydrometeorological, in cold mountain areas.

Specialised skills

High-mountain monitoring and modeling methods, application of research in practice

Research projects (selected)

National projects:

National Research Programme 48: GISALP, Spatio-temporal information on rapidly changing climate-sensitive high-mountain environments as a strategic tool for communication, analysis, participative planning and management in the intensely developed tourist region of the Upper Engadin

National Research Programme 31: Climate Change and Natural Disasters: Glacier Retreat and Natural Disasters in High Mountains.

National Science Foundation Project: Analysis of glacier hazard potentials by knowledge-based remote sensing fusion for GIS modeling (2000-2004)

National Science Foundation Project: frozen rock walls and climate change: transient 3-dimensional investigation of permafrost degradation (2004-)

National Science Foundation Project: Slope instabilities in perennially frozen and glacierised rock walls: analysis and modeling (2006-)

Debris flows in the Swiss National Park (2005-2006)

Debris flow and rock-ice avalanche modeling (2006-)

<http://www.geo.unizh.ch/~chuggel/agreg.html>

International projects :

EU Research project PACE: Permafrost and Climate in Europe, continued as ESF-project PACE21 (ongoing)

EU Project GLOCHAMORE: Global Change in Mountain Regions (2004-2005) (partners, among others MRI)

High-mountain hazards in the Caucasus (partners: research institutions in Russia)

Glacial hazards in the European Alps (research institutions in Italy, France and Norway)

Volcano-glacier hazards (partners: U.S. Geological Survey)

Contact people

Prof. Dr. Wilfried Haeberli is full professor, director (since 1986) of the World Glacier Monitoring Service (WGMS), former Vice President (1998 – 2003) of the International Permafrost Association (IPA) and member of the Swiss Expert Group for Hazard Prevention with the Humanitarian Aid Unit (DEZA).

Dr. Christian Huggel is senior scientist and has coordinated hazard prevention projects in several mountain regions worldwide, among others projects of the Swiss Agency for Development and Cooperation (DEZA) in the Caucasus and Colombia. He is member of the Steering Committee of the Commission on Volcano-Ice Interactions of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).

Research networks

Glacier and Permafrost Hazards in Mountains – GAPHAZ: A Scientific Working Group of the International Commission on Cryospheric Sciences (CSS) and the International Permafrost Association (IPA)

Swiss Expert Group for Hazard Prevention with the Humanitarian Aid Unit (DEZA)

Reference works

Cf bibliography

Internet sites, links

<http://www.geo.unizh.ch/phys/aboutus/>

<http://www.geo.unizh.ch/gaphaz/>

<http://www.glacierhazards.ch/>

<http://www.geo.unizh.ch/wgms/>

EDUCATION

Courses offered	Several courses in the field of geomorphology, glaciology, glacial and high mountain hazards, modeling methods
Level	Bachelor and Master
Other information	Selected partners : ETH Zurich, Swiss Federal Institute for Forest, Snow and Landscape Research (WSL/SLF). University of Oslo: Department of Geosciences Adresse : Physical Geography, Department of Geography, University of Zurich, Winterthurerstrasse 190, CH-8057 Zurich, tel. +41 44 635 51 21

CONSULTING

<p>Glacier hazards, debris flows and floods in the area of the hydro power station San Gaban, Peru. Fichtner GmbH & Co. KG and Government of Peru, 1999 - 2000.</p> <p>Surge-like advance and floods in relation with glacier lakes at Ghiacciaio del Belvedere, Department of Civil Protection Italy, Piemonte Region and Community of Macugnaga, since 2001.</p> <p>Glacier hazard assessment and modeling for vulnerability study of the hydro power station Macchu Pichu, Peru, Empresa de Generación Eléctrica Machupicchu S.A, Fichtner, GmbH & Co. KG and Reynolds Geosciences Ltd., 2002-03.</p> <p>Disaster management, hazard assessment and consulting in the case of the ice-rock avalanche catastrophe at Kolka-Karmadon, Caucasus (Republic of North Ossetia, Russian Federation), Ministry of Natural Resources, Republic of North Ossetia and Swiss Agency for Development and Cooperation, Swiss Humanitarian Aid Unit, since 2002.</p> <p>Monitoring of glaciers and related hazards in Colombia, Instituto de Hidrologia, Meteorologia and Estudios Ambientales (IDEAM), Colombia, and Swiss State Secretariat for Economic Affairs, 2004 - 2006.</p> <p>Permafrost prospecting for mining purposes, Pascua-Lama, Chile, Barrick Gold Corporation, since 2005.</p> <p>Prevention, mitigation and early warning of volcano-glacier hazards in the Cordillera Central in Colombia, Swiss Agency for Development and Cooperation, Humanitarian Aid and Colombian partners, since 2006.</p> <p>Partners Swiss Agency for Development and Cooperation Swiss State Secretariat for Economic Affairs Italian Department of Civil Protection, Regione Piemonte Republic of North Ossetia-Alanya, Russia Fichtner GmbH & Co Several governmental institutions in Colombia Reynolds Geosciences Ltd.</p>
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Social Psychology

Plattenstrasse 14, CH – 8032 Zurich, Phone : + 41 44 – 634 21 13, Fax + 41 44 – 634 49 31

RESEARCH

Social sciences

Types of disaster

Flooding and other natural disasters
Perception of risks of new technologies (EMF, GMO, Nano etc.)

Research projects

National projects:

Hochwassergefahren in der Schweiz: Risikobewusstsein in der Bevölkerung und die Implikationen für eine erfolgreiche Risikokommunikation (PLANAT)

Contact people

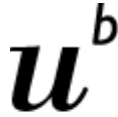
Prof. Dr. Heinz Gutscher
gutscher@sozpsy.unizh.ch,
PD Dr. Michael Siegrist

Reference works

Siegrist M, Gutscher H, Orlow P, Yoker Ü. Hochwassergefahren in der Schweiz: Risikobewusstsein in der Bevölkerung und die Implikationen für eine erfolgreiche Risikokommunikation. Biel: Planat; 2004.
Keller C, Siegrist M, Gutscher H. The role of affect in risk communication. Risk Analysis. in press.
Siegrist M, Gutscher H. Flooding risks: A comparison of lay people's perceptions and expert's assessments in Switzerland. Risk Analysis. in press.
Siegrist, M., Cvetkovich, G. & Gutscher, H. (2002). Risk preference predictions and gender stereotypes. Organizational Behavior and Human Decision Processes, 87, 91-102.

Internet sites, links

<http://www.sozpsy.unizh.ch/personal/gutscher.html>



Institute of Geography

Fiche G1

Centre for Development and Environment (CDE)

Steigerhübelstrasse 3, CH-3008 Bern, Phone : + 41 31 – 631 88 22; info@cde.unibe.ch , <http://www.cde.unibe.ch>

RESEARCH

No specific activities in this field

EDUCATION

Courses offered	CDE's Geoprocessing Unit holds university courses on geo-information processing at the Institute of Geography, University of Berne: it teaches a section of a BSc training module and a full MSc training module (in prep). In addition it offers standardized, tailor-made or on-the-job lectures and trainings for various partner institutions. Courses can contain modules of geographic information systems (GIS), remote sensing and satellite-based surveying. The principle platforms are ArcView 3.x, ArcGIS 9.x, Erdas Imagine 9.x and IDRISI Andes.
Level	For the Institute of Geography, University of Bern: BSc and MSc level. On request basis: level can be adapted to the needs of requesting institutions.
Description	For the current university courses, please consult the website of the Institute of Geography (www.giub.unibe.ch). Trainings on request basis are intended for persons dealing with spatially relevant activities in the humanitarian or development context. CDE places special emphasis on sustainable resource management and regional development but is also involved in disaster-related activities. Courses can be designed and implemented for single persons or groups. They are mostly conducted on location for partner institutions in the South and in the East, but can basically take place anywhere. The training programme and documentation including exercises with datasets can either be chosen from our modular training concept or will be developed based on the specific needs of the training participants.
Other information	<p>Title: The trainings on request basis are not linked to a degree, but CDE issues certificates or a confirmation that a course was attended.</p> <p>Academic partners: For BSc and MSc training: University of Bern (within the framework of teaching obligations at the Institute of Geography).</p> <p>Address and phone number: Thomas Gurtner, Centre for Development and Environment (CDE), Steigerhübelstrasse 3, 3008 Bern, Switzerland, thomas.gurtner@cde.unibe.ch phone: +41 31 631 88 22, fax: +41 31 631 85 44</p>

CONSULTING

Thematic, topographic and rapid mapping services

CDE's Geoprocessing Unit offers a broad range of services for crisis management, prevention of conflicts, risk assessment, monitoring of disasters, planning of infrastructure and modelling of geospatial information. Processing, analysis and integration of geographic information are the main tasks managed by the Unit. Key concerns are related with capacity development (GIS, earth observation, satellite surveying), integrated regional development, resource management, poverty reduction, food security and disaster management.

The Unit supplies geoinformation and mapping support mainly to the humanitarian community for emergency response, to development cooperation for relief and rehabilitation programmes, to Peace Corps for security commitments, to demining teams for operational assistance, to mediators for peace negotiations and to policy leaders for institutional developments.

Contact people : Jürg Krauer & Thomas Gurtner, Centre for Development and Environment (CDE), Steigergubelstrasse 3, 3008 Bern, Juerg.krauer@cde.unibe.ch & Thomas.gurtner@cde.unibe.ch

Tel.: +41 31 631 88 22, Fax: +41 31 631 85 44

Partners : Swiss Agency for Development and Cooperation (SDC), Swiss National Science Foundation (SNSF), Swiss Federal Department of Foreign Affairs, German Technical Cooperation GTZ, Syngenta Foundation for Sustainable Agriculture (SFGA), United Nations (UNOPS, UNDP, UNFPA, UNMIS, UNMEE) and other bilateral and international agencies

Local disaster risk management

This consultancy package is related to mountain development. It comprises the following elements:

Workshop Guidelines for awareness building and training activities: These guidelines are designed for workshop moderators and include descriptions of exercises and practical work as well as thematic sheets relating to different aspects of the Local Integrated Disaster Reduction Approach.

Elaboration of a simulation game as a training tool: The simulation game is an integral part of the package. It enables workshop participants to get acquainted with the essentials of the approach, concept, and tools relating to integrated local disaster risk management. The game elaborates on the links between causes and consequences of natural disasters.

Training of moderators in awareness building and training of local communities: This optional didactic tool provides moderators with an introduction to the principles of adult education and presents a range of active learning methods.

Conception of a mobile exhibition including a movie (in preparation): This tool aims at information sharing and awareness building at the village level. It comprises an "information tent" to host the itinerant exhibition, which can be moved from one village to the next. Basic information is provided by posters, flyers and a movie relevant for village communities including schools.

Contact people: Ernst Gabathuler, Centre for Development and Environment (CDE), Steigerhubelstrasse 3, 3008 Bern, Switzerland, ernst.gabathuler@cde.unibe.ch, phone: +41 31 631 88 22, fax: +41 31 631 85 44

Partners : Central Asian Mountain Partnership Program (CAMP), Bishkek (Kyrgyzstan) and Dushanbe (Tajikistan)
Disaster Reduction Programme for Central Asia, Swiss Agency for Development and Cooperation (SDC), 20 Pavlova Street, Dushanbe, Tajikistan.

Hallerstrasse 12, 3012 CH-Berne, Tel. +41 (0)31 631 8884, Fax +41 (0) 31 631 8511

RESEARCH

- Climate Dynamics (variability and trend analysis of Alpine precipitation, paleoclimate variability and extreme events, flood frequency analysis and public risk management in a historical perspective)
- Hydrology (Methods and models for flood estimation)
- Applied geomorphology (natural hazard and risk assessment, risk perception and appraisal)
- North-South issues (syndromes of global change, pressures on different resources (human, natural, economic), and of the responses of different social groups and society as a whole.

TYPES OF DISASTER

Hydrometeorological and geological (gravitational)

CONTACT PEOPLE

Climate Dynamics:

- Prof. Dr. Heinz Wanner, Prof. Dr. Martin Grosjean, Dr. Jürg Luterbacher (<http://www.giub.unibe.ch/klimet/index.html>)
- Prof. Dr. Christian Pfister (Philosophisch-historische Fakultät, Historisches Institut, Abteilung für Wirtschafts- Sozial- und Umweltgeschichte, <http://www.wsu.hist.unibe.ch/index.php?id=194>)

Hydrology / Soil hydrology:

- Prof. Dr. Rolf Weingartner (<http://hydrant.unibe.ch>)
- Prof. Dr. Peter Germann (<http://sinus.unibe.ch/boden/>)

Applied geomorphology and natural risks (AGNAT)

- Prof. Dr. Hans Kienholz (<http://www.naturgefahren.ch/index.php?userhash=7340312&l=e&navID=156>)

North-South issues

- Prof. Dr. Hans Hurni, Prof. Dr. Urs Wiesmann, Dr. Thomas Kohler (<http://www.cde.unibe.ch>)

NATIONAL PROJECTS

The management centers of two NCCR's (National Centers of Competence in Research) are affiliated at the Geographical Institute of the University of Berne:

- NCCR Climate (<http://www.nccr-climate.unibe.ch/>)
- NCCR North-South (<http://www.nccr-north-south.unibe.ch/>)

INTERNATIONAL PARTICIPATION

See websites as mentioned above.

RESEARCH NETWORKS

See websites as mentioned above

EDUCATION

Courses offered	Geography. See: http://www.giub.unibe.ch/e/
Level	Bachelor / Master

CONSULTING

All the above mentioned are occasionally working also as consultants in their fields.



Human Geography / Urban and Regional Studies

Klingelbergstrasse 27, CH-4056 Basel, Phone : + 41 61 – 267 36 45; <http://www.humgeo.unibas.ch>

RESEARCH

Urban Social Geography : Urban and Metropolitan Area Development, Urban Policy. **Economic Geography** : Regional Economic Development, Economic Development Strategies. **Developing Countries and Development Strategies**

Types of disaster

Natural disaster: geological (earthquakes), hydrological (tsunamis) Impact of natural disaster on livelihood and relief measures;

Livelihood affecting risks: pertaining to the poor supply of sanitary housing and related health risks

Society at risk (Risikogesellschaft): Socioeconomic and demographic developments in emerging and mature economies

Specialised skills

GIS-based research:

GIS-maps as quasi-cadastral base survey of slums communities. GIS-maps of socio-economic, demographic and environmental factors that determine health and well-being

Research projects (selected)

National projects:

Society at risk – Examples of past projects

- Social welfare – development, dimension, structure and spatial aspects in Basel
- Infrastructure for the elderly in the Canton of Basel-City
- Sociospatial inequalities in the housing market – the example of Basel, Switzerland.
- Housing for the Elderly – Preferences of senior citizens concerning housing and neighbourhood development.

International projects :

Impact of Natural Disasters on livelihoods

1. GIS-Based Slum Monitoring for Mitigating Poverty, Vulnerability and Disease in Urban Slums.

Empirical research on post earthquake slum development in the cities of Ahmedabad and Bhuj, Gujarat, India; results and tools transferable to other metropolitan areas of developing countries. Metropolitan areas have a key role in the world-wide process of urbanisation and are also global risk areas due to demographic, social, political, economic and ecological processes, and poorly coordinated administration and planning. Because of the high proportion of slum dwellers among the urban population, the problems of urban poverty areas deserve special attention. The objectives of this research partnership are to contribute to improving living conditions in urban poverty areas, minimizing and preventing risks (pertaining to the poor supply of sanitary housing and related health risks), giving the most vulnerable/slum dwellers a voice in the issues of slum upgrading and identifying factors that assist in moving people out of urban poverty.

Partner: All India Disaster Mitigation Institute (AIDMI), Gujarat, India, www.southasiadisasters.net In cooperation with: National Centre of Competence in Research (NCCR) North-South; The Government of Gujarat Labour and Employment Department; The Gujarat State Disaster Management Authority; The Bhuj Collectorate; The Bhuj Area Development Authority.

2. Determinants of health risks in urban quarters of Nouakchott, Mauritania

The objective of the study is to contribute to the amelioration of the environmental and sanitary situation of the disadvantaged people in the City of Nouakchott, with a special attention to Malaria and tuberculosis.

Partner: Swiss Tropical Institute; in cooperation with:

National Center of Competence in Research (NCCR) North-South; Fonds National de la Recherche Scientifique (FNS) ; Direction du Développement et de la Coopération suisse (DDC) ; JACS Afrique de l'Ouest

Contact people

Prof. Dr. phil. R. Schneider-Sliwa, Head of the department. please refer to www.humgeo.unibas.ch for individual profile.

<p>Research networks</p> <p><i>North South Research Partnership</i> Basel University's Geography Department and the All India Disaster Mitigation Institute (AIDMI) have signed a memorandum of understanding on a joint research cooperation. This focuses on building up geographic information systems and subsequent social science research on the determinants of poverty or well-being in urban slums, as a first step of a long term joint monitoring project on slum-recovering at Bhuj/India. The partnership solves a problem of AIDMI's efforts in mapping slums and the ongoing GIS-based social monitoring of slum communities in Ahmedabad and Bhuj. The inventory, documentation and analysis of housing patterns using satellite- and GIS-assisted methods combined with a detailed social science survey on socio-economic, demographic and environmental factors will support Urban Community- and Community Consultation Reports and find tools for moving people out of urban poverty. The results from this applied research will directly feed back to local NGO's, local urban planning agencies and various governmental agencies that have needs for base line information in planning.</p> <p>Reference works SCHNEIDER-SLIWA R. & M. BHATT: Recovering slums (forthcoming 2006) (Please refer to the research databank of the University of Basel : www.forschungsdatabank.unibas.ch)</p> <p>Internet sites, links www.humgeo.unibas.ch www.southasiadisasters.net www.forschungsdatabank.unibas.ch</p>

EDUCATION

Courses offered	<ol style="list-style-type: none"> 1. Study tour India - mitigation research focus by Prof. Dr. phil. habil. R. Schneider-Sliwa 2. Geography of developing countries – poverty as escrow issue by Prof. Dr. phil. habil. R. Schneider-Sliwa 3. Der Mensch im Zentrum der globalen Umweltproblematik by Prof. Dr. phil. H.-G. Bohle 4. Developing Countries – poverty and urban risk issues by Prof. Dr. phil. habil. R. Schneider-Sliwa
Level	Introductory, intermediate
Description	<p>The students will be able to learn how mitigation research is organized in Gujarat and what can be done (or is done) by NGO's and the Government on the other side.</p> <p>Academic partners: Prof. Dr. phil. H.-G. Bohle, University of Bonn, Germany</p>
Other information	University of Basel, Department of Environmental Sciences, Human Geography/ Urban and Regional Studies, Klingelbergstrasse 27, CH-4056 Basel, Phone: 061 267 36 45

CONSULTING

<p>Consulting in GIS-use for spatial illustration of social science surveys in slum communities Partners : All India Disaster Mitigation Institute (AIDMI) in India</p>
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Swiss Federal Institute for Snow and Avalanche Research

Fiche 11

Research Unit Warning and Prevention

SLF, Flüelastrasse 11, CH-7260 Davos Dorf, Phone : +41 81 – 417 01 51 (Jakob Rhyner)

RESEARCH

Forecast and warning Systems, Natural hazard protection systems, Integral risk management, Electronic information platforms

Types of disaster

Avalanches, Small catchment hydrological hazards

Specialised skills

Operational forecast and warning systems, Forecast models, Snowcover modelling, Risk analysis and evaluation methods, Observation and measurement networks, Training and education

Description

Research unit «Warning and Prevention» is responsible for :

- the Swiss avalanche warning system, with daily forecasts in normal and early warnings imminent critical situation
- further development of forecast and warning procedures
- development of forecast and warning systems for hydrological hazards in small catchment areas
- research on technical protection measures, support and guidelines for practitioners
- research and application of risk analysis and management methods

Research projects

- ASSIST (EU, 5 partners): Alpine Safety, Security & Informational Services and Technologies
- IRASMOS (EU, coordinated by SLF, 8 partners): Integral Risk Management for Extremely Rapid Mass Movement
- SARFOS (ESA, 2 partners): Search And Rescue Forward Operation Support System
- Avalanche Warning Switzerland

Research networks

- Networks created by EU projects
- Strong links world wide to snow and avalanche research institutions (France, Norway, USA, Canada, India, Japan, etc)
- Collaborations with Swiss and foreign universities

Profile of researchers

Natural Scientists, geographers and engineers with strong drive to connect research and practice

Reference works

Avalanche Warning Switzerland, pilot projects for hydrological warning systems in Swiss cantons of Valais and Glarus, numerous guidelines

Internet sites, links

www.slf.ch

www.slf.ch/iramos

<http://www.assist-gmes.org>

OTHER ACTIVITIES

Coordinating the working group of the European Avalanche Warning Services

Department Snow Avalanches, Debris Flows and Rockfalls
 SLF, Dr. Perry Bartelt, Flüelastrasse 11, 7260 Davos Dorf, Switzerland
 081-417-0251 (Telephone); 081-417-0111 (Fax)

RESEARCH

Gravitationally driven rapid mass movements.

Types of disaster

Snow avalanches, debris flows, rockfalls and rock slides

Specialised skills

Field scale experimental observations of rapid mass movements, numerical modelling of snow avalanches, debris flows and rockfalls in three-dimensional terrain, field observations, tree mechanics and protective forests, GIS, avalanche dams, granular (small scale) chute experiments.

Description

The Research Unit investigates the formation, movement and deposition of these three complex geophysical processes to support the development of sound engineering and economically feasible defense strategies. Snow avalanches, debris flows and rockfalls are rapid, gravitationally driven mass movements that threaten mountain communities in Switzerland and throughout the world. The scientific research themes of the unit are:

- To develop and employ state-of-the-art sensors at field scale observations stations to experimentally identify the important flow characteristics of these movements.
- To elaborate physical theories describing the granular, multiphase rheology including the complex interaction with the terrain.
- To numerically model snow avalanches, debris flows and rockfalls. Models are validated using field scale measurements and laboratory experiments.
- To formulate frequency/magnitude relations describing the starting conditions of catastrophic events. These relations are introduced into hazard mapping procedures.
- To investigate the interaction of these movements with mountain forests and man-made defense structures such as avalanche dams and rockfall barriers.

Research is driven by our close interaction with practitioners to facilitate the application of new methodologies and guidelines in natural hazard analysis.

Stakeholders are mainly in the scientific community, integral risk managers at local and federal agencies and in private consulting companies.

Research projects

On going research projects include :

1. **Debris flow observations:** A special purpose experimental observation site—Illgraben -- is maintained to gather information concerning debris flow rheology, including basal normal and shear stresses, pore water pressure and velocities.
2. **Debris flow modelling.** Two-phase depth-averaged debris flow model is being developed with the help of experimental observations in Illgraben.
3. **Snow avalanche observations:** The unique experimental test site Vallée de la Sionne is instrumented with velocity, pressure and density sensors that capture flow behaviour of avalanches. Videogrammetric and photogrammetric measurements of large dens and powder snow avalanches.
4. **Snow avalanche impact pressures:** Hazard mapping requires accurate estimates of avalanche impact pressures, depending on avalanche flow regime and type.
5. **Snow avalanche basal shear stresses:** Chute experiments are performed to formulate constitutive relations for the basal shear stresses of flowing avalanches.
6. **AVAL-1D :** The highly successful avalanche dynamics software is used world-wide to predict flowing and powder snow runoff distances.
7. **RAMMS:** An integrated software package for rapid mass movements in complex three dimensional topography. Modules for snow avalanches, debris flows and rockfalls exist.
8. **Snow avalanche dam interaction.** Protective measure often involve the interaction with defense structures. This project investigates how to dimension avalanche dams.
9. **Dust clouds** of rapid mass movements. Rock and snow avalanches are often accompanied by dust clouds. This project investigates how these clouds form and how fast they move.
10. **Tree-avalanche-rockfall interaction.** Protective forests should stop rockfalls and avalanches – this project determines the energy absorption capacity of trees and the usefulness of protective forests.
11. **Wire nets for rockfall and debris flow protection.** Wire nets are an efficient protective device against rockfalls and debris flows. This industry sponsored project works on improving the capacity of these devices.
12. **Hazard mapping:** Snow avalanche, debris flow and rockfall hazard mapping.

Research networks

The research group is embedded in two large research networks:

CES: The ETH Switzerland Competence Center for Environment and Sustainability

RNVO: The French Savoy (Grenoble, Lyon, Aix-les-Bains) based research network dealing with natural hazards

Intensive bilateral work is performed with Montana State University (Prof. Ed Adams), Cornell University (Prof. M. Louge), Cambridge (Dr. J. McElwaine), SASE (Indian Snow Research Establishment, Chandigarh), Austrian Snow Research (Innsbruck) and most of the northern Italian regional snow research groups.

Profile of researchers

1. Dr. P. Bartelt (Civil engineering, numerical modelling, geophysics)
2. M. Christen (Civil engineering, computer programming)
3. F. Dufour (Civil engineering, experimental observations)
4. W. Gerber (Civil engineering, field analysis)
5. C. Graf (Geography, field analysis)
6. D. M. Kern (Experimental physics)
7. Dr. O. Korup (Geography, geophysics)
8. Dr. B. McArdell (Geology, river hydrology, field observations)
9. Dr. B. Sovilla (Hydrodynamics, experimental geophysics)
10. Dr. A. Volkwein (Civil engineering, numerical modelling)

Reference works

1. Sovilla, B., P. Burlando and P. Bartelt, 2006. Field experiments and numerical modelling of mass entrainment in snow avalanches, *J. of GEOPHYS. RES.*, 111.
2. Korup, O., 2006a. Rock-slope failure and the river long profile. *GEOLOGY*, 34, 45-48.
3. Korup, O., 2006b. Effects of deep-seated bedrock landslides on hillslope morphology, Southern Alps, New Zealand. *J. Of GEOPHYS. RES.* 111, F01018, doi:10.1029/2004JF000242.
4. Bartelt, P. Buser, O. (2004) The principle of minimum entropy production and snow structure, *JOURNAL OF GLACIOLOGY*, 50 (170), 342- 352.
5. Kern, M. F. Tiefenbacher and J. McElwaine. (2004) The rheology of snow in large chute flows, *COLD REGIONS SCIENCE AND TECHNOLOGY*, 39 (2-3), 181-192.
6. Bartelt, P. Buser, O. Sokratov, SA. (2004) A nonequilibrium treatment of heat and mass transfer in alpine snowcovers, *COLD REGIONS SCIENCE AND TECHNOLOGY*, 39 (2-3), 219-242.
7. Turnbull, B, Bartelt, P. Mass and momentum balance model of a mixed flowing/powder snow avalanche, *SURVEYS IN GEOPHYSIS*, 24(5-6) 465 – 477
8. Bartelt, P., Lehning, M. (2002) A physical SNOWPACK model for the Swiss avalanche warning Part I: numerical model, *COLD REGIONS SCIENCE AND TECHNOLOGY*, 35 (3), 123 - 145.
9. Bartelt, P. Stockli, V. (2001) The influence of tree and branch fracture, overturning and debris entrainment on snow avalanche flow. *ANNALS OF GLACIOLOGY*, 32, 209 – 216.
10. Bartelt, P. Buser, O. (2001) Avalanche physics ploughs ahead, *PHYSICS WORLD*, 14(3), 25- 29.
11. Bartelt, P, Salm, B, Gruber, U. (1999). Calculating dense-snow avalanche runout using a Voellmy-fluid model with active/passive longitudinal straining, *JOURNAL OF GLACIOLOGY*, 45(150), 242-254.

Research Unit Snow and Permafrost

SLF, Flüelastr. 11 CH-7260 Davos Dorf

RESEARCH**Snow cover and micrometeorology, Snow physics, Snow avalanches, Formation of alpine natural hazards, Snow climatology, Permafrost, Snow sports, mobility on snow****Types of disaster**

Snow avalanches, Debris flows, Floods, Slope instabilities, Permafrost degradation

Specialised skills

Modelling, measuring snow microstructure, fluid dynamics, wind tunnel technology, monitoring of weather and snow, slope stability evaluation, statistics, hazard prediction, climate assessment, engineering in permafrost, GRID technology

Description

This Research Unit investigates the physical properties of snow, soil and permafrost and the surface exchange with the atmosphere in order to understand: a) the formation of natural hazards such as avalanches, floods and slope instabilities; and b) the interaction of the cryosphere with climate change.

Micro-structural snow research provides a basis for understanding the macro-level behaviour of snow cover, such as avalanche formation, water transport and snow interaction with vehicles and sport tools. This research contributes, therefore, to our understanding of the influence of snow and wet or frozen soil on natural hazard generation and on the earth's climate, and of how global climate change affects alpine permafrost.

The experimental methodologies employed by this Research Unit range from using laboratories (CT-Scanning, wind tunnel, shear box) to field-scale test sites. A primary output of this research is to improve current community models for climate change analysis and warning applications and to create new models.

New techniques to measure and document the natural snow stratigraphy and its physical properties are developed using the SnowMicroPen and near-infrared photography.

New methods to measure the gliding performance of different materials on snow.

Research projects

Spatial statistics of extreme events
Boundary layer wind field over snow and in mountains
Avalanche Formation
Multi-scale spatial variability of snow mechanical properties
Triggering of instabilities
Development of a physical model of Alpine surface processes
Model support for operational avalanche warning
Infrastructure in Alpine permafrost
Permafrost and climate
Active layer stability
Gliding on Snow

Research networks

The Unit has its partners and stakeholders in the warning and local safety services, the cryospheric scientific community, industry and sport association. It collaborates with Institutes from EPFL and ETHZ, meteorological and engineering and sport university institutes worldwide, research organizations and the high performance computing community

Profile of researchers

Physicists, Engineers, Meteorologists, Geographers, Geophysicists

Reference works

Lehning, M., 2005. Energy Balance and Thermophysical Processes in Snowpacks, M.G. Anderson (ed.). Encyclopedia of Hydrological Sciences, *John Wiley & Sons, Ltd*, ISBN: 0-471-49103-9, 2475-2490.

Lehning, M., Wilhelm, C., 2005. Integral Risk Management and Physical Modelling for Mountainous Natural Hazards, in Albeverio, S., Jentsch, V., Kantz, H., eds. "Extreme Events in Nature and Society", *Springer*, 349 pp.

Latenser, M. and M. Schneebeli, 2003: Long-term snow climate trends of the Swiss Alps (1931-99). *International Journal of Climatology*, 23, 733-750.

Schweizer, J., Jamieson, J.B. and Schneebeli, M., 2003. Snow avalanche formation. *Reviews of Geophysics*, 41(4): 1016, doi:10.1029/2002RG000123.

Schneebeli, M. and Bebi, P. Hydrology: Forest and Snow and Avalanche Control: pp 397 – 402 In: Burley, J., J. Evans and J. A. Youngquist (Eds.) *Encyclopedia of Forest Science*. Elsevier, London. 2004.

M. Fauve, H.U. Rhyner, M. Schneebeli: Preparation and maintenance of pistes. Handbook for practitioners. (available also in German and French), Davos, 2002

Internet sites, links

www.slf.ch/research/schneep-en.html



Materials Science & Technology

EMPA

Department of Information, Reliability and Simulation Technology

Fiche J1

Structural Engineering Research Laboratory

Ueberlandstrasse 129, CH-8600 Duebendorf, Phone : +41 – 44 – 823 55 11

RESEARCH

Seismic assessment and retrofitting of existing structures. Development of structural health monitoring (SHM) systems

Types of disaster

Earthquake, Wind

Specialised skills

- Application of advanced materials and technologies for repair and seismic upgrading of existing structures
- Development of wireless sensor networks and smart seismic accelerometers for structural health monitoring
- Ability to conduct large scale static and dynamic laboratory as well as field tests

Description

A large number of existing structures around the world have been built prior to the establishment of the modern seismic codes. Therefore most of these structures are not able to resist moderate or major earthquakes. The first step toward the upgrading of seismic deficient structures is the assessment and identification of their dynamic behavior. The Empa Structural Engineering Laboratory performs laboratory and field tests on bridges and masonry buildings using large scale servo-hydraulic jacks to excite the structures and measure their behavior using different types of sensors. After identifying the structure, appropriate seismic upgrading techniques shall be applied to retrofit the structure. Empa is one of the world leaders in applying advanced fibre composites to strengthen structures. Empa is currently investigating the application of post-tensioned fibre composites as an innovative technique to enhance the seismic capacity of structural elements such as reinforced concrete columns and masonry walls. The performance of the upgraded structures, as well as the assessment of crucial infrastructure after a seismic event is a major challenge. The main question to be answered after a moderate and major earthquake is 'has the mechanical behavior of the structure changed? Are there any damages? Where are the damages? What is the remaining resistance of the structure? Visual inspections are necessary, but in no way enough to answer all the above-mentioned questions. Empa is developing economically viable wireless sensor networks to be integrated in structures to monitor the behavior of structures before and after a seismic event.

Research projects

Seismic retrofitting of masonry walls using post-tensioned systems. Seismic retrofitting of reinforced concrete columns using advanced fibre composite materials and post-tensioned systems. Dynamic characterization of existing masonry building using forced and ambient vibration tests. Low power wireless sensors network for monitoring of civil structures. Smart sensors for seismic and structural health monitoring in civil engineering. Distributed mitigation of wind-induced vibrations in long-span bridges. Optimal vibration control of large civil structures under seismic excitation. Sustainable bridges: Assessment for future traffic demands and longer lives (EU FP6 integrated project).

Research networks

- European SAMCO Network (Structural Assessment, Monitoring and Control)
- ISHMII (International Structural Health Monitoring of Intelligent Infrastructures)
- Empa-ETHZ (IBK) Centre of Intelligent Load Bearing Systems

Profile of researchers

Masoud Motavalli : Professor, Phd, Civil Engineer, expert in advanced composite materials, seismic assessment and retrofitting of existing structures
Glauco Feltrin : Phd, Civil Engineer, expert in structural dynamics, wireless sensor networks, adaptive structures. Felix Weber : Phd, Mechanical Engineer, expert in structural control. Daniel Gsell : Phd, Civil Engineer, expert in structural dynamics, wave propagation. Andrea Bergamini : Material Science Engineer, expert in non-destructive testing, adaptive materials. Christoph Czaderski : Civil Engineer, expert in post strengthening of existing reinforced concrete structures. Kerstin Pfyl: Phd, Civil Engineer, expert in seismic evaluation of masonry buildings. Ann Schumacher: Phd, Civil Engineer, expert in fatigue of steel structures

Internet sites, links

www.empa.ch/abt116

OTHER ACTIVITIES

Controllable magneto-rheological dampers. Adaptive tuned mass dampers. Iron based shape memory alloys (SMA) for applications in structural engineering. Tuneable sandwich structures. Monitoring and inspection of bridge cables. Dynamic characterisation of layered wood panels. Vibration and wave propagation based damage identification of mechanical structures.

Technology and Society Lab

Lerchenfeldstr. 5, 9014 St-Gallen, Peter Wick. Tel. +41 – 274 75 00

- ICT and Converging Technologies: Prof. Dr. Lorenz Hilty, Phone +41-71-274 73 45
- Nanotechnology: Claudia Som, Phone +41-71-274 78 43
- New Energy Systems, Mobility: Dr. Rainer Zah, +41-71-274 78 49

RESEARCH**Technological Risk Assessment, Innovation and Technology Analysis, Sustainability Impact Assessment, Precautionary Principle****Types of disaster**

Emerging environmental, health and societal risks caused by new technologies:

- ICT: Information and Communication Technology
- Nanotechnology
- New energy systems
- Converging Technologies

Specialised skills

Qualitative risk assessment, Life Cycle Assessment, Socio-Economic Modeling

Description

The Technology and Society Laboratory analyses the impacts of technological developments on society and the environment. Our work is intended to contribute to sustainable development and to help society to optimally exploit the opportunities offered by new technologies and to minimize their risks at an early stage of development. Interdisciplinary team of 25 researchers.

Research projects

- Risks and Opportunities of RFID applications
- The Precautionary Principle in the Information Society / Impacts of Pervasive Computing
- Nanorisk : Safety and Risks of Carbon Nanotubes
- Nanohealth: Public Perception of Opportunities and Risks of
(1) Engineered Nanoparticles (2) Neural Implants
- Nanologue: Facilitating the Dialogue between Research, Business and the Civil Society
- Sustainability Impacts / Socio-economic Impacts of Biofuels

Research networks

TA-Swiss (Bern), ETH (Zürich), PSI (Villingen), IZT (Berlin), ITAS (Karlsruhe), FFRC (Turku/Helsinki), IPTS (Sevilla), ISO-TC229 Nanotechnology, International Nanotechnology and Society Network, ICON/CBEN (US)

Profile of researchers

Interdisciplinary team (Environmental Sciences, Geography, Biology, Chemistry, Physics, Engineering, Computer Science, Social Sciences).

Reference works

Hilty, L.M, Behrendt, S., Binswanger, M., Bruinink, A., Erdmann, L., Froehlich, J., Köhler, A., Kuster, N., Som, C., Wuertenberger, F.: 2005, The Precautionary Principle in the Information Society – Effects of Pervasive Computing on Health and Environment, Second Revised Edition. Edited by the Swiss Center for Technology Assessment (TA-SWISS), Bern, Switzerland (TA46e/2005) and the Scientific Technology Options Assessment at the European Parliament (STOA 125 EN), available at:

http://www.empa.ch/plugin/template/empa/*136234/--/l=2

Hilty L., Som C., Köhler A.: Assessing the Human, Social and Environmental Risks of Pervasive Computing, Hum. Ecol. Risk Assess., Vol. 10, No. 5, pp. 853-874

Internet sites, links

www.empa.ch/tsl

Electronics / Metrology / Reliability Laboratory

Ueberlandstrasse 129, CH-8600 Duebendorf, Phone : +41 44 – 823 41 73, urs.sennhauser@empa.ch

RESEARCH

Microelectronic and optical components and systems, telecommunication networks, interconnection technologies, power electronics, nanoelectronics, -photonics, and -systems

Types of disaster

Technical / industrial risks. Critical infrastructure system failures.

Specialised skills

Reliability, risk, safety and failure analysis, assessment, modelling, and testing of technical components, systems, networks and infrastructure
Infrastructure monitoring, remote sensing, non-destructive evaluation (X- and N-rays, ultra sound, optical, infrared, etc.)

Research projects

- Reliability, availability, and maintainability of optical communication networks
- Reliability and safety of nanostructured materials and devices
- Dependability of sensors and long term monitoring systems (e.g. for bridges and power dams)
- Reliability of leadfree solders (required by RoHS for electronic products, effective July 1, 2006)

Research networks

- COST Action 270 Reliability of Optical Components and Devices in Communications Systems and Networks
- ELFNET European Lead Free Network, network of excellence EU frame work 6
- Nanoreliability Network (EU registered network)
- EMPA reliability pool (including about 20 major companies)

Profile of researchers

Physicists, materials scientists, electrical and mechanical engineers

Internet sites, links

www.empa.ch/abt173; www.cost270.com; www.europeanleadfree.net; www.aramis-research.ch/d/12067.html ;

OTHER ACTIVITIES

Teaching at ETH Zurich: "Reliability of devices and systems" and "Physics of failure and failure analysis of electronic circuits"

Lab of Materials – Biology Interactions

Lerchenfeldstr. 5, 9014 St-Gallen, Peter Wick. Phone : +41 71 – 274 76 84, Arie Bruinink, Phone : + 41 71 – 274 76 95

RESEARCH

Related to disaster research: Nanotoxicology

Types of disaster

Exposition to nanomaterials

Specialised skills

Molecular biology, cell-biology, in vitro toxicology (See for more information: www.empa.ch/matismed)

Description

In the field of nanotoxicology: The aim of our research in this field is to elucidate the toxicomechanisms of nanosized materials, to define critical parameters (of the nanosized materials as well as biological parameters to detect the effects) and to estimate the in vitro no adverse effect level of the materials tested. For this we are investigating the effects of different highly defined nanosized materials in vitro using different cell types. As parameters to describe effects on cell functionality we take cell proliferation (DNA content), cell energy state (MTT-conversion), the quantity of reactive oxygen species and cell migration. Furthermore, the effect on gene activity and synthesis of specific proteins are assessed.

Research projects

In the field of nanotoxicology:

- 6. Fp Eu Project CANAPE Workpackage Health effects.
- Nanorisk. A joint project between CTI, BAFU, BAG and Empa.
- Neuro-CNT-tox: Empa internal project
- Nanotox: Informal project with ETHZ

Research networks

Within the frame of the 6.FP EU project CANAPE especially the partners related to part health: Prof S. Roth and Dr. U. Dettlaff of the Max Planck Inst Stuttgart, D; Prof. P. Poncheral and Dr. S. Fiorito of Uni Montpellier (F):

Within the Nanorisk project: C. Som, A. Helland and L. Hilty of the Empa section Technology and Society

Within Nanotox: Prof. W. Stark and his team, Inst. Chem./Bioing. Sci., ETHZ

Profile of researchers

The cell-biology team of the section Materials – Biology Interactions consists of 5 academics, 4 lab technicians and several diploma thesis students. Dr. A. Bruinink, the head of this team, is a registered toxicologist and expert in pharmacology, toxicology and cell biology. He is currently co-ordinator of one (CellForce) and WP-leader of another FP6 EU project (Canape: Part in vitro health effects). In addition, he is coordinator of the CTI-BAG-BAFU-Empa project Nanorisk.

He and his collaborators have published numerous papers in the field of neuropharmacology, toxicology, and cell materials interactions (A. Bruinink 38 peer reviewed publications, 12 book chapters, 5 short communications and 3 patents). P. Wick is the project leader of the FP6 Canape Project and an expert on nanotoxicology. K. Maniura is an expert on mitochondrial biology. S. Weigel an electrophysiology and J.P. Kaiser an expert on cell migration. The main theme of the team is to investigate cell-materials interactions. The team has 2 fully equipped cell culture labs to work with primary human cells (including the transfection equipment for introducing Fluorescent Protein gene constructs as reporter for activity of specific genes), a fully equipped molecular biology lab, including quantitative real-time PCR, 2-D gel electrophoreses and analysis system, a fully equipped electrophysiology lab for measuring nerve cells activity using the patch clamp technology, two adapted CLSM for long-term cell culture (migration) monitoring and an flow-cytometer.

Internet sites, links

www.empa.ch/matismed

OTHER ACTIVITIES

Several other activities are presently going on in the team (see webpage):

- Cell-surface interactions. The goal here is to elucidate and define critical surface features that affect cell functionality and migration in order to design knowledge-based implant surfaces. Furthermore, we are interested in forces of the cell that are transduced to the substratum (6. FP project Cellforce).
- Neuroimplants. The goal is to define a chip to analyse nerve cell activity of single motoneuron axons as a base to design neuroimplants and neurotox biosensors.



Mountain Hydrology and Torrents

Zürcherstrasse 111, 8903 Birmensdorf, Switzerland, Phone: +41 44 739 24 72 (Manfred Stähli)

RESEARCH

Hydrological processes in mountain areas; hill-slope hydrology, erosion and landslides, bedload and dead-wood transport in torrents, snow hydrology, runoff modelling, analysis of hydrological extreme events

Types of disaster

floods, landslides, bedload redistributions

Specialised skills

hydrological modelling, soil physics, soil mechanics, protective measures against slope instabilities and bedload transport

Description

The Research Unit investigates hydrologic processes in mountainous catchments and related processes resulting in floods, erosion, slope instabilities and sediment transport. Further, it examines impacts and needs with regard to protective measures. The unit studies the generation and propagation of surface and subsurface runoff, surface erosion, shallow landslides, sediments and woody debris as well as the interaction of these processes. A particular focus of the unit is on snow hydrology. Process studies on the scale of channels and catchments also form the basis for the development of simulation models and of hazard assessment procedures and for the design of countermeasures, including investigating the protective function of various vegetation covers (eco-engineering). Damage and damaging processes due to frequent and extreme events are assessed as prerequisites for the risk-based and sustainable management of natural hazards.

Principal stakeholders: scientific community, federal and local agencies and professional engineers in Switzerland and abroad.

Research projects

- Analysis of the flood event of August 2005 in Switzerland (together with Federal Office for Environment)
- Operational flood forecast system for the Yangtze-river (China) and the Canton of Glarus (Switzerland)
- TRAMM-Triggering of rapid mass movements (ETH-Competence Centre of Environment and Sustainability)
- Longterm hydrological measurements in a subalpine catchment

Research networks

ETH-Competence Centre of Environment and Sustainability (CCES); personnel connections with hydrologists in Switzerland and Europe (Sweden); EU research projects (AWARE, GALAHAD)

Profile of researchers

environmental physicists, geographer, geomorphologists, numerical modellers, GIS- and data base experts

Internet sites, links

www.wsl.ch

http://www.wsl.ch/forschung/forschungunits/gebirgshydrologie/index_EN

Appendices

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