



Policy Issues in Insurance

Financial Management of Large-Scale Catastrophes

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Foreword

The growing impact of major disasters on OECD and non-member economies has stimulated a demand for an in-depth evaluation of possible strategies to reduce their large-scale damaging effects. Dramatic events such as the devastation caused by Hurricane Katrina in the United States in 2005, and the earthquake that struck China's Sichuan Province in 2008, have brought the financial management of catastrophic risks once again to the forefront of the public policy agenda globally.

Are governments in developed and emerging countries adopting efficient strategies to manage the increasing financial burden of catastrophes? What are the roles and responsibilities of key stakeholders in the public and private sectors in the management of disaster risks and costs? How best to prepare for the unprecedented challenges posed by large-scale risks?

To address these issues and develop sound policies, the OECD established an International Network on the Financial Management of Large-Scale Catastrophes. Under the guidance and intellectual leadership of a High-Level Advisory Board, the Network promotes the exchange of information and experiences among policymakers, industry, and academia in OECD and non-member countries.

This publication supports the ongoing activities of the Network. It contains three main parts:

- Part I: *Policy Approaches to the Financial Management of Large-Scale Disasters*, by Alberto Monti. This Part provides a comparative review and stocktaking of different policy strategies and approaches with respect to the prevention, mitigation, and financial compensation of large-scale catastrophes in OECD and selected non-member Asian countries, drawing from the results of data collection activities pursued by the OECD in the recent years. It discusses, in particular, the approaches adopted by governments regarding financial coverage against disaster risks, and the respective roles of the public and private sectors in providing compensation and incentives to reduce the risk of catastrophic losses.

- Part II: *Reducing the Impact of Natural Disasters: The Insurance and Mitigation Challenge*, by Howard C. Kunreuther and Erwann O. Michel-Kerjan. This Part focuses on the new scale of destruction from natural disasters witnessed in recent years, its impact on disaster insurance and the challenges and opportunities for utilizing mitigation measures to reduce future losses. It discusses the role of cost-benefit analysis in evaluating the effectiveness of mitigation measures and characterizes why people do not always voluntarily invest in cost-effective mitigation measures. The report concludes by proposing the development of a new insurance product: the use of long-term insurance contracts for encouraging the adoption of measures that have the potential to reduce economic and human losses from large-scale disasters.

- Part III: *Coping with Non-Conventional Crises: Strategic Leadership in a Chaotic World: Some Guideposts*, by Patrick Lagadec and Xavier Guilhaou. This Part consists of an analysis of specific operational strategies and programmes for the prevention and management of non-conventional crises, and provides useful guidance for policy action for an improved management of risks. Its intent is to clarify the general terrain on which the major crisis issues of today need to be considered and managed, to identify some strategic points of reference, and to suggest the dynamics that must be engaged to consolidate the capacities of our decision-making systems.

The OECD has produced several publications to date on large-scale catastrophes, including “Catastrophic Risk and Insurance” (2005), “Terrorism Risk Insurance in OECD Countries” (2005), “Large-scale Disasters: Lessons Learned” (2004), “Environmental Risks and Insurance: A Comparative Analysis of the Role of Insurance in the Management of Environment-Related Risks” (2003), and “Emerging Risks in the 21st Century. An Agenda for Action” (2003).

This publication has been prepared with the assistance of Timothy Bishop and Nina Paklina from the OECD Financial Affairs Division, and with technical support from Sophie Saltre and Edward Smiley.

The views expressed in this publication are the sole responsibility of the authors and do not necessarily reflect those of the OECD and its member countries.

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Part I

**POLICY APPROACHES TO THE FINANCIAL MANAGEMENT
OF LARGE-SCALE DISASTERS**

Alberto Monti*

The global economic and financial impact of natural catastrophes and man-made disasters, both accidental and intentional, has dramatically increased over the past decades, and the trend is towards higher degrees of vulnerability and exposure, leading to larger losses. Governments in OECD and non-member economies have taken very different policy approaches to manage the increasing financial burden of catastrophes, and the situation is rapidly changing in several countries. This Part provides a comparative review and stocktaking of different policy strategies and institutional approaches to the financial management of large-scale disasters in selected OECD and non-member Asian countries drawing, inter alia, from the results of data collection activities pursued by the OECD in the recent years.

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INTRODUCTION

This section of the publication provides a comparative review and stocktaking of different policy strategies and institutional approaches to the financial management of large-scale disasters in selected OECD and non-member Asian countries drawing, *inter alia*, from the results of data collection activities pursued by the OECD in the recent years under the aegis of the Network project¹.

The global economic and financial impact of natural catastrophes and man-made disasters, both accidental and intentional, has dramatically increased over the past decades, and the trend is towards higher degrees of vulnerability and exposure, leading to larger losses. This appears to be due to several factors, including social, demographic, political, environmental and climatic issues. The new dimension of the international terrorism threat after 9/11 is just one of the examples, as it is the changing meteorological risk scenario associated with the increasing uncertainty of weather patterns². The growth of urban development and population density in exposed areas also contributes to the phenomenon: since large proportions of world's population and assets are concentrated near the coastline, for instance, even a small rise in sea levels might cause severe social and economic disruptions³.

Governments in OECD and non-member economies have taken very different policy approaches to manage the increasing financial burden of catastrophes, and the situation is rapidly changing in several countries. In certain legal systems, pursuant to the principle of solidarity - often recognized at the Constitutional level - the mutualisation of losses arising out of disaster events is perceived as a fundamental right of the citizens. This is the case, for instance, in Belgium, France, Italy and Spain.

Almost every country provides basic social security to compensate for personal injury and allows tort claims against liable parties, at least in case of man-made disasters⁴. As far as property damages and economic losses are concerned, however, the situation differs⁵.

Some states directly provide, to a greater or lesser extent, compensation to property owners by means of either structural arrangements (such as compensation funds) or *ad hoc* disbursement of public funds in the aftermath of a catastrophe, while others leave the protection of private property to individuals and firms. In this respect, private insurance plays an important role in the coverage of property damages and economic losses caused by large-scale events, but the level of disaster insurance penetration, as well as the actual terms and conditions of coverage vary significantly across domestic markets.

In consideration of the peculiar insurability problems posed by catastrophic risks⁶, moreover, governments have sometimes entered into partnerships with the private insurance sector with a view to making disaster insurance available to the general public. Special institutional arrangements involving public/private partnerships have been set up in a number of OECD and non member countries to deal with losses caused by natural catastrophes⁷, man-made disasters and terrorist attacks⁸.

Public sector participation in these partnerships may entail the introduction of a mandatory or quasi-mandatory disaster insurance regime - to provide sufficient risk pooling and to reduce the potential impact of adverse selection -, the provision of the necessary legal and regulatory framework, the provision of reinsurance arrangements, dedicated lending facilities, or other form of State guarantee - to limit private sector exposure in case of catastrophic losses -, or simply the creation of the basic preconditions for the private insurance market to work properly (*e.g.* regulations concerning preventive and mitigation measures, land use, mandatory building codes, emergency planning, tax incentives, accounting and fiscal treatment of cat reserves, etc.).

Coping with issues related to natural catastrophes and man-made disasters has led to the achievement of different institutional models where preventive and mitigation measures are accompanied by the implementation of specific public or private insurance coverage systems and by other instruments, the trend being indeed to set up 'mixed' models where several measures are established both on a public and on a private scale, and they coexist and interact with one another. This section discusses the main features of such institutional arrangements in order to take stock of the current situation in a number of OECD and non-member countries, and to compare the different policy approaches in this field.

NOTES

1. The OECD International Network on Financial Management of Large-scale Catastrophes. See: A. Monti, *Financial Management of Large Scale Catastrophes*, in 'Catastrophe Risk Management', September 2006, 20; A. Monti, *Managing and Financing Large Scale Risks in OECD Countries. Challenges and Institutional Solutions*, in "IRDA Journal", Volume V, n.5, April 2007, 13.
2. The increases in disaster losses due to natural catastrophes primarily result from weather related events, in particular windstorms events and floods. See e.g. *Topics Geo – Natural catastrophes 2007*, Munich Re, 2008; *Natural catastrophes and man-made disasters in 2007*, Swiss Re SIGMA series 1/2008, Swiss Reinsurance Company; see also: *Topics Geo – Natural catastrophes 2006*, Munich Re, 2007; *Natural catastrophes and man-made disasters in 2006*, Swiss Re SIGMA series 2/2007, Swiss Reinsurance Company.
3. According to recent studies, at present half the world's population is currently living live within 200 kilometers of the coastline. If current trends continue, in twenty years from now there will 6 billion people exposed to risks associated to rising sea levels. See: Lloyd's 360 Risk Project, *Climate Change. Adapt or Bust*, London: 2006. Available online at: http://www.lloyds.com/News_Centre/360_risk_project/The_debate_on_climate_change/
4. See: M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Tort and Insurance Law Vol. 14, Vienna/New York: Springer 2006.
5. The focus of this section is on the coverage of property damages and economic losses, not on the compensation of personal injuries. Moreover, it shall be clarified that the special case of agricultural risks lies outside the scope of this part of the publication.
6. Traditional insurance and reinsurance mechanisms can encounter significant problems in coping with such risks, since risk predictability, the ability to spread the risk both geographically and over time and the financial capacity of the market relative to these risks, are limited. The risk of accumulation is

quite high in the primary market, since a single catastrophic event can cause losses involving many different insured properties and infrastructures at the same time or many different lines of business, giving rise to immense claims burdens in a single policy period. Adverse selection is another problem that may negatively affect the ability of an insurance company to spread the risk of loss geographically, even on a national market. See e.g. the proceedings of the OECD conference held in Paris on 22-23 November 2004, published in: *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, in particular Part I (Insurability of Catastrophic Risks). See also: J.R. Coomber, *Natural and Large Scale Catastrophes – Changing Risk Characteristics and Challenges to the Insurance Industry*, The Geneva Papers, 2006, 31 (88-95); D. Jaffee, and T. Russell, “Markets Under Stress: The Case of Extreme Event Insurance,” in Richard Arnott, Bruce Greenwald, Ravi Kanbur, and Barry Nalebuff editors, *Economics for an Imperfect World: Essays in Honor of Joseph E. Stiglitz*, MIT Press (2003); K.A. Froot., *The Market for Catastrophe Risk: A Clinical Examination*, Journal of Financial Economics, 60, 529-571, 2001; M.G. Faure, *The Limits to Insurability from a Law and Economics Perspective*, Geneva Papers on Risk and Insurance, 1995, 454-462; C.F. Camerer and H.C. Kunreuther, *Decision Processes for Low Probability Events: Policy Implications*, Journal of Policy Analysis and Management 8 (1989): 565-592.

7. See: OECD, *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005; A. Monti, *Environmental Risks and Insurance. A Comparative Analysis of the Role of Insurance in the Management of Environment-Related Risks*, Policy Issues in Insurance n.6, Paris, OECD Publishing: 2003.
8. See: OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, Paris, OECD Publishing: 2005.

Chapter 1

COMPARATIVE REVIEW

This chapter compares different policy and institutional approaches to the financial management of large-scale catastrophes, highlighting the importance of coordination between public and private sectors in the prevention, mitigation, and financial compensation of disaster losses. The comparative review is framed by a thematic concern revolving around the central question of ex ante and ex post approaches to managing the costs of catastrophes, and it focuses on key aspects such as the respective roles of public and private sectors, the types of perils and losses covered, and the pricing mechanisms.

1. *Ex ante* versus *ex post* policy approaches: alternatives or complements?

Confronted with the potentially large financial costs of catastrophes, governments may adopt different policy approaches. Among the various available policy options, some involve or promote *ex ante* financial planning and investments on the part of individuals, businesses, the insurance industry, and governments in risk prevention and mitigation and in compensation arrangements - including insurance coverage -, while others involve *ex post* expenditures to respond to crises and emergency situations, to cover disaster losses and sustain the costs associated with rehabilitation and reconstruction.

When discussing the *ex ante* versus *ex post* nature of a national or regional policy approach to the financial management of large-scale disasters, it is important to distinguish among the numerous different types of public policies that can be implemented with a view to enhancing the quality of catastrophe risk management systems and reducing the total cost of accidents¹.

Most if not all OECD countries under review have, to a greater or lesser extent, adopted *ex ante* policies to avoid or reduce disaster risks; such policies include risk awareness campaigns, early warning systems, zoning and planning programs, building codes, safety and security measures, as well as other governmental actions aimed at controlling vulnerability and exposure to natural and man-made catastrophe risks. In several countries, moreover, disaster response strategies and emergency management plans have been carefully studied and designed in advance.

It is generally recognized that the adoption of safety and preventive measures, as well as the development of effective disaster response strategies and operational contingency plans can significantly reduce the direct and indirect costs of large-scale natural and man-made disasters. They cannot, however, completely eliminate such costs.

The **economic coverage** of disaster losses, therefore, constitutes a key policy issue to be addressed by governments. The public sector is directly concerned with this issue for several reasons: public assets, including buildings and infrastructures, are exposed to risk; moreover, it is very often the case that in the aftermath of a catastrophe the public authority will be under strong political pressure - or sometimes even under a legal duty² - to provide disaster relief, emergency assistance and/or compensation to victims.

In respect of financial planning, country approaches vary significantly: some countries have devised a framework of contingency measures either by

way of establishing special disaster funds or by promoting catastrophe insurance coverage, whereas other countries have decided to deal with the issue of emergency assistance and compensation for disaster losses **on a purely *ex post*, *ad hoc* basis**, with a minimal or non-existent level of insurance coverage.

The opportunity to develop an *ex ante* strategy for the financial management of large-scale catastrophes is generally suggested by the observation that ***ex post* approaches to the compensation of disaster losses may have several limitations**. In many cases, they proved to be cost ineffective and untargeted: delivery of compensation is often too slow and, if the hazard risk exposures are significant, the fiscal burden may be unsustainable for the public authorities in the long run. Moreover, *ex post* allocation of public funds to meet critical needs may divert resources from other projects, and critical decisions have to be made under political pressure. Furthermore, *ad hoc* compensation necessarily entails inequalities and discontent. Finally, even if the matter is controversial, *ad hoc*, *ex post* compensation mechanisms may also reduce the incentive to take precautions *ex ante*, thereby increasing the total cost of disasters.

Possible *ex ante* solutions include the establishment of dedicated catastrophe funds, market-based or state-sponsored disaster insurance and reinsurance programs, alternative risk transfer (ART) and alternative risk financing (ARF) tools - such as risk securitisation and contingent capital arrangements - allowing broader risk spreading through capital markets.

In theory, once those who are exposed to disaster risks have been granted access to, or have utilised, such financial management tools, the public authority should refrain from making *ex post* compensation payments to the victims of catastrophes in a manner that would undermine *ex ante* solutions. It is, however, extremely difficult for the government to make a credible commitment that it will not provide compensation once a catastrophe occurred: this is usually referred to as the **Samaritan's Dilemma**. A recent example is offered by Turkey, where *ex post* compensation was granted to uninsured persons notwithstanding the mandatory earthquake insurance provisions under the scheme managed by the Turkish Catastrophe Insurance Pool (TCIP): such an approach, of course, may have a negative impact on prevention³.

While the different *ex ante* approaches adopted by some of the countries under review will be discussed in more details *infra*, it is worth noting that the **level of *ad hoc* *ex post* government intervention** for the compensation of losses due to natural and man-made disasters varies significantly across countries. Some countries rely almost exclusively on an *ex post* approach; in **Italy**, for instance, *ad hoc* *ex post* compensation of disaster losses by the state is

the rule, with limited or no involvement of the private insurance sector. By contrast, in **Switzerland**, where natural disaster risks are mandatorily included in fire insurance policies, most natural disaster losses incurred by households and businesses are covered *ex ante* by private or cantonal insurance companies. In many countries, there is uneven or incomplete coverage of disaster risks by private insurance markets, so that some mixture of private insurance and government compensation is involved in the coverage of individual and business assets; this compensation may be complemented by government payments for other direct and indirect economic losses arising from disasters. In the **Czech Republic**, approximately 50 per cent of the economic losses caused by the 2002 floods were covered by the government, with the remaining half covered by insurance companies. In the **United States of America** insurers' exposure from the 2005 hurricanes is estimated to be about USD 60 billion, while governmental expenditures are estimated at USD 200 billion.

Even if, for the reasons discussed above, *ex ante* financial planning appears to be desirable in many situations, it should be noted that **certain disaster risks can be so remote and/or unpredictable that it may be more efficient to deal with them on an *ex post* basis**, since *ex ante* financial solutions can be extremely costly. There is, therefore, a need to select those catastrophic risks that can be dealt *ex ante* by risk transfer solutions and those other risks that, due to their remoteness and/or unpredictability (such as a large CBNR terrorist attack in a major city), would require other approaches (*e.g. ex post* public funding mechanisms). While it is very difficult to draw a sharp line between different types of risks so to identify the appropriate mix of *ex ante* and *ex post* policy measures, this aspect should be taken into account when designing or evaluating an institutional scheme.

2. Coordination between public and private sectors

Recent events have shown that the financial management of large-scale disasters is an issue that concerns not only governments, but all the stakeholders involved, including businesses and individuals exposed to catastrophic risks.

In this perspective, while the *UN Hyogo Framework for Action* recognizes governments as having the primary responsibility for guiding the implementation of disaster reduction in national terms, it also calls for the important role that business enterprises and the 'private sector' can play in working more purposefully and effectively with public authorities and the Global Platform of the ISDR system in the context of public private partnerships (PPP)⁴. A PPP is a voluntary association of both public and private actors to address common goals through shared resources and skills. Partnerships typically involve some form of sharing of responsibilities,

opportunities and risks in recognition that the combined value of their respective attributes provides greater potential for accomplishment than would be possible through individual efforts⁵.

As specifically concerns financial planning for catastrophes, in the OECD area there is an **observable trend towards institutional solutions that involve some level of coordination (sometimes explicit) among stakeholders for the prevention, mitigation, and coverage of future potential losses caused by large-scale disasters**. In the context of such schemes, insurance and reinsurance sector participants, capital markets, and public authorities all have a defined role to play. These solutions are not necessarily PPP arrangements *per se* but are nevertheless based on some level of a mutual understanding of natural disaster risk exposures and broad assumptions regarding the respective roles played by the public and private sectors. These institutional solutions are often broad in scope as they may cover all types of disaster risks, natural and man-made.

The **aim of such institutional arrangements is mainly to coordinate the efforts of the various stakeholders** involved by setting up a clear framework for action. Coordination, nevertheless, may also take place spontaneously, when economic actors recognize that a cooperative behavior serves the interests of all parties involved. Spontaneous coordination between the private and the public sectors generates an implicit partnership. In the **United Kingdom**, for instance, insurance coverage against flood damage has been a standard feature of household policies since the early 1960s and the **British** insurance industry was able to make this commitment to its customers on the understanding that the UK government would provide effective flood defenses.

While, in the context of an explicit coordination scheme, risks, duties and responsibilities are clearly allocated among the various participants, in the case of an **implicit partnership** the coordination between public and private sectors (and other stakeholders for that matter) is subject to a higher degree of uncertainty as well as to the risk of opportunistic behavior. From this perspective, **explicit partnerships** may facilitate more stable and reliable coordination efforts.

From a theoretical viewpoint, therefore, **governments should aim at making explicit arrangements** with all stakeholders in which there is a basic understanding regarding the allocation of responsibilities for the taking of precautions, as well as responsibilities for the assumption of risks and losses. It should be noted that this does not necessarily entail that the public authority has to take charge of the compensation of disaster losses; what is important is that mutualisation options for protecting against catastrophic losses are clearly understood and debated before a major disaster. Individuals, businesses, central

and local authorities will then be aware of the expected roles played by different stakeholders in dealing with large-scale disasters.

3. Types of public-sector roles

In the context of an implicit or explicit coordination scheme, there is a broad range of potential roles for public authorities. In paragraph 3.1, we shall discuss strategies that do not involve a direct commitment of the government to pay for disaster losses, while in paragraph 3.2 we shall discuss different ways in which public authorities have acted to participate directly in the financial coverage of losses resulting from catastrophes.

3.1 Indirect intervention strategies

Disaster risk reduction measures and emergency preparedness

Regarding indirect intervention strategies, governments can and have adopted policies aimed at the **improvement of disaster risk awareness, preparedness, prevention and mitigation**, thereby **reducing vulnerability and exposure** and thus contributing to the **creation of the basic pre-conditions for private insurance markets** to work properly. Examples of these policies are: public awareness programs and campaigns, mandatory preventive and mitigation measures, land use regulations, zoning and planning, mandatory building codes and emergency management plans.

The **Australian** government, for instance, has developed a number of “all-hazard” contingency plans. These plans are complemented by a range of sub-plans that have been developed by respective state and territory governments. Contingency plans have also been devised at the central and/or local level in several other countries under review, with a view to limiting the damaging effects of various types of catastrophes. Contingency plans usually coordinate the work of police, ambulance, fire brigade, army, public authorities and private associations. They also provide direction for readiness activities, potential for mitigation of further damage and post-disaster recovery planning, and ensure the necessary level of operational preparedness.

In **Canada**, the National Emergency Response Plan is an all-hazard plan developed by Public Safety and Emergency Preparedness Canada on behalf of the federal government of Canada for the coordination of federal and national support during emergencies of significant impact or complexity. In **Iceland**, the Civil Protection Department and regional Civil Protection Units have devised contingency plans for many types of perils but primarily snow avalanches, earthquakes and volcanic eruptions, as these are the greatest threats to public

safety. Specific efforts have also been made to assess such “out of the box” or extremely unlikely events as tsunamis. In **Japan**, based on the *Disaster Countermeasures Basic Act*, the Central Disaster Management Council chaired by Prime Minister establishes the Basic Disaster Management Plan. This plan forms the foundation of contingency planning and demonstrates basic policies on establishing disaster prevention schemes, facilitating prevention programs, expediting and optimizing emergency restoration and promoting research, science and technology which are relevant to disaster prevention. Since Japan suffers from a repetition of earthquakes, among other natural hazards, a series of national principles and guidelines have been introduced to cope with this type of hazard. In order to protect the people and their assets, the *Building Standard Law* defines minimum standards concerning the siting, construction, equipment, and use of buildings and the *Housing Quality Assurance Act* provides additional building standards as well as an evaluation system.

Mexico has emergency plans at both the local and federal levels in which collaboration exists between civil, governmental and military institutions, in order to address natural disasters. Their objectives are to prevent, alert and stimulate a self-protection culture, as well as to reduce the population’s exposure to natural catastrophes and man-made disasters. In some cases, such as volcanic eruptions, hurricanes or other possible catastrophic events, public authorities must highlight the threat and promote risk awareness among the population. There have been efforts to promote an insurance culture among population as well as social awareness of the possible occurrence of catastrophic risks. These initiatives have improved the level of penetration of the insurance sector in relation to the whole economy providing a basis for a solid and consistent insurance market, as well as protecting the population. In addition, Mexico has a Natural Disasters Prevention Fund (FOPREDEN) that provides resources for preventive actions, as well as to avoid and reduce the negative impact effects of catastrophic natural disasters.

In **Spain**, the *Law on Civil Protection* establishes guidelines for the protection of the population against disasters, including natural catastrophes, and for the identification of the responsibilities of all the stakeholders (national, regional and local administrations, as well as citizens); the *Basic Rule on Civil Protection* (Royal Decree 407/1992), on the other hand, establishes regulatory guidelines for the elaboration of emergency plans⁶. A series of regulatory measures have been undertaken, including in relation to building codes (anti-seismic), the management of basins, and river warning tools.

More generally, in those countries that have recently decided to take relevant initiatives in this field, such measures were often aimed at a **fundamental shift in focus towards cost-effective, evidence-based disaster**

mitigation, moving beyond disaster response and reaction, towards anticipation and mitigation. In **Australia**, for instance, the Council of Australian Governments commissioned, in 2001, a review of the approach in dealing with natural disasters. The review concluded that the national framework for natural disaster management could be improved with a view to achieving safer, more sustainable communities, and reduced risk, damage and losses. Central to this approach is a systematic and widespread national process of disaster risk assessments and a special focus on anticipation and mitigation. The review recommended a series of reform commitments and a five-year Disaster Mitigation Australia Package for which the Australian government announced new funding: the Natural Disaster Mitigation Program is a key component of this Package⁷.

The **culture of emergency preparedness and response** also appears to be strong in **Canada**, where the Department of Public Safety and Emergency Preparedness (PSEPC) has overall responsibility for enhancing the protection of critical infrastructure, and safeguarding lives and reducing damage to property by fostering better national emergency management and preparedness. From a legal viewpoint, the *Emergency Preparedness Act* (EPA) serves as the foundation for the Canadian government's engagement in emergency planning and its emergency management relationship with other jurisdictions in Canada. Additionally, each Province and Territory in Canada has emergency management legislation that governs civil emergency preparedness. A number of provinces - Ontario, Québec, Alberta, and British Columbia - have revised their emergency management legislation to emphasise the need for hazard identification and vulnerability assessment and underscore disaster mitigation as an essential component of comprehensive emergency management.

In **Iceland**, the Civil Protection Department of the National Commissioner of the Icelandic Police is in charge of risk assessment and monitoring as regards safety of the population. Regulatory measures undertaken for prevention and mitigation purposes include: strict building codes (earthquakes and wind loading); land use measures for snow avalanches; warning systems for earthquake, volcanic eruption, and snow avalanches; barriers against snow avalanches and floods; hazard mapping; and awareness programs, for instance for earthquake and volcanic risks.

In **New Zealand**, the National Civil Defence Emergency Management Plan operates in conjunction with the related *Guide to the National Civil Defence Emergency Management Plan*. The plan was developed by the Ministry of Civil Defence and Emergency Management (MCDEM) and key stakeholders including representatives from CDEM Groups, local authorities, emergency services, government agencies, and lifeline utilities. The plan

outlines and provides for hazards and risks to be managed at the national level and establishes the necessary arrangements for meeting these hazards and risks. The plan also provides support to the management of local emergencies. Under the *Civil Defence and Emergency Management Act*, it is the responsibility of CDEM groups (consortia of local and regional councils) to identify, assess and manage the hazards and risks in their region. A number of other central government bodies besides MCDEM are relevant to prevention and mitigation of natural disasters (e.g., building codes).

In the **United States** of America there have been multiple regulatory actions taken (most specifically directed towards critical infrastructure areas) to mitigate potential hazards and service disruptions. These regulations, much like the regulators, are different for each of the various critical infrastructures but they are all bound together with the inherent goal of preserving the integrity and capacity of the operators during times of emergency and threat. In addition to the focused regulations directed upon infrastructure, other federal, state and local regulations as well as established standards and codes also come into play to try and provide comprehensive coverage and to prevent failure of operations and services to occur. While all of these efforts bear a burden of financial cost to both the public and private sectors, they pale in comparison to the complete operational loss should a natural hazard or act of terror destroy the entity outright.

Regulatory and other measures to promote private-sector solutions

Governments may also encourage the development of private-sector solutions by adopting measures concerning, for instance, the fiscal treatment of disaster insurance premiums, with a view to providing incentives to purchase coverage. Another policy option related to the tax treatment of catastrophic risk insurance is that of permitting insurance companies to establish tax-deductible reserve funds for catastrophes. The aim of such policies is to stimulate both the demand and the supply side with the aim of facilitating the financial coverage of catastrophic risks by financial institutions and other private sector participants.

In some countries, insurance undertakings are either expressly allowed (**Austria, Canada**) or obliged (**Belgium, France, Italy, Japan, Mexico, Portugal, Spain and Turkey**) to set aside catastrophic risk reserves. Such reserves are often tax deductible (**Austria, Belgium, France, Italy, Japan, Mexico, Portugal, Spain and Turkey**), at least to a certain extent; in other countries, however, no tax benefit is granted⁸.

In the **Czech Republic, Hungary, Luxembourg, the Netherlands, New Zealand, Poland, the Slovak Republic and Switzerland**, there are no special

insurance regulatory rules regarding the formation of reserves for the purpose of provisioning for catastrophic risks⁹. In the **United States of America**, the Internal Revenue Service (IRS) Code limits the ability of insurers to set aside catastrophe reserves for events that have not occurred.

Key limitations and remaining shortcomings

Most of the countries under review have reported problems related to the lack of public information and risk awareness and the insufficient level of implementation of risk prevention measures and disaster mitigation strategies, sometimes due to lack of funding. The urgent need for more effective early warning systems, emergency evacuation plans, disaster response actions, and crisis management skills has also been reported by some countries. The need to improve co-ordination between central government and local authorities with regard to disaster prevention and response actions is also considered an issue in numerous jurisdictions.

In those countries where insurance coverage of disaster risks is not mandatory, the lack of risk awareness may explain the very low average levels of demand for insurance and market penetration. Even in countries with mandatory systems of insurance coverage, there may still be problems with awareness and thus securing more comprehensive insurance coverage in the population. The possible low levels of coverage may be due to a broader lack of financial culture related to the prevention of catastrophic risks. In **Germany**, for instance, although disaster insurance is offered for about 90 per cent of the inhabited territory, on average only about 10 per cent of household effects insurance policyholders and about 5 per cent of residential building insurance policyholders choose to have this included in their coverage. Of course, a low level of insurance coverage may reflect a low real risk of catastrophic disasters occurring or a belief in an *ex post* government compensation of losses.

Finally, the lack of comprehensive risk maps and of accurate data on the potential economic impact of catastrophic risks has been identified by some countries as a limit to the possibility of conducting a cost-benefit analysis of the proposed implementation of prevention and mitigation measures in order to reduce long-term disaster vulnerability. Such gaps in social-economic data gathering and estimation of disaster loss make it difficult to demonstrate such cost-benefit analysis to policy and decision-makers.

3.2. Direct intervention strategies in respect of financial coverage

In addition to the adoption of preventive, mitigation and other regulatory measures discussed above, public sector intervention may, particularly in an

explicit coordination scheme, also entail the **introduction of a mandatory or quasi-mandatory disaster insurance regime** - to provide sufficient risk pooling and to reduce the potential impact of adverse selection - with the provision of the necessary legal and regulatory framework.

As a complement to such disaster insurance regime, special reinsurance arrangements, dedicated lending facilities or other form of state guarantees **may limit private sector exposure in case of catastrophic losses**.

If the government elects to make a financial commitment, it may choose to act, directly or through a special purpose entity, as:

- (i) **Primary insurer** (such as in **Spain, New Zealand** for earthquake risks and **Iceland**): The government acts as an insurer by providing insurance and responding to claims either to the fullest or up to a certain limit.
- (ii) **Reinsurer of last resort** (such as in **France** for all catastrophic risks and in **Australia** for terrorism risks): The government protects the insurance sector by offering special reinsurance arrangements.
- (iii) **Lender of last resort** (such as in **Australia** and in the **UK** for terrorism risks): The government provides liquidity to the insurers incurring payout burdens or losses due to a catastrophic event.
- (iv) **Guarantor** (such as in **Germany** for terrorism risks, **Spain, New Zealand** for earthquake risks, **France** for terrorism and nuclear risks **and Iceland**): The government guarantees that any body, pool or fund created to cover catastrophic risks will meet all its obligations.

Special risk-sharing agreements between the private and public sectors, mixing the above features, have also been implemented in **Belgium** for natural catastrophes and terrorism (through the *Caisse nationale des calamites* and the *Terrorism Insurance & Reinsurance Pool*) in the **United States** for terrorism risks (under TRIA and its extensions) and in **Japan** for earthquake risks.

In numerous countries, including **Australia** (for natural hazards), **Czech Republic, Finland, Germany, Italy, Luxembourg**, the **Netherlands** and the **Slovak Republic** neither private entities, nor public bodies have undertaken any specific measure to promote extensive *ex ante* financial coverage of the

population or corporate entities. The incentives to insure are often very low, and the purchase of natural disaster insurance is not compulsory.

Another option for providing compensation of disaster losses is through the establishment of dedicated *ex ante* funds: in **Hungary**, for instance, the Fund for Flood and Inland Water Compensation (*Wesselényi Miklós*) regulates the compensation of flood damages; individuals who own real property in risky regions of Hungary pay contributions to the Fund and, based on these contributions, are entitled to indemnification in the case of loss. The Fund is co-financed by government budgetary support if it lacks enough resources to fulfill its obligations. Along the same lines, in **Austria** the Catastrophes Fund covers parts of the damages caused by natural disasters and further help is provided by special laws enacted on an *ad hoc* basis. Similarly, limited *ex post* compensation is available in **Poland** through various dedicated funds and budget allocations. Catastrophe funds, however, provide only very limited incentives to prevent and mitigate disaster losses.

In **Italy**, as mentioned, *ad hoc ex post* compensation is regularly granted in the aftermath of each disaster by the State, but no dedicated fund has been established. At present in **Italy** there is no compulsory insurance against catastrophic risks. Several proposals have been made during the past years, but none has made it through the legislative process yet, partly due to competition law restrictions and to the opposition of consumer associations.

After the severe damage caused by the catastrophic flooding in August 2002, there was a public discussion in which those *Länder* hardest hit were calling for compulsory insurance for **Germany**. As a result of an extensive research into the subject undertaken by the federal government and the *Länder*, in which the advice of the insurance industry was sought as well, the governmental authorities finally determined that, in view of the large number of legal, financial and fiscal factors, no adequate solution could be found, and therefore decided not to proceed with plans to introduce compulsory insurance for protection against natural catastrophes.

In other countries, a compulsory or quasi-compulsory catastrophe insurance scheme has been set up. In **New Zealand**, for instance, the purchase of insurance is voluntary for households; however, EQC coverage must be included in all house fire insurance policies. Similar solutions were adopted in **France, Iceland, Norway, Spain and Switzerland**. In **Belgium**, the institutional arrangements to provide adequate financial coverage of catastrophic risks have recently changed: starting from March 2006, by operation of law, all new fire insurance contracts issued to simple risks must also cover the risk of natural catastrophes. Mandatory rules define the perils

covered (earthquake, flood, storm, landslide and ground subsidence) and the indemnification criteria. Further to a Law enacted in 2007, moreover, since 1 May 2008 terrorism risk coverage is mandatorily included in several classes of insurance contracts covering risks located in Belgium¹⁰; in these new systems, the *Caisse nationale des calamités* (for natural hazards) and the *Terrorism Insurance & Reinsurance Pool* (for terrorism risks) play a role as reinsurers of last resort.

In **Canada**, there is generally no requirement for any individual or corporate entities to purchase house insurance. However, banks require fire insurance for residential mortgage applicants who cannot afford a down payment of more than 25 per cent of the property; this practice applies to commercial borrowers as well.

Catastrophic risks coverage is carried out in **Spain** by the *Consortio de Compensación de Seguros*, a public business institution attached to the Ministry of Economy and Finance. The purchase of insurance is always optional; however, in certain lines of insurance (mainly property damage, business interruption, and personal accident) natural disaster coverage is compulsorily included, together with the coverage against all “extraordinary risks” (*riesgos extraordinarios*), as defined in the applicable regulation¹¹.

Regulation in **Mexico** establishes an obligation to contract earthquake and other catastrophic risks insurance, as well as fire insurance, for certain categories of buildings. Moreover, the Natural Disasters’ Fund (FONDEN), created by the federal government, provides support, in a complementary manner and within the limits of its resources, in case of emergency and natural disasters situations.

In **Turkey**, the impact of natural disasters and the low level of insurance penetration led the government to initiate studies to promote disaster insurance and establish a widespread and effective earthquake insurance system, especially after the Adana earthquake of June 1998. As a result, with the help of political momentum created by the Marmara disaster, as well as public and insurance industry recognition of the need for action, the government decided to introduce a compulsory earthquake insurance scheme in 2000, with the creation of the Turkish Catastrophe Insurance Pool (TCIP). Insurance was made obligatory for all residential buildings that fell within municipality boundaries starting from 27 September 2000. The compulsory earthquake insurance scheme aims to alleviate the financial burden of earthquakes on the government budget, to ensure risk sharing by residents, to encourage standard building practices, and to establish long-term reserves in financing future earthquake losses.

In the **United States of America**, beyond insurance products sold by the private sector, there are state mandated pools for hard-to-write risks and a few catastrophe funds. There is a National Flood Insurance Program (NFIP) to provide coverage for the flood peril. The NFIP is a program where private insurers are involved in issuing policies and settling claims, but the federal government reinsures 100 per cent of the losses and does so at subsidized rates. Further progress on mitigation and improvements in the accuracy of computer catastrophe simulation modelling results may result in even more private insurance capacity. Insurance of this type is not compulsory as a matter of law but is often required by lenders to secure outstanding mortgages. A few states, for example, Florida (for hurricane) and California (for earthquake), have established special mechanisms to serve markets that the private sector does not wish to serve. Outside of governmental programs and voluntary private contributions, insurance is the major provider of compensation.

4. Financial sector role

4.1. Insurance and Reinsurance

In the context of an implicit or explicit coordination scheme involving the public and private sectors, the insurance and reinsurance industry can contribute significant technical expertise and financial capacity in various phases of the disaster risk management process, such as: risk assessment, risk transfer, investment and management of assets covering technical provisions, claims handling and loss adjustment. The availability of reliable disaster risk models, and the ability of the insurance industry to process claims arising out of a catastrophic event in an expedite manner, often turn out to be crucial elements. The efficiency of a system providing voluntary or compulsory insurance coverage against disasters, in fact, largely depends on the professional expertise of insurance companies both in the underwriting and in the claims handling phases.

In a number of countries under review, **the private insurance market plays an important role in the financial management of large scale catastrophes**. In **Switzerland**, for instance, in 1939 a group of insurers formed the Natural Perils Pool to provide cover for natural catastrophe losses, without any direct financial support from the public authority. Federal law simply included natural peril coverage in the scope of the fire insurance for buildings and chattels. In **Austria**, the *Österreichischer Versicherungspool zur Deckung von Terrorrisiken* has been set up on 1 October 2002 by the Austrian insurance association (VVO - *Verband der Versicherungsunternehmen Österreichs*) as a purely private terrorism risk co-reinsurance pool, with no state guarantee. In

Indonesia, PT. Asuransi MAIPARK Indonesia, the nation's catastrophe risk reinsurer, is owned and funded by the industry itself.

In several countries, including **Australia** (terrorism), **Belgium**, **Denmark**, **France**, **Japan**, **Norway**, **Spain** and **Turkey** the private insurance sector actively cooperates with the public sector in the context of explicit coordination scheme. Along similar lines, the Portuguese private insurance sector, in cooperation with the government, has studied a possible pooling mechanism to cover losses due to seismic risks.

In **Germany** insurance is offered on a voluntary basis against damage to buildings and household effects from fire, storm, hail and lightning in the private, commercial and industrial area. Since 1991 it has been possible, either as a supplement to building insurance and household effects insurance or as a separate insurance policy, to insure against damage from flooding (high water), earthquake, ground subsidence, landslide, heavy snow, avalanches, volcanic eruption and storm rainfall.

In other countries, such as **Austria**, **Italy**, the **Netherlands**, **Poland** and the **Slovak Republic**, the role of the private insurance sector in the financial coverage of losses due to natural catastrophes is currently under scrutiny, to a greater or lesser extent. While governments are aiming to improve risk awareness among the population by highlighting the responsibility of both citizens and corporate entities and by stimulating the private insurance coverage of risks related to natural and man-made catastrophes, no specific regulatory measures have been reported and disaster insurance penetration generally remains very low.

In several countries **insurance companies**, either individually or through their industry associations, **have also taken various initiatives aimed at raising public awareness of natural disaster risks and how to prevent or mitigate loss**. These measures range from the publication of reports, studies, newsletters and brochures, to educational programs in schools (**Japan**), to the development of publicly accessible risk zoning models (**Austria**), to the provision of early warning systems. In **Germany**, for instance, some insurers, in co-operation with suppliers of meteorological data, offer their customers a storm warning service via mobile telephone which notifies a policyholder as soon as the weather changes in a way which could pose a threat to his particular area of risk, so that appropriate precautionary measures can be taken.

In **Canada**, the insurance industry founded, in 1998, the Institute for Catastrophic Loss Reduction, an independent, not-for-profit centre for multi-disciplinary disaster prevention research. It aims to identify and support

sustained actions that improve society's capacity to adapt to, anticipate, mitigate, withstand and recover from natural disasters. The P&C insurance industry association, the Insurance Bureau of Canada, is also actively involved in promoting prevention and mitigation. In the **United States of America**, private insurers support the Institute for Business and Home Safety, which conducts a wide variety of research and communications on building-related safety issues and the Insurance Information Institute which provides safety messages to the public¹². The National Association of Insurance Commissioners (NAIC) has a Consumer Information Source and a consumer education program called InsureU.

4.2. Capital markets

Capital markets, in turn, may provide additional source of funding and financial capacity to absorb catastrophic risks. The market for “**cat bonds**” and other insurance-linked securities is relatively young, since it started in the late nineties, but it is constantly growing. According to the latest available data, 2007 was another record year with total new issues in the amount of USD 7 billion (USD 4,69 bn in 2006 / USD 1,99 bn in 2005 / USD 1,14 bn in 2004 / USD 1,73 bn in 2003)¹³. The emergence of new trigger types, new sponsors¹⁴, transactions covering pandemic risks and other extreme mortality risks in life insurance settings¹⁵, as well as an increased use of shelf offerings that allow more flexibility and lower costs, have been witnessed in recent years¹⁶; it is also interesting to note a growing securitization activity in non-bond form, such as sidecars, Industry Loss Warranties (ILWs) and other vehicles.

Since modern catastrophe risk securitization transactions inevitably entail some degree of basis risk – i.e. the risk associated with imperfect hedging of the underlying portfolio losses – it becomes crucial to determine the objectives pursued by the sponsor. The cat bond issued in May 2006 on behalf the government of **Mexico**, for instance, is aimed at providing the necessary liquidity for emergency response measures, not at covering the losses caused by a severe earthquake. A similar objective is pursued by the Caribbean Catastrophe Risk Insurance Facility (CCRIF), launched under the auspices of the World Bank, which allows Caribbean governments to purchase parametric insurance coverage that will provide them with an immediate cash payment after the occurrence of a major hazard event, thus enabling them to overcome the typical liquidity crunch that follows a disaster and start recovery operations without delays.

In most countries, there has been, to date, little or no use of **ARTs** to cover natural disaster risks. In several cases, the use of ARTs for risks dealing with

natural disaster claims has not become common practice for a number of reasons, including availability of reinsurance and uncertainties in the regulatory environment.

The **Australian** Prudential Regulation Authority (APRA) has indicated it would not have any “in-principle” objections to the use of ARTs, particularly for sophisticated players who could demonstrate the effectiveness of alternative risk transfer techniques. To date, however, there has been little use of ARTs to cover **Australia’s** natural disaster risks.

In **Germany**, under the *Act on the Supervision of Insurance Enterprises*, primary insurers are permitted to engage exclusively in insurance business and business directly connected to it; this rule also applies to the use of ART products, in particular catastrophe bonds offerings.

In the **United States** of America, ARTs are a part of the market, but so far, only a very small part. Reportedly, for the foreseeable future insurance will be largely provided by insurers and by government programs, such as the National Flood Insurance Program (NFIP).

In Europe, the Reinsurance Directive¹⁷ recently enabled member state regulators to establish a softer regulatory regime for insurance special purpose vehicles (ISPVs). Domestic incorporated and non incorporated ISPVs should greatly simplify insurance securitisation structures and provide an attractive legal framework for insurance risk securitisations. The transposition of this Directive in the domestic legislation of EU member countries is, therefore, expected to facilitate the development of the use of insurance-linked securities to transfer catastrophic risk exposures to capital markets¹⁸, also in anticipation of Solvency II.

5. Temporary versus permanent nature of the scheme

An important aspect to be considered in the comparative analysis of **public-private coordination schemes for the financial coverage of losses is the temporary or permanent nature of the institutional arrangement**, as well as the determination of an exit strategy.

While **most** institutional schemes dedicated to the financial coverage of natural catastrophes have been established on a **permanent basis**, such as in **France, Belgium, Japan, Mexico, New Zealand, Norway and Spain**, it is possible that these schemes could be reviewed and revised as circumstances or policy may dictate. This is certainly the case for institutional arrangements aimed at covering man-made losses due to terrorist acts, where institutional

arrangements are, with the exception of the Spanish *Consortio*, almost invariably temporary. Some countries have set a terminal date for such schemes, such as **France**, **Germany**, **the Netherlands** and the **United States**. In **Australia** and in the **United Kingdom** no terminal date has been set, but government programs are subject to periodic assessment and revision. It may prove difficult to terminate such schemes, in particular if terminating the government plan means switching from a high level of government support to none at all on a particular date. The most operational option may be that of **gradual reduction of the government role** when appropriate, through an increase in industry retention, and periodic assessment of the scheme. This allows as much flexibility as possible in the decision to extend, or not, its duration, which appears relevant given that the evolution of terrorism risk and of the market financial capacity and technical ability to manage it in the future are currently not predictable. Any decision about the future of a public-private coordination scheme in the financial coverage of catastrophic risks should be made early enough to allow insurers and reinsurers to take this key parameter into account when defining the conditions of policy renewals.

6. Perils covered

The institutional arrangements set up in the countries under review cover different types of perils. Some of them have a **broad scope of application**, encompassing coverage for a wide range catastrophic risks - the Spanish *Consortio de Compensación de Seguros* offers a good example of this approach, covering both natural catastrophes and socio-political events, including terrorist acts¹⁹ - others focus instead on **single perils** or **categories of perils** (such as: natural calamities, earthquake, terrorist acts, technological accidents, etc.).

In **France** there are three different schemes covering natural catastrophes²⁰, terrorist incidents and industrial accidents respectively. In **Belgium** two schemes were recently set up to cover certain natural perils (i.e. earthquake, flood, storm, landslide and ground subsidence) and terrorism risks respectively. In **Iceland**, insurance coverage is mandatory for earthquake, volcanic eruption, snow avalanches, landslides and floods. In **Japan** the coordination scheme covers earthquakes, volcanic eruptions and resulting tsunami. The **Mexican** FONDEN covers geological risks (earthquake; volcanic eruption; avalanche; tidal wave; landslide), hydro meteorological risks (atypical drought; cyclone; extreme rains; snowfall and hailstorm; atypical floods; tornado) and forest fires. In **New Zealand** the scheme covers: earthquake, natural landslip, volcanic eruption, hydrothermal activity, tsunami; in the case of residential land, a storm or flood; fire caused by any of these. The **Norwegian** pool covers losses caused by landslide, storm, flood, earthquake

and volcanic eruption. In **Switzerland** the coverage of flood, inundation, windstorm, hail, avalanche, snow pressure, rock and stone fall, and landslide has been included by operation of law in fire insurance for buildings and chattels. In **Turkey**, although the original design of TCIP envisaged a multi-peril coverage, it currently provides only compulsory earthquake insurance coverage.

A number of schemes, moreover, requires an “**official declaration**” to trigger coverage: this is the case under the **US** Terrorism Risk Insurance Act (and its extensions), the **Australian** and the **Belgian** terrorism schemes, the schemes implemented in the **Netherlands** (Royal Decree) and in **Denmark** (Danish Storm Council), the **Mexican** FONDEN and the **French** schemes covering natural catastrophes and technological disasters respectively. This has also been the case in **Spain** until 1986, when the requirement for an official declaration was removed. While the official declaration requirement has the advantage of making incontestable that a certain event is covered by the scheme, the decision making process may be time consuming and politically biased.

In the **UK**, whenever an incident occurs that may be the result of an act of terrorism, there will be informal discussions involving the Pool Re members affected, Pool Re and HM Treasury. Once the facts are known and it is established that the act in question falls within the legal definition²¹, HM Treasury will issue a certificate under an agreed procedure.

7. Losses covered

The various institutional solutions, furthermore, differ in terms of type of losses covered. Most of the schemes provide **compensation for property damage**, but the nature of the property covered may vary (commercial versus residential properties, private properties versus public properties and infrastructures, etc.).

In **France**, the CAT NAT and terrorism schemes cover commercial and residential property damages as well as business interruption losses (but not damages to public property owned by the State), while the scheme enacted for technological accidents covers only residential property damages. The earthquake scheme in **Turkey** is also limited to registered residential properties.

Pool Re arrangements in the **UK** (terrorism risk) are concerned only with commercial property insurance and they do not extend to life or personal injury; nor does the scheme protect private property, although it can cover residential property insured by a firm (such as a block of flats owned by a property

company). The **German** scheme for terrorism risks (Extremus AG) is also applicable to commercial property only. The coverage offered by the **Spanish Consorcio**, on the other hand, includes residential and industrial property damages, business interruption losses, as well as personal injuries and death.

The scheme implemented in **New Zealand** covers direct losses to residential dwellings (self-contained premises used as a home, including apartments), most personal property (excluding some types *e.g.* motor vehicles and art) and the land immediately around the dwelling. The scope of application of the **Japanese** earthquake insurance scheme is also limited to residential buildings and household property.

There has been movement towards the inclusion of business interruption losses, as witnessed by the experience of *Consorcio* in **Spain** and Pool Re in the **United Kingdom**. Nevertheless, in some countries, including **Iceland**, the coverage is still limited to direct losses.

Finally, **only a few schemes cover liability exposures** (see *e.g.* the **Australian** terrorism scheme, which also covers commercial property damages and business interruption losses), and even less provide coverage for life, accident and health (the Spanish *Consorcio*²² and the new Belgian terrorism scheme), while these losses may be covered by social security laws in some countries.

8. Mandatory versus voluntary nature of the scheme

The mandatory nature of the scheme is often cited as a key component of several institutional arrangements implemented in OECD and non-member countries. However, one must clarify the meaning of “mandatory” under a scheme.

Some countries have made the **purchase of catastrophe insurance coverage mandatory**: this is the case, for instance, of **Turkey** (earthquake) and **Iceland**. The purchase of fire and natural disaster insurance is also mandatory in the **Swiss cantons** of Schwyz, Uri and Obwalden. Others have simply **required insurance companies to make catastrophe insurance available**, by introducing a mandatory offer of coverage that can be declined by the policyholder: this is how the **US TRIA** (terrorism), the **Japanese** and the **Californian** earthquake schemes work.

In a number of countries, moreover, fire or other first party insurance policies are marketed on a voluntary basis, but insurance companies are required by law to include coverage for catastrophic risks in such policies: this

is the case, for instance, in **Australia** (terrorism), **Belgium**, **France** (natural catastrophes, terrorism and technological disasters), **New Zealand** (earthquake), **Norway**, **Spain** and **Switzerland** (with the exception of the cantons of Schwyz, Uri and Obwalden, where fire and natural perils coverage is mandatory).

Under the Pool Re scheme in the **UK**, if a policyholder decides to extend their policy to include terrorism cover, the cover must apply to all the property which they insure. It is not open to insured to elect to insure only part of their property portfolio for terrorism.

Finally, the mandatory component of the scheme may concern the participation of private insurance companies in special pooling and/or reinsurance arrangements, such as the Natural Perils Pool in **Norway**. This was also the case of recent proposals presented in **Italy**.

9. Risk-based pricing versus flat pricing

The pricing of catastrophe coverage is yet another feature of the various public-sector schemes and within private insurance markets. While some coordination schemes apply a risk-based pricing mechanism, others have opted for flat pricing, invoking the principle of solidarity. In any case, it is important to recognize the impact of risk differentials across the territory of a country or region and to incorporate such risk differentials in the pricing mechanism, with a view to providing proper incentives to those most exposed to risk, while keeping coverage affordable and pricing manageable.

Risk zoning is used for pricing purposes by private insurers in the **Czech Republic**, **Germany**, **Japan**, **Mexico**, **Turkey** and the **United States**, and its use is now also considered in **Austria**, **Belgium** and **Poland**. In the **United States**, moreover, premiums are heavily based on the prior claims experience of the insured and discounts are available for installing specified equipment such as storm shutters, wind resistant glass and fire suppression systems. Similarly, in other countries premiums are linked to the level of prevention measures; with regard to premiums of earthquake insurance in **Japan**, the application of different rates depends on the location the material used in the building (wood or non-wood) and special discounts are applied according to construction age and the installation of specific quake-resistance structures. In **Turkey**, premiums vary across the country depending upon seismicity, local soil conditions, and the type and quality of construction.

Risk-based pricing is also adopted by **British** insurers to cover flood risks. Similarly, insurers in the Pool Re scheme are free to decide the price at which they offer terrorism cover to their customers. As a result, different quotes may

be obtained from different insurers. Although it is open to each insurer to decide how it will determine the price it will charge, the most important factors tend to be the total value of the property, its location and whether the policy is to cover property damage only, or also business interruption losses.

In **France**, on the other hand, pursuant to the applicable legislative provisions, pricing of insurance against natural catastrophes is based on a fixed percentage of the basic premium charged for the underlying property insurance policy, without specific risk differentials. More specifically, the rates of additional premium for the compulsory catastrophe extension are set by decree and, since 1 September 1999, the rate of catastrophe premiums for property other than motor vehicles is 12 per cent of the premium or contribution paid for the basic property coverage.

In **New Zealand**, according to the applicable Earthquake Commission Regulation the earthquake insurance premium is calculated as a percentage of the amount to which the property is insured, without further differentiations²³. As a result of a change in the **Spanish** scheme, the *Consortio*'s surcharge is now calculated on the basis of a system of own rates, based on the sum insured, instead of being a fixed percentage of the base premium.

Pricing mechanisms must also be tested against applicable **competition laws**. More generally, it is important to note that the establishment of insurance pools, product-tying mechanisms, centralized pricing mechanisms and information-sharing agreements may conflict with applicable **antitrust laws and regulations**²⁴.

NOTES

1. The total cost of disasters is the sum of the cost of disaster losses (insured and uninsured), the cost of preventive measures to avoid or mitigate disaster losses and the transaction costs (*i.e.* the costs of implementing the scheme). See: G. CALABRESI, *The Cost of Accidents: A Legal and Economic Analysis*, Yale University Press, 1970.
2. This was the case, for instance, in Turkey, pursuant to Disaster Law n.7269 of 1959, until the enactment of the mandatory earthquake insurance regime.

3. This occurred twice since the establishment of TCIP: after the 3 February 2002 Afyon earthquake (magnitude 6.0) and after the 1 May 2003 Bingol earthquake (magnitude 6.4). Reportedly, this attitude had a very adverse effect on the penetration rate.
4. See: *Words Into Action: A Guide for Implementing the Hyogo Framework*, UN/ISDR April 2007; *Indicators of Progress: Guidance on Measuring the Reduction of Disaster Risks and the Implementation of the Hyogo Framework for Action*, UN/ISDR, 2008.
5. *Words Into Action: A Guide for Implementing the Hyogo Framework*, cit.
6. Special plans have been devised for large-scale floods, earthquakes, wildfires and volcanic eruptions. Central, regional and local administrations are required to take actions under such plans. Regional and local administrations bear more responsibilities in the management of disasters caused by other perils.
7. See <http://www.ga.gov.au/hazards/policy.jsp>
8. For instance, in **Mexico**, there are no fiscal incentives for the policyholders to insure against catastrophic risks. Nevertheless, the Income Tax Law (*Ley del Impuesto sobre la Renta*), amended on 29 December 2005, establishes in Article 54 that insurance companies will make deductions “only for the creation or increase of the unearned reserve, outstanding reserve over claims and endowment and the catastrophic risk reserve”.
9. In **Poland**, the supervisory authority has developed a system for the collection of information from insurers regarding the estimated amount of compensations paid by insurers following a natural catastrophe. This system has enabled a monitoring of the effects of natural catastrophes on the financial stability of insurers.
10. The Law includes a definition of “terrorism”, which appears to be modeled on the *OECD Check-List of Criteria to Define Terrorism for the Purpose of Compensation* (Recommendation of the OECD Council of 15 December 2004).
11. Regulation concerning Extraordinary Risks Insurance (*Reglamento del Seguro de Riesgos Extraordinarios*), approved by Royal Decree 300/2004, and amended by Royal Decree 1265/2006.
12. The mission of the Insurance Information Institute is to improve public understanding of insurance. Their website contains a section entirely

dedicated to disaster preparedness and disaster insurance information See: <http://www.iii.org/prepare/home/>

13. *“With USD 7 billion in publicly disclosed issuances for the year, 2007 was by far the most active year in history of the catastrophe bond market. Record-setting years are becoming commonplace, as this is the third year in a row in which a new issuance record was established. Cat bond issuance volume for 2007 increased by 49 percent over the 2006 record of USD4.7 billion and 251 percent over the 2005 record of USD2 billion. The 27 transactions completed exceeded the 20 closed in 2006 and nearly tripled the 10 placed in 2005.”* Guy Carpenter, *The Catastrophe Bond Market at Year-End 2007 – The Market Goes Mainstream*, GC Securities, a division of MMC Securities Corp., 2008.

Concerning 2006, Guy Carpenter reported that: *“(a)cross nearly all measurable dimensions, including the number of issuances, total risk capital issued, total risk capital outstanding, number of perils securitized, diversity of trigger type and offering structure, activity exceeded all previous annual records, generally by a large margin.”* Guy Carpenter, *The Catastrophe Bond Market at Year-End 2006*, MMC Securities, 2007.

14. Not only insurance/reinsurance companies, but also other corporate entities as well as governments now sponsor these transactions. During 2006 two catastrophe bond transactions were sponsored by non-insurance entities, the first by FONDEN, a facility created by the government of Mexico (EQ risk), the second by Dominion Resources Inc., a US based energy company.
15. See e.g. the transactions named: Vita Capital II (Swiss Re), Tartan Capital (Scottish Re) and Osiris Capital Plc (AXA).
16. A shelf offering is a structure that, after the initial offering, allows sponsors to issue additional notes of a similar risk profile with abbreviated offering documents, on an as-needed basis throughout a transaction risk period. (see Guy Carpenter).
17. Directive 2005/68/EC of the European Parliament and of the Council of 16 November 2005 on reinsurance.
18. In Germany, for instance, the existing regulation on solvency margins (*Kapitalausstattungsverordnung*) has been amended to allow the commitments by regulated ISPVs to count against the reserves of an insurer in the same way as claims under a reinsurance would be counted.

19. Natural perils covered by the Spanish scheme include: extraordinary floods, earthquakes, seaquakes, volcanic eruptions, atypical cyclonic storms (tornadoes and gusts of wind above 135 km/h included) and fall of sidereal bodies and meteorites.
20. The regime established by Law n.82-600 of 13 July 1982 (*Loi relative à l'indemnisation des victimes de catastrophes naturelles*) does not refer to a list of natural perils covered, nor it contains a list of exclusions. The 1982 Law merely refers to the notion of “uninsurable damage”. Article L125-1 of the Insurance Code, in particular, states that uninsurable direct material damage, caused by the abnormal intensity of a natural agent, when normal measures taken to avoid such damage have been unable to prevent the occurrence thereof or could not be taken, shall be deemed to be a natural disaster.
21. Reinsurance (Acts of Terrorism) Act 1993: “*Acts of persons acting on behalf of, or in connection with, any organisation which carries out activities directed towards the overthrowing or influencing, by force or violence, of Her Majesty’s government in the United Kingdom or any other government de jure or de facto.*”
22. See Article 1 of the Spanish Regulation concerning Extraordinary Risks Insurance, cit.
23. See Earthquake Commission SR 1993/345, Article 3.
24. According to some commentators, for instance, the French CAT NAT scheme “*creates distortions that competition law is willing to prevent and it is also at odds with the principles of the group exemption for the insurance industry. However, both efficiency reasons and grounds of national solidarity may provide powerful arguments to justify a compulsory catastrophe extension of voluntarily subscribed property insurance contracts. The concerns about competitive distortions are legitimate but should be discussed in a broader social welfare context. Since pure forms of public intervention (ad hoc solutions and compensation funds) provide insufficient incentives for risk prevention and mitigation of losses, forms of public-private cooperation that avoid the latter inefficiencies may generate benefits outweighing the costs of anti-competitive distortions*” Bergh, R.J. Van den, Faure, M. (2006). Compulsory Insurance of Loss to Property caused by Natural Disasters: Competition or Solidarity?, *World Competition*, 29(1), 25-54.

Chapter 2

SURVEY OF COUNTRY APPROACHES

This chapter is aimed at taking stock of the current institutional approaches to the financial management of large-scale catastrophes in selected OECD and non-member countries. It is largely based on the elaboration of data provided by several countries that responded to an OECD questionnaire survey.

SELECTED OECD COUNTRIES

AUSTRALIA

Natural events such as *floods*, *bush-fires*, *hail*, *earthquake*, *tidal surge* and *tropical cyclones* occur regularly across the Australian continent. They cause severe damage each year to homes, businesses and the country's infrastructure, along with serious disruption to communities, especially in capital cities and along coastlines.

The Australian government has risk assessment, hazard monitoring, weather forecasting and warning service capabilities in various agencies across Australia. The Bureau of Meteorology provides weather forecasting as well as warning services for tropical cyclones, severe thunderstorms, bushfire, flood and marine conditions. Geoscience Australia also undertakes risk assessment and risk research activities, including the development of risk models and innovative approaches to assess the potential losses to Australian communities from a range of sudden impact natural hazards. Models are being developed to assist planners and decision makers in assessing community risk and effectiveness of various mitigation strategies. Of these hazards, Geoscience Australia conducts basic research into the origin and consequences of earthquakes and landslides; for other hazards, the group relies in part on basic data and hazard parameters from other agencies (*e.g.*, the Bureau of Meteorology) for input to hazard and risk model development. The Bureau of Meteorology and Geoscience Australia have shared responsibility for the recently established Australian Tsunami Warning System.

Scientific agencies such as the Australian Commonwealth Scientific and Research Organisation (CSIRO) and the Co-Operative Research Centres, in addition to university research centres, also undertake natural hazard research and regularly collaborate with government to work toward reducing risks from natural hazards.

Under the Australian Constitution, protecting the community and property from natural disasters is primarily the responsibility of the State and Territory Governments. However, the Australian government assists the States and

Territories by enhancing their response capabilities and providing extra financial resources as required.

Natural Disaster Relief and Recovery Arrangements (NDRRA)

In recognition of the unpredictable nature and potentially significant costs of relief and recovery measures, as well as the disruption and cost to communities, the Australian Government has Natural Disaster Relief and Recovery Arrangements (NDRRA) in place to alleviate the financial burden of catastrophes on States and Territories and to facilitate the early provision of assistance to disaster affected communities.

Under the NDRRA, which were first formalized more than thirty years ago and are managed by Emergency Management Australia, the Australian government provides partial reimbursement of a range of State and Territory natural disaster relief and recovery expenditures. Disasters covered by the NDRRA include bushfires, cyclones, earthquakes, floods, storms, storm surge, landslides (consequential upon an eligible disaster event), tornados and meteorite strikes. Expenditure each year varies substantially, depending on the incidence and severity of natural disasters¹.

Australian government financial assistance is not normally provided until after a natural disaster has occurred and is calculated on the basis of: half of State and Territory outlays incurred in providing PHD (personal hardship and distress) relief for a specific disaster where State or Territory disaster expenditure exceeds the small disaster criterion (currently AUD 240 000) in respect of each disaster; half of State or Territory expenditure on eligible relief measures above a threshold base amount (0.225 per cent of State or Territory revenue) up to the second threshold (1.75 times the first threshold) where the Australian government reimburses three quarters of all further expenditure. Once a natural disaster has been notified, the relevant State/Territory Government seeks reimbursement from the Australian government under the above criteria. Individuals wishing to seek assistance will need to contact in the first instance their respective State/Territory emergency response agency.

It is important to note that a principal objective of the NDRRA is to ensure that disaster relief assistance does not operate as a disincentive to effectively plan, mitigate and allocate sufficient resources for disasters or to discourage individuals or businesses taking out appropriate insurance to protect their assets and income.

Subject to the limitations and exclusions indicated below, natural disaster coverage is generally included in property and motor insurance both in personal

and in commercial lines². In addition, some commercial insurance packages may include business interruption insurance that may be triggered by a natural disaster. In personal insurance (motor and home and contents), policies generally cover a range of natural disasters. Standard home and contents policies, however, exclude coverage for subsidence, landslide, flood and for “action of the sea”, including storm surge, high tide and tsunami. In commercial insurance, coverage is generally available for effectively most natural disasters at a risk rate, although some small business policies may include specific exclusions for flood. Most commercial policies also have exclusions for “action of the sea”. There are no fiscal or other incentives to insure against natural disasters and the purchase of natural disaster insurance by the population or corporate entities is not compulsory³.

Authorised general insurers in Australia are subject to prudential regulation and oversight by the Australian Prudential Regulation Authority. A significant part of this oversight is a requirement for insurers and reinsurers to determine their maximum potential exposure and demonstrate that they have sufficient capital and reinsurance arrangements to cover that exposure. Natural disaster risk is generally shared across the industry and within global reinsurance markets. The net effect of this prudential oversight is that individual insurers and reinsurers are not highly exposed to natural disaster risks. There has been no recent failure of an Australian authorised general insurer or reinsurer in the aftermath of a natural disaster.

In its industry code of practice, Australian general insurers have made a number of commitments in responding to catastrophes and disasters⁴. Moreover, the new Industry Catastrophe Coordination Plan, managed by the Insurance Council of Australia (ICA), is designed to coordinate the response required in disasters so that the insurance industry can work with government and emergency services to provide the best possible response and recovery service for the people who have been affected by a natural disaster⁵.

According to recent estimates, over the last 5 years, the Australian Government has covered around 25 per cent of the total estimated loss arising from natural disasters. In addition to the assistance provided by the Australian Government, state, territory and local governments have provided a similar level of assistance to the community where a natural disaster has occurred.

Against this backdrop, a review of the approach in dealing with natural disasters was commissioned in 2001 by the Council of Australian Governments (COAG – the Council is made up of the Prime Minister and the first Minister of each State/Territory government and the President of the Australian Local Government Association). The review examined Australia’s approach to

dealing with natural disasters and concluded that the national framework for natural disaster management could be improved with a view to achieving safer, more sustainable communities, and reduced risk, damage and losses. Central to this approach was the recommendation of a need for a systematic and widespread national process of disaster risk assessments and a special focus on anticipation and mitigation. The review recommended a series of reform commitments and a five-year Disaster Mitigation Australia Package for which the Australian government announced new funding: the Natural Disaster Mitigation Programme was a key component of this package. There have been a number of Australian post-disaster reviews that were commissioned after particular disasters, and which are available in the public domain.

Australian Reinsurance Pool Corporation (ARPC)

With a view to providing coverage for damages caused by terrorist acts, the Australian Reinsurance Pool Corporation (ARPC) - a hybrid pool/post funded scheme – was established in 2003 under the *Terrorism Insurance Act*. The relevant legislation overrides terrorism exclusion clauses in eligible insurance contracts and eligible terrorism risks can be reinsured with ARPC⁶.

A definition of ‘terrorist act’ for the purpose of this scheme together with the process to determine when an event is a ‘terrorist act’ is set out in Section 6 of the *Terrorism Insurance Act*. The legislation requires a declaration from the Treasurer, following consultation with the Attorney General, that an act was a ‘terrorist act’ for the purpose of the scheme.

Australia’s terrorism insurance scheme applies to insurance for commercial property in Australia and associated business interruption losses and public liability claims. The Act operates so that terrorism exclusions in eligible insurance contracts are deemed to have no effect. In turn, insurers can reinsure any terrorism risks that the Act requires them to assume with the Australian Reinsurance Pool Corporation (ARPC), which was established to administer the scheme. The ARPC charges insurers a premium for reinsurance and requires that they retain some terrorism risk. The scheme provides cover for terrorism risks through a number of layers. The first main layer of cover is provided by a monetary pool (which was initially planned to accumulate to AUD 300 million), funded by reinsurance premiums. The pool is supplemented by a line of credit of AUD 1 billion, which is underwritten by the Government, after which the Government has provided an AUD 9 billion indemnity.

A report issued by the Treasurer in 2006⁷ recommended refining the scheme. Specifically, the report recommended requiring the ARPC to continue charging premiums for reinsurance at the current rates; that once the pool

reaches AUD 300 million, the ARPC has discretion to use premiums to build the terrorism insurance pool further or purchase reinsurance for the scheme; increasing insurer retentions under the scheme; that in relation to bundled insurance policies, requiring the ARPC to charge reinsurance premiums only on those sections of the policy that exclude terrorism risks; and modifying the scheme to cover all commercial insurance provided for public authorities, ensuring consistent treatment to insurance for government business enterprises and local government (which the scheme currently covers) and other public authorities that commercially insure, such as some local water utilities (which the scheme currently excludes). These refinements are aimed to encourage greater participation of the commercial market and to increase the consistency of the scheme's application to commercial property and infrastructure.

AUSTRIA

The types of natural disasters to which Austria is most exposed are **floods, storms, hail, avalanches, mudslides** and **earthquakes**. Austria is vulnerable to these disasters since there are numerous buildings that have been built in zones highly exposed to earthquake, avalanche and flood risks, for example along the Danube. A new risk zoning and mapping model for floods (HORA) has been developed through a private-public partnership between the Federal Ministry of Agriculture, Forestry, Environment and Water Management and the association of Austrian insurance companies (*Versicherungsverband Österreich*). This publicly accessible model is aimed to increase risk awareness and facilitate insurance penetration⁸.

The responsibilities of the Central Institute for Meteorology and Geodynamics, an agency affiliated with the Federal Ministry of Education, Science and Culture, include all activities usually carried out by a national meteorological and geophysical service, such as providing information, advice, and warnings in cases of crises and incidents as well as natural and environmental disasters, and gathering and treating the results of meteorological and geophysical examinations. The Central Institute also compiles hazard zone maps about earthquakes. Hazard zone maps for rivers, mountain torrents and avalanches, including assessments of risks, are adopted by the Federal Ministry of Agriculture, Forestry, Environment and Water Management.

Coverage for natural perils

In Austria, losses from **natural disasters** are covered on the one hand by the private insurance market and, on the other hand, by the Austrian Catastrophes Fund. Private insurance cover for losses caused by earthquakes, floods, storms, hailstorms, avalanches, landslide and mudslides is available, but

reportedly not widespread. There is no comprehensive natural disaster insurance policy in private insurance markets in Austria. Rather, private insurance cover for losses caused by natural catastrophes is provided in the framework of (i) a windstorm insurance (hail, rock slide, landslide) and (ii) a limited coverage for losses caused by natural catastrophes such as floods, earthquakes and avalanches. The insurance cover for floods, avalanches, or earthquake losses is low and premiums are not usually dependent on risks. Further compensation and assistance is provided by special laws enacted on an *ad hoc* basis⁹.

While existing insurance coverage is limited, Austrian insurance companies are exposed to natural disaster risks, since such risks are mainly written by national companies. However, no insurance or reinsurance company has failed as a result of a disaster in Austria. Based on HORA, the new risk zoning and mapping model for floods, it should become possible for Austrian insurance companies to introduce more effective risk-based premiums.

At present, private insurance against losses caused by natural forces is not able, alone, to provide adequate coverage. Large losses from natural disasters are compensated by the Austrian Catastrophes Fund established in 1966 and currently governed by the Catastrophes Fund Law of 1996, which is financed through shares in the income tax, the reward tax, the corporation tax and the capital yield tax. The amount of endowment which is not consumed by compensations is brought into a reserve. This system of financing by running tax shares and compensation of an increased financing requirement out of the reserve proved itself as more or less sufficient in the past.

Extreme situations, however, such as the extraordinary flood of 2002 can prove that this system is insufficient to grant quick aid and reconstruction of destroyed infrastructure of damaged areas. In order to guarantee the financial means for assuring adequate aid to injured persons and for reconstructing the damaged infrastructure additional resources were granted by the Austrian Parliament in the year 2002. Additional amounts were also granted for the execution of urgent measures and the accelerated implementation of preventive measures to avoid high water damage. In the aftermath of the floods of 2002 and 2005, the Austrian Government conducted in-depth post-disaster reviews.

Coverage for terrorism risks

In order to facilitate the coverage of **terrorism risks**, the *Österreichischer Versicherungspool zur Deckung von Terrorrisiken* was set up on 1 October 2002 by the Austrian insurance association (*Versicherungsverband Österreich*) as a purely private co-reinsurance pool, with no state guarantee¹⁰. The capacity of the Austrian terrorism risk pool amounts to EUR 200 million

(EUR 50 million are borne by direct insurers, while the reinsurers' contribution totals EUR 150 million). In the event of losses exceeding EUR 200 million in one year, the payments would be reduced on a pro-rata basis.

BELGIUM

Belgium is exposed to a diverse array of natural hazards, the most frequent being *storms, floods, ground subsidence, cyclones* and *earthquakes*. Floods, on average, lead to the most significant damages. A sufficiently powerful storm could destroy property throughout the entire country. Earthquakes did not result in much damage in the past, but a strong earthquake in a heavily urbanized area could result in considerable damages.

In comparison with other OECD countries, Belgium has not known a large-scale natural catastrophe. This helps to explain, in part, the limited resources dedicated, to date, to enhancing risk awareness, the evaluation of risks, and their prevention. National legislation contains very few measures that promote risk prevention. According to the Belgian authorities, policies promoting prevention and mitigation of risk could be better developed and coordinated in light of the future evolution of natural disaster risks in Belgium. Regional authorities in Belgium have developed mathematical models in the area of water management. These models can be used with a view to simulating floods. It appears that certain insurance companies also have similar types of models but do not publish them.

Insurance coverage for natural perils

As of early 2006, insurance against natural catastrophes was fairly limited, with the exception of storms, which were, by law, required to be included in fire insurance policies covering "simple risks" (i.e., low-value private housing and low-value private and public buildings). Insurance coverage of natural catastrophes is expected to increase as a result of major amendments introduced in September 2005 that required all fire insurance contracts covering simple risks to cover not only storms but also all natural catastrophes. Mandatory rules define the perils covered (storms, earthquake, flood, public sewage overflow and backflow, landslide, and ground subsidence) and the indemnification criteria. The requirement for full disaster coverage, which took effect for all fire contracts issued after March 2006, applies to both direct and indirect losses from natural catastrophes. The new regime also applies to existing fire insurance contracts upon their first annual renewal.

In this system, the Belgian *Bureau de Tarification* is responsible for ensuring adequate coverage and specifies rates and conditions for risks that are

not willingly covered by fire insurance companies (“BT risks”). All potential policyholders have access to these rates and conditions and any fire insurance company that refuses to offer a fire policy or that charges a higher premium or deductible than that set out by the Bureau must inform the potential policyholder of the rates and conditions set forth by the Bureau as well as inform the potential policyholder that he/she can go to another insurer for business. Natural catastrophe risks that are covered pursuant to the Bureau’s rates and conditions are covered by all fire companies selling fire policies covering simple risks under the terms and conditions of the Bureau, up to a limit, with the excess being reinsured by the state, subject to a pre-determined ceiling. This two-layered arrangement, involving a partnership between the public sector and private insurance companies, is, more specifically, as follows:

1. **Mutualization of losses among fire insurers participating in the CaNaRa scheme:** A non-profit, government-mandated, loss-sharing industry body, called ASBL CaNaRa¹¹, serves to spread disaster losses across members of the scheme, according to a pre-determined formula, as well as to fund the *Bureau de Tarification*. This arrangement effectively involves a sort of market-wide coinsurance agreement. This loss-sharing scheme is limited to catastrophic risks and does not concern other risks that the insurers cover pursuant to their own conditions. In regard to BT risks, each insurer is responsible for the share of losses corresponding to its share of the market for fire insurance (simple risks), calculated on the basis of premium income. The amount of losses exceeding this share is reimbursed to the insurer by CaNaRa. An insurer is obliged to pay into CaNaRa the amount of premium income that exceeds its market share.
2. **Compensation from the government-backed national calamity fund:** Fire insurers participating in the CaNaRa scheme can cap their aggregate exposure to catastrophic losses, in accordance with specific formulas¹². As soon as the ceiling is reached, the insurance company can file a claim with the national calamity fund, or *Caisse nationale des calamites*, which will reimburse the difference between the established ceiling and the total indemnities to be paid by the insurer. This second level of compensation, therefore, introduces a loss-sharing arrangement between the private and public sector. The insured parties only deal with the insurance company, which advances payments that will, in turn, be reimbursed by the *Caisse nationale des calamites*. The intervention of the *Caisse* is limited, on a per event, market aggregate basis, to EUR 700 million in case of earthquakes and to

EUR 280 million for the other natural catastrophes covered. If this ceiling is reached, the indemnity to be paid to the insured parties – that is, the fire insurance policyholders – is reduced proportionally. In consideration of the amounts set by the law (in excess of the indemnities paid by private insurers), this hypothesis is relatively remote.

Belgian financial regulation requires insurance companies to establish an equalization and catastrophe provision in recognition of potential non-recurring losses and special risks that could occur in the future. This provision enjoys partial tax advantages.

While the introduction of extended mandatory insurance coverage against natural disasters will, in the short term, increase the level of disaster insurance coverage in the population, as all those with fire policies for simple risks will enjoy extended coverage, it is conceivable that the degree of coverage could fall in view of increased premium rates arising from the extension of fire coverage to all natural catastrophes. An evaluation of the level of insurance coverage against natural disasters will therefore not have any value until the insurance market has stabilized subsequent to the intervention of the *Bureau de Tarification*.

Insurance coverage for terrorism risks

Further to a Law enacted in 2007, since 1 May 2008 terrorism risk coverage is mandatorily included in the following classes of insurance contracts covering risks located in Belgium: life insurance (individual and group policies), accident and health insurance (including work accidents), fire insurance for households and small businesses, liability insurance for public places in case of fire or explosion, and third party motor liability insurance. The new regime also applies to existing contracts upon their first annual renewal.

The Law includes a definition of “terrorism”¹³, which appears to be modeled on the *OECD Check-List of Criteria to Define Terrorism for the Purpose of Compensation*¹⁴. The occurrence of a terrorist act must be officially declared by a special Committee, composed of representatives of the government, the Banking, Finance and Insurance Commission (CBFA) and the reinsurance industry.

In compliance with the provisions of the Law, the ASBL TRIP (Terrorism Insurance & Reinsurance Pool) was established on 1 February 2008 as a non-profit organization to distribute the cost of terrorism cover among the participants¹⁵. TRIP provides coverage of terrorism risks up to a global annual

limit of EUR 1 billion (adjusted every year based on the Consumer Price Index relative to December 2005). Under this scheme, EUR 700 million (indexed) capacity is provided by the insurance and reinsurance industry, while the government offers an excess capacity of EUR 300 million. The ceiling of EUR 1 billion (indexed) can be changed by the government in response to new risk conditions. Participation in the pool is not mandatory, but only TRIP members benefit from the liability cap established by the Law.

CANADA

The majority of Canada's disasters are due to *weather-related events* (e.g., hurricanes, tornadoes, hailstorms, blizzards, ice storms, and floods). **Flooding** is the most common type of disaster occurring in Canada. Geological hazards, particularly *earthquakes*, also pose a significant geophysical threat to Canadians and the Canadian economy. For example, in the past century, there have been severe earthquakes (5.5 - 7.5 on the Richter scale) in a number of major Canadian centers including Montreal, Vancouver, Ottawa and Quebec City.

In addition to the array of hazards, Canada's hazard risk is exacerbated by the concentration of its population into 25 major metropolitan areas many of which are located in high risk areas (e.g. Vancouver, with a population of 2.1 million faces risk from tsunamis, earthquakes and rising sea levels). Aging infrastructure and inter-dependent technologies also have potential to increase disaster risk and costs.

The Canadian Disaster Database, maintained by federal Department of Public Safety and Emergency Preparedness (PSEPC), contains historical information on disasters that have directly affected Canadians, at home and abroad, over the past century. The database has references to all types of Canadian disasters, including those triggered by natural hazards, technological hazards, or conflict (but not war). The database describes where and when a disaster occurred, who was affected, and provides a rough estimate of the direct costs. Additionally, the property and casualty insurance industry association, the Insurance Bureau of Canada, publishes an annual table of disaster losses in their *FactsBook* publication.

According to Canadian governmental authorities, Canada has a strong culture of emergency preparedness and response. PSEPC has overall responsibility for enhancing the protection of critical infrastructure, and for safeguarding lives and reducing damage to property by fostering better national emergency management and preparedness in Canada. PSEPC consults on national emergency management priorities across prevention/mitigation,

preparedness, response and recovery through a Federal/Provincial/Territorial committee of senior officials responsible for emergency management.

The federal *Emergency Preparedness Act* (EPA) serves as the foundation for the federal government's engagement in emergency planning and its emergency management relationship with other jurisdictions in Canada. The *Act* assigns a wide range of leadership responsibilities to the designated federal ministries relating to: training and education; research and development; and to disaster financial assistance programs. The EPA also mandates each federal ministry to identify areas of accountability and to develop effective emergency plans to address identified contingencies. The EPA was, at the time that this stocktaking was undertaken, under review with a view to including reference to mitigation, among other significant proposed changes.

The Federal Policy on Emergencies (FPE) articulates the role and responsibilities of federal government departments, key concepts, and coordination mechanisms for dealing with emergencies. It underscores the need for close collaboration and coordination among federal departments and agencies, and between them and the provinces and territories. PSEPC is the linchpin in this coordination. The policy allows for periodic review and amendment to the FPE to reflect changing relationships among federal government departments or orders of government and to integrate modern emergency management concepts. Such a review is anticipated in conjunction with the review of the EPA.

Additionally, each province and territory in Canada has emergency management legislation that governs civil emergency preparedness. The primary objective of the legislation is to prevent loss of life, protect public health and welfare and minimize damage to Canadian communities. Recently, a number of provinces - Ontario, Québec, Alberta, British Columbia - have revised their emergency management legislation to emphasise the need for hazard identification and vulnerability assessment and underscore disaster mitigation as an essential component of comprehensive emergency management.

To date, the federal government has not implemented a national-level disaster mitigation strategy. As a result, Canada's emergency management approach remains predominantly response-focused. There is differential economic capacity among municipalities and provincial/territorial governments to implement mitigation measures that will ultimately influence implementation the adoption of mitigation practices in the future. There are still gaps in social-economic data gathering and estimation of disaster loss that make it difficult to demonstrate to policy and decision-makers the benefits, versus the costs, of

implementing prevention/mitigation measures in order to reduce long-term disaster vulnerability.

Canada has a comprehensive national weather warning system for a wide range of meteorological hazards. The Meteorological Service of Canada (MSC), a branch of Environment Canada, issues severe weather warnings, watches, and advisories to the public via the media, weather outlets and weather radio. The Service monitors water quantities, provides information and conducts research (including risk modelling) on climate, atmospheric science, air quality, ice and other environmental issues, making it an important source of Canadian expertise in these areas. The MSC and Emergency Management Ontario (Ontario government) have developed a community level Hazard Identification and Risk Assessment (HIRA) process that is intended to assist Ontario municipalities in assessing weather-related hazards for emergency management planning purposes.

The Canadian federal government initiated the Flood Damage Reduction Program (FDRP) in 1975 to curtail escalating disaster costs in areas of known flood hazard and to discourage development in flood vulnerable areas. Between 1975 and 1995, more than 900 communities were mapped and designated under the FDRP including some major urban centres. Although the FDRP is no longer in existence, most flood-prone areas were mapped and the provinces/territories and municipalities continue to use the zoning maps that were developed under the program to establish zoning regulations in areas of high flood risk.

Conducting a hazard risk and vulnerability assessment is critical part of every emergency program. In the province of British Columbia, this is a requirement mandated by the provincial *Emergency Program Act* that requires local authorities to prepare emergency plans. To assist municipal authorities in the regard, the B.C. government, through its Provincial Emergency Preparedness program, has developed an online hazard, risk and vulnerability analysis tool (HRVA). The purpose of HRVA is to help communities make risk-based decisions that augment disaster mitigation, preparedness, response and recovery.

A number of non-profit organizations are involved in disaster risk awareness, prevention, and mitigation. For instance, the Canadian Natural Hazards Assessment Project (CNHAP), a collaborative project with Environment Canada, is designed to assess the risk to Canadians from natural hazards and determine how those risks might be mitigated, take an inventory of gaps in knowledge, and enhance public awareness. CNHAP published the first comprehensive assessment on the state and nature of knowledge on Canadian hazards and disasters in the summer of 2003. The outcomes of this project,

funded jointly by PSEPC, the MSC and the Institute for Catastrophic Loss Reduction (ICLR), contribute to the establishment of appropriate mitigation measures for the variety of hazards. The interdisciplinary publications provide a useful reference for natural hazards researchers and emergency management practitioners and help to transfer Canadian experiences to the international community. The Canadian Risk and Hazards Network (CRHNet) is a not-for-profit organization that was established in the fall of 2003 to create an environment in which the natural hazards research, education and emergency management practitioner communities can share knowledge and innovative approaches that reduce disaster vulnerability. The CRHNet hosts annual symposia focusing on disaster reduction.

The insurance industry founded the Institute for Catastrophic Loss Reduction (ICLR) in 1998. ICLR is a not-for-profit research centre for multi-disciplinary disaster prevention research. It achieves its mission through the identification and support of sustained actions that improve society's capacity to adapt to, anticipate, mitigate, withstand and recover from natural disasters. The P&C insurance industry association, the Insurance Bureau of Canada, actively engages in promoting prevention and mitigation.

According to available data¹⁶, insurance coverage for climatic and seismic hazards in Canada is readily available in private insurance markets. The majority of the population is insured against some natural catastrophes under home insurance policies as most policies sold in Canada are multi-peril. A standard property insurance policy generally provides coverage against perils such as strong winds, tornadoes, hurricanes, hail and freezing rain. Coverage for additional perils such as torrential rain, sewer back-up, landslides and damage caused by the weight of snow are also generally available as endorsements, or additions, to the standard property policy. Some weather-related hazards, however, are not generally covered by insurance policies or endorsements because of circumstances which make them unacceptable for underwriting reasons. Damage caused by flooding of lakes, rivers and streams, as well as waves, tides and tidal waves are examples of localized risks which violate basic underwriting criteria, and thus, cannot be covered by standard insurance policies. In all provinces, except Quebec, basic fire policies cover fire loss from several causes, including earthquake and terrorist acts.

Since 1998, a regulatory framework has been in place for the management of earthquake risk in federally regulated insurance companies that includes mandatory requirements for estimating probable losses. The federal guideline stipulates that insurers must have funds available from their capital base, reinsurance arrangements or dedicated earthquake reserves to pay for the probable maximum loss resulting from a 250 year earthquake on their book of

business with the threshold level of preparedness increasing over time towards a 500 year earthquake. The property and casualty industry has, in the past, sought tax relief on income earned on these earthquake reserves. Such relief has not been granted; the amounts placed in these reserves are limited as a result. For earthquake risk, insurers rely extensively on reinsurance excess of loss cover for managing their exposures to catastrophic risk. The solvency regime also requires that companies work with their actuaries to model scenarios including significant natural disasters. The results of these models are shared with solvency regulators in setting capital requirements.

The use of alternative risk transfer instruments (ARTs) by Canadian insurers for risks dealing with natural disaster claims has not been a common practice for a number of reasons, including the availability of reinsurance and uncertainties in the regulatory environment. OSFI's guideline permits their use subject to regulatory approval.

In addition to private insurance coverage, in the event of a large-scale natural disaster the Government of Canada provides financial assistance to provincial and territorial governments under the Disaster Financial Assistance Arrangements (DFAA) that were implemented in 1970 to bring coherence and consistency to the Government of Canada's response to provincial and territorial requests for disaster recovery assistance. Provincial governments design, develop and deliver disaster response and assistance programs within their own jurisdictions. In doing so, they establish the financial assistance criteria they consider appropriate for response and recovery. The federal government supports the provincial and territorial governments through the DFAA. The DFAA are intended primarily to address natural disasters and other multi-sectoral emergencies resulting in extensive property damage or disruption of the delivery of essential goods and services. The purpose of the DFAA is to assist provinces with the costs of dealing with a disaster where those costs would otherwise place a significant burden on the provincial economy and would exceed what they might reasonably be expected to fully bear on their own.

Assistance is available under the DFAA when a province's eligible expenses incurred in carrying out its own disaster response and recovery program are above CAD 1 per capita of the provincial population (as estimated by Statistics Canada to exist on July 1st in the calendar year of the disaster).¹⁷

The DFAA are intended to support the provinces in: providing or reinstating the necessities of life to individuals, including help to repair and restore damaged homes; re-establishing or maintaining the viability of small businesses and working farms; and, repairing, rebuilding and restoring public

works and essential community services to their pre-disaster capabilities. The DFAA are not intended to replace or undermine private insurance. Private assets that are insurable are not eligible for cost-sharing.

In regard to post-disaster response, the National Emergency Response Plan (NERP) is an all hazard plan being developed by PSEPC for the coordination of federal and national support during emergencies of significant impact or complexity which may not be covered under situation-specific contingency plans or arrangements. It is based on the National Emergency Response System (NERS). The NERS is the process by which the Government Operation Centre (GOC) and Directorate monitors events, analyses implications, vulnerabilities and risk and plans and coordinates the federal response to events, both predictable and unforeseen. The NERS is divided in four phases: monitoring and reporting; risk assessment and analysis; planning, and operations coordination. The risk analysis phase includes detailed assessment of risks, and considers the most likely scenario, the likely impacts on local population, critical infrastructure, emergency responders, security, the environment, the economy and on the political scene as well as vulnerabilities and government's tolerance to risk. Based on this information the planning process takes place to respond to events and to manage its negative impact.

National and regional catastrophe contingency plans are developed in Canada. Contingency planning is initiated when an event can be predicted or seems imminent (*e.g.*, annual cycle of flooding and forest fires, a catastrophic earthquake on Canada's west). Contingency plans lay out the federal response for the initial disaster response based on the most likely scenario. Contingency plans also provide direction for readiness activities, potential for mitigation of further damage, and post-disaster recovery planning and ensure the necessary level of operational preparedness. This type of planning relies on solid hazard and risk management research and detailed analysis.

In total, the estimated cost of natural disasters in Canada since 1970 is CAD 40 billion. An estimated CAD 7.8 billion in damages was caused by the 1996 Saguenay River flood in Québec (over CAD 1.5 billion), the 1997 Red River flood in Manitoba (almost CAD 1 billion) and the 1998 Eastern Canada Ice Storm which struck Ontario, Quebec, and New Brunswick (exceeding CAD 5 billion). Firestorm costs in British Columbia are estimated at CAD 700 million, the federal share of which under the DFAA could reach CAD 200 million. These figures do not take into account the cost of provincial/territorial disasters that do not meet the DFAA threshold, making it very difficult to provide a meaningful estimate of ex post payments for disasters by governments.

Post-disaster reviews have been conducted. For instance, the province of British Columbia experienced the worst forest fires in its history during the summer of 2003. Following the post-event review of the 2003 fires, commissioned by B.C. government, the federal Canadian Forestry Service initiated an assessment of the vulnerability of Canadian forests and forest-based communities to wildfire. The recommendations of the provincial review are publicly available¹⁸.

CZECH REPUBLIC

The Czech Republic is most exposed to *floods* and the areas with high density of population and industry are especially vulnerable. Catastrophic risk insurance, including floods insurance is reportedly available, but market conditions after the 2002 floods have changed. Some insurance companies currently use a risk zoning system (Geographic Information System - GIS) for the evaluation of flood risk; this technology was acquired by the Czech Insurance Association and it identifies four different flood risk zones in the Czech Republic. Pricing of flood insurance is, therefore, based on the location of the property to be covered. The Flood Risk Assessment Tool (FRAT), developed through collaboration among the Czech Insurance Association, Multimedia Computers, and Swiss Re, covers 16 000 km of rivers and streams in the Czech Republic, enabling accurate assessment of flood risk; this technology fully supports the underwriting process of primary insurers and it can also be used as a basis for improved flood accumulation reporting and control. The GIS is also used by Czech insurance companies for the evaluation of storm risk.

Flood risk coverage is marketed on a voluntary basis in this country, as a component of property insurance policies¹⁹. Over 50 per cent of Czech households in 2004 had insurance policies on household contents. Insurance companies can take into account, regarding the setting of premiums, the level of prevention undertaken by the policyholder; this may also affect the deductible. The policyholder may be remunerated by a bonus in case there are no losses. Even if data on penetration rates and coverage limits are not readily available, it is reported that foreign reinsurance companies played an important role in financing flood losses in 1997 and 2002. It is also reported that approximately 50 per cent of flood losses in 2002 (CZK 70 bn in total) were covered by private insurance, but Czech primary insurers had ceded more than 90 per cent of the risk to foreign reinsurance undertakings, so that they did not experience financial difficulties. For those losses not covered by private insurance, *ad hoc* compensation has often been made available *ex post* by the State.

The establishment of technical provisions in the Czech law corresponds to the European insurance legislation. There are no special technical provisions for catastrophic losses only. Reinsurance arrangements play, as noted, a large role in the management of disaster insurance risks by domestic Czech insurance companies. For the time being, ART instruments are not employed and they are not expected to be used in a significant way to cover natural disaster risks.

An integrated rescue and crisis management system has been developed with a view to ensuring the collection and distribution of information in the aftermath of a catastrophe, as well as the coordination of fire brigades, army units, police and other authorities involved. Post-disaster reviews have been conducted in the Czech Republic and are available through the Office of State Supervision in Insurance and Czech Insurance Association.

DENMARK

The most significant natural risks in Denmark are *storms, flood* and *hail*.

Almost every person with any kind of property insurance is insured against windstorm damage. Danish insurance companies mainly reinsure their windstorm risk with international reinsurance companies. The Danish Financial Supervisory Authority engages in continuous reviews and on-site inspections to assess whether domestic insurance companies have sufficient reinsurance cover and sufficient capital to absorb losses resulting from a catastrophic event.

A government-backed scheme was established in 1991 as a compensation mechanism to cover the losses resulting from the floods caused by overflowing of the sea. The scheme was extended in September 2000 to compensate for windstorm damage in woods, provided that a base policy covering storm is in place.

All property insured against fire is automatically covered by the scheme. The scheme is funded through a tax on every fire insurance policy, except for vehicle insurance. The scheme is administered by a central government entity – *Stormrådet* (Storm Council) – assisted by the insurance companies. The Storm Council has its secretariat at the Danish Insurance Association. The Council is entrusted with the authority to decide whether there has been flood or windstorm damage in an area within a certain period of time.

Denmark has contingency plans for natural and other disasters, with the scope of the contingency plan depending on the specific incident and its potential consequences. These plans might involve different authorities such as the Emergency Service, the Meteorological Office, and other agencies.

FINLAND

In Finland, the main natural catastrophes threats relate to *storms* and *floods*. Authorities responsible for environmental issues and rescue services evaluate the risks relating to natural catastrophes. A national working group on exceptional floods examined, in 2003, the best methods of flood prevention and risk assessment.

After the 2004 tsunami in Asia, planning for a national warning system of natural catastrophes (LUOVA) was initiated. The warning system will comprise several information networks and a 24-hour weather forecast service. The aim is to produce on-line information on natural catastrophe threats both abroad and in Finland.

Insurance companies enhance disaster risk awareness concerning, *e.g.*, damages to woods and fire damages, through the provision of general information to consumers and policyholders on the prevention of damages.

The government of Finland decided, in 2003, on a policy that recognizes the most vital functions in society and the need for strategies to safeguard these essential functions. On the whole, this policy is controlled and guided by the government; every Ministry is responsible for specific tasks and projects in the field of their own affairs.

According to Finnish legislation on “exceptional conditions in society”, the government can provide guarantees to certain vital (export and import) transport insurance contracts that could otherwise not, due to exceptional conditions, be reinsured on the market. This authority is available only under certain conditions, such as war conditions or after a major disaster.

Insurance undertakings are required, by law, to be prepared and have in place plans to maintain the vital functions in exceptional conditions. The government is allowed to regulate financial and insurance markets in the event of exceptional conditions, as specified in the legislation.

There is no compulsory natural disaster insurance. Floods are not insured against through traditional household insurance²⁰. Damages related to exceptional floods are offset by compensation to injured parties through the state budget. Under the *Act on Compensation of Exceptional Floods* (Law n.284 of 1983), exceptional floods in inner lakes, rivers, and such water areas are compensated by the State in Finland. Damages covered include: damage to woods, private roads and bridges, buildings, and private property.

Storms are insured against in approximately 70 per cent of household insurance contracts, and in almost all commercial property insurance policies. National insurance companies are not highly exposed to natural disaster risk at the moment and ARTs are not currently used in this country.

FRANCE

In France, the compensation of victims of catastrophic events (natural or man-made) is widely understood as the enforcement of the Constitutional principle of national solidarity. The Preamble to the 1946 Constitution - quoted in the Preamble to the 1958 Constitution - in fact expressly refers to “*the solidarity and equality of all French people as to the charge resulting from national calamities*”²¹.

As in other countries, personal injuries and property damages caused by catastrophes are not compensated in the same way in France: while personal injuries due to a disaster often fall under the national health and social security system, damages to property are, in most instances, covered by first party insurance. As a result of a series of legislative interventions, private insurance companies may not exclude from first party coverage losses arising out of: (a) natural catastrophes, (b) technological disasters, or (c) terrorism. While the market for first party policies (such as fire policies) is, as a general rule, voluntary in France, most people do in fact take up insurance, especially if they own or rent premises²².

Natural Disaster Compensation Scheme (CAT NAT)

Pursuant to article L125-1 of the *French Insurance Code*, insurance contracts, issued to any natural or legal persons other than the State in order to insure against damage caused by fire or any other damage to property located in France as well as damage to hulls of motor vehicles, must also cover against the effects of natural disasters and subsidence of land due to underground cavities²³ or due to Marl-pits on property covered by the insurance contracts. In addition, when the insured is covered for business interruption, the cover must be extended to the effects of natural disasters in accordance with the terms of the corresponding contract.

This regime, established by Law n.82-600 of 13 July 1982 (*Loi relative à l'indemnisation des victimes de catastrophes naturelles*) and forming the basis of the French National Disaster Insurance Scheme (CAT NAT; see below), does not refer to an exhaustive list of natural perils covered, nor does it contain a

complete list of exclusions. The 1982 Law merely refers to the notion of “uninsurable damage”; in particular, the *Insurance Code* states that uninsurable direct material damage, caused by the abnormal intensity of a natural agent, when normal measures have been taken to avoid such damage have been unable to prevent the occurrence thereof or could not be taken, shall be deemed to be a natural disaster.

In any event, the existence of natural disaster must be expressly declared by inter-ministerial decree which shall determine the areas and the periods of the occurrence of the disaster and the nature of the damage. The decree shall state, for each Municipality that has requested the recognition of the existence of a natural disaster, the decision of the Ministers.

According to Article L125-2, a clause in the contract must explicitly state that natural disasters are covered and that coverage cannot be excluded or limited for any of the properties mentioned in the contract. All the insurance contracts mentioned above are deemed to contain such a clause, and any exclusion is considered null and void (Article L125-3). Notwithstanding any provision to the contrary, moreover, the coverage offered includes the reimbursement of the cost of geotechnical studies rendered necessary prior to repairing constructions affected by a natural disaster (Article L125-4).

The *Insurance Code* specifies that some categories of damages are excluded from this mandatory extension of coverage. The following are, in particular, excluded from the CAT NAT regime: damage caused to non-harvested crops, cultivation, soil and livestock outside premises²⁴; damage sustained by the hulls of air, marine, lake and inland waterway vehicles as well as goods in transit. The regime does not, moreover, apply to damages caused to real property built and to activities carried out in breach of administrative regulations in force intended to prevent the damage caused by a natural disaster.

Compulsory coverage was extended in 1990 to damage caused by wind during storms, hurricanes and cyclones (Article L122-7 of the *Insurance Code*). This additional coverage applies when no declaration of natural disaster has been issued. However, in the case of wind attributable to a cyclone in respect of which the maximum surface winds recorded or estimated on the damaged area have reached or exceeded 145 kilometers an hour on average over ten minutes or 215 kilometers an hour in gusts, coverage is provided under the CAT NAT scheme, implying that a state of natural disaster has to be declared by inter-ministerial decree.

In summary, the French natural disaster compensation scheme provides for a compulsory extension on all property damage policies purchased on the

voluntary market²⁵. It is important to note that, as mentioned, coverage under the catastrophe extension is triggered only when the state of natural disaster is declared by inter-ministerial decree. Moreover, the damaged property must be covered by a "property damage" insurance policy and a causal link must be established between the catastrophe declared in the decree and the damage suffered by the insured property.

The payment of compensation under the French CAT NAT scheme, therefore, is subject to the following two conditions: (a) an official declaration of the state of natural disaster must be issued by inter-ministerial decree; (b) the damaged property must be covered by a insurance policy against fire or any other type of damage (theft, water damage, etc). The natural disaster cover follows the terms and conditions of the underlying first party insurance policy²⁶, with the exception of the premium rate and deductibles.

According to the rules of the scheme, the insured parties must retain a portion of the risk, by means of a statutory deductible that cannot be bought back even by means of another policy. Deductibles are compulsory – i.e., they apply even when the basic policy does not include them – and their amount is determined and updated by means of decrees issued periodically by the competent authority.

Since 1 January 2001, a sliding scale has been introduced to vary these deductibles so as to encourage loss prevention measures. This scale applies to those districts which do not yet have a prevention plan for foreseeable natural risks (PPR). A multiplicative coefficient is applied to eligible natural disaster claims located in districts without a PPR for the given peril.

The coefficient is based on the number of declarations (an inter-ministerial decree can contain several declarations) issued in respect of this same peril during the first five years preceding the new decree declaring a state of natural disaster. These coefficients shift, in step-wise fashion, the risk of natural disasters to policyholders as the frequency of natural disasters increases²⁷. This sliding scale does not apply when a PPR is set up for the peril in question, but it is reactivated if the PPR is not approved within four years. This scale does not apply to motor vehicles. The deductibles are compulsory, i.e. they apply even when the basic policy does not include them.

The additional premium rates linked to the compulsory catastrophe extension in policies are set by decree. Since 1 September 1999, the rate of catastrophe premiums for property other than motor vehicles has been 12 per cent of the premium or contribution paid for the basic property coverage.

This complex scheme is able to work effectively due to the fact that *Caisse Centrale de Réassurance* (CCR), a state-owned company established in 1946, entered into an agreement with the authorities that allows it to offer reinsurance cover with a government guarantee in the field of natural disasters. CCR does not have a monopoly in natural disaster reinsurance: primary carriers, therefore, are free to seek coverage from the reinsurer of their choice, and may even take the risk of not purchasing reinsurance. In any event, CCR remains the only company within its sector of activity that offers a whole range of reinsurance solutions with unlimited cover. CCR thus provides a guarantee of solvency and security for insured parties within the French natural disaster compensation scheme²⁸.

According to current practice, CCR usually offers two types of reinsurance solutions, which are combined to provide two-fold reinsurance cover to primary catastrophe risk carriers. Under the first solution, known as "quota-share", the insurer cedes a certain proportion of the premiums collected to the reinsurer and the latter, in return, undertakes to pay the same proportion of losses. Quota-share reinsurance ensures that the reinsurer follows the fortunes of the insurer, since the latter has to cede a percentage of each of the accounts in its portfolio to the reinsurer. Thus, the risk of anti-selection is avoided. The second solution, known as "stop-loss", covers the portion not ceded on a quota-share basis by the insurer - in other words, the insurer's retention. This is a non-proportional form of reinsurance because, contrary to the "quota-share" system, the reinsurer only intervenes if the total annual losses exceed an agreed figure, expressed as a percentage of the premiums retained. This type of reinsurance enables the insurer to protect itself against the frequency or accumulation risk, i.e. the risk of many claims occurring at the same time. Although most "stop-loss" reinsurance treaties contain a limit of indemnity, CCR's cover in the field of natural disasters is unlimited thanks to the State guarantee from which it benefits²⁹. The deductible under the CCR treaty therefore represents the maximum amount which an insurer will have to bear in the course of a single underwriting year, however many losses occur³⁰.

Under the *Insurance Code*, the Natural Disaster Central Rating Bureau (*Bureau Central de Tarification des Catastrophes Naturelles*) is entrusted with several regulatory powers with respect to the governance of the CAT NAT scheme. Articles R250-2 and R250-3, for example, lay out the procedure for referring certain controversial matters to the Bureau, such as the refusal to grant coverage by at least two insurance companies and the failure of the insured to conform to the provisions of a disaster prevention plan.

Insurance Coverage for Man-made Catastrophes

(a) Terrorist acts

Pursuant to Article L126-2 of the of the *Insurance Code*, property insurance contracts may not exclude the coverage for damage as a result of terrorist attacks or bombing perpetrated on the national territory. Any clause to the contrary shall be deemed null and void. Article L126-1, in turn, states that the victims of terrorist attacks perpetrated on French national territory and French nationals victims abroad of such same acts may seek indemnification from the government's Guarantee Fund of Victims of Terrorist Attacks and Other Offences³¹. Compensation may be refused or the amount thereof reduced in case the fault lies with the victim.

In order to address the shrinkage in the supply of terrorism risk reinsurance after 9/11, a dedicated terrorism reinsurance pool, named GAREAT, was established in December 2001 (covering risks since 1 January 2002). GAREAT offers reinsurance protection to direct insurers provided that they cede the terrorism risk forming part of all qualifying policies within their portfolio. The French government effectively acts as reinsurer of last resort, offering unlimited protection through the CCR³².

(b) Technological Disasters

As a response to the AZF accident of 21 September 2001, involving the explosion of a chemical plant in Toulouse that caused 30 fatalities, 5 000 injuries and the devastation of thousands of buildings, a law was enacted in July 2003 to extend first party insurance coverage to damage caused by industrial catastrophes.

Pursuant to Article L128-1 of the French *Insurance Code*, introduced by Law n.2003-699 of 30 July 2003, when an accident occurs in a hazardous facility, causing damage to a large number of buildings, an official statement by the public administration will recognize the occurrence of a technological disaster³³.

Article L128-2 states that insurance contracts taken out by any natural person outside his professional activity and covering damage caused by fire or any other damage on property used as dwelling or deposited in premises used as dwelling located in France, as well as damage on hulls of land motor vehicles, must also cover damage resulting from technological disasters affecting the insured property. This cover must guarantee the total compensation of the damage, within the limits, for chattels, of the value declared or the capital

insured by the contract. The insurance company is then subrogated to the rights of the insured against the liable parties, up to the amount of the indemnity paid.

The mandatory extension of coverage does not apply to properties built in areas demarcated by a technological risks prevention plan, unless such properties were built before the publication of the plan; similarly, the mandatory extension of coverage does not apply to properties constructed in breach of administrative rules intended to prevent the damage caused by a technological disaster (Article L128-4).

GERMANY

The main threats in Germany are from *storms* (gale-force winds in autumn/winter and summer storms with hail and downpours) and *floods*.

To model flood risks, the German insurance industry has developed a “Zoning system for flooding, backwater and storm rainfall” (*Zonierungssystem für Überschwemmung, Rückstau und Starkregen – ZÜRS*). In 2004, ZÜRS was revised and is now divided into four hazard classes, instead of three as previously. The new hazard zone (GK2) represents risks which are threatened by levee breaches, levee overflows or by extreme high water. Buildings that lie in this zone can, in principle, be insured taking account of the individual risk; however, each insurer will have to calculate and make allowance for the cumulative hazard of all his policies in force.

In Germany, insurance is offered on a voluntary basis against damage to buildings and household effects from fire, storm, hail and lightning in the private, commercial and industrial area. Since 1991, following approval by the Federal Insurance Supervisory Office, it has been possible - either as a supplement to building insurance and household effects insurance or as a separate insurance policy - to insure against damage from flooding (high water), earthquake, ground subsidence, landslide, weight of snow, avalanches, volcanic eruption and storm rainfall backflow. Indirect damage from lightning, e.g., so-called voltage surge damage, can also be included in building insurance or household effects insurance policies by supplementary agreement. There is no insurance available against damage from drought, groundwater, or tidal wave.

The rate of insurance coverage for storm damage and fire is, in Germany, very high (insurance against storm damage: about 90 per cent; fire: more than 90 per cent). However, while supplementary disaster insurance coverage is offered for roughly 90 per cent of the inhabited territory, on average only about 10 per cent of household effects insurance policyholders and about 5 per cent of residential building insurance policyholders choose to have this supplementary

coverage included in their policies. The distribution of such insurance across Germany is very uneven, for historical reasons. In Baden-Württemberg about 90 per cent of the insurance policies for buildings include damage from natural forces, since such insurance was compulsory there until the end of 1993. On the territory of the former German Democratic Republic as well, a large number of residential buildings are insured by a so-called GDR building insurance policy, which covers damage to residential buildings by flooding even in areas with a high risk of flooding.

In Germany, natural disaster risks are evaluated in detail using statistically/geographically-based zoning systems and are covered by insurance in accordance with individual insurance companies' own underwriting and rate principles. As risk assessment instruments improve, broader and more refined offer of insurance for natural hazards are cautiously being elaborated. However, this has not resulted so far in any significant changes in insurance density; for instance, for flood insurance, most of the new requests for insurance – in particular, immediately after catastrophes – come from endangered riverbank areas which, for technical reasons, the insurance industry will find it difficult to insure, if at all.

One of the perceived problems in connection with insurance against natural hazards in Germany is the low level of subjective awareness of the risks among the population, which expresses itself in a very low average level of demand and market penetration. It can be observed that even after quite major catastrophes, people soon return to their accustomed “daily routine” and thoughts of hazards and precautions recede into the background. In light of this, it is possible to state that while there is no problem with the supply of insurance services in Germany, there is a problem with demand.

In the field of prevention, the federal structure of responsibilities in Germany poses a further problem, in addition to public risk awareness, in terms of trying to implement effective prevention measures. Thus, for example, in the context of the *Flood Prevention Law* passed in 2005, it proved impossible to do much in the way of tightening riverbank use restrictions or raising construction standards, since such issues are predominantly the responsibility of the *Länder*, whose regulations differ widely.

While it is not possible to make a general statement as to whether insurance companies, when calculating premiums, take into account additional preventive measures taken by the customer to reduce risks, property and casualty insurers have, through their trade associations, developed some (non-binding) technical pointers for consumers or are continuing to work on them. Some insurers, in co-operation with suppliers of meteorological data, offer their

customers a storm warning service via mobile telephone which notifies a policyholder as soon as the weather changes in a way which could pose a threat to his particular area of risk, so that appropriate precautionary measures can be taken.

There are no special insurance regulatory rules regarding the establishment of reserves for the purpose of providing for catastrophic risks. That said, applicable rules require an insurance company to set aside reserves to compensate for fluctuations in the amounts of claims in coming years (claims equalization reserves); such reserves benefit from favorable fiscal treatment under certain conditions.

Germany has, in some cases, provided *ex post* compensation to victims of specific disaster events³⁴. For instance, in the aftermath of catastrophic flooding in August 2002, a special fund was set up to provide some limited preliminary financial assistance to victims of the disaster. With respect to private losses, businesses and individuals who suffered flood damages were eligible to receive financial assistance insofar as they could not receive compensation from insurance companies, or other third parties³⁵. The fund was specifically designed to provide compensation for property damages.

After the severe damage caused by the catastrophic flooding in August 2002, there was a public discussion in which those *Länder* hardest hit were calling for compulsory insurance for Germany. As a result of an extensive research into the subject undertaken by the federal government and the *Länder*, in which the advice of the insurance industry was sought as well, the governmental authorities finally determined that, in view of the large number of legal, financial and fiscal factors, no adequate solution could be found, and therefore decided not to proceed with plans to introduce compulsory insurance for protection against natural catastrophes.

As concern terrorism risks, a specialist insurance company was established in Germany in September 2002, called EXTREMUS Versicherungs-AG. EXTREMUS has a share capital of EUR 50 million writing only terrorism business and it benefits from a limited guarantee offered by the German State³⁶. Only risks located in Germany with a total insured value (property damage and business interruption combined) of at least EUR 25 million are eligible for coverage by EXTREMUS. The program is capped at annual aggregate of EUR 10 billion.

HUNGARY

The experience of the past few years shows that, as far as natural disasters are concerned, Hungary is most exposed to **flood** risk. In particular, the regions surrounding the Tisza river are considered to be the riskiest and most vulnerable areas.

Legislation adopted in 2003 established a Fund for Flood and Inland Water Compensation (*Wesselényi Miklós*) and regulated compensation for flood damages. Individuals who own real property in risky regions of Hungary pay contributions to the Fund and, based on these contributions, are entitled to indemnification in case of loss. The Fund is co-financed by government budgetary support if it lacks enough sources to fulfill its obligations.

ICELAND

Iceland is prone to considerable losses from **earthquake** and **volcanic risk** and, to a lesser extent, from **floods**, **avalanches** and **windstorm**. The capital area of Reykjavík has the greatest potential exposure due to the concentration of population and property but is not in a major risk area for the main perils of earthquake and volcanic eruption.

The Civil Protection Department of the National Commissioner of the Icelandic Police is in charge of risk assessment and monitoring as regards safety of the population. Sophisticated monitoring is employed by the State Meteorological Bureau, which runs an early warning and information system for seismic and volcanic risk as well as for avalanche risk in liaison with local authorities. Risk modeling techniques are employed by the Civil Protection Department and Iceland Catastrophe Insurance for earthquake risk (South Iceland Model) and other risks.

The Civil Protection Department and regional Civil Protection Units are engaged in contingency planning for many types of perils but primarily in respect of snow avalanches, earthquakes and volcanic eruptions as these are the greatest threat to public safety. Specific efforts have been made to assess such “out of the box” or extremely unlikely events as tsunamis which have been considered to be extremely unlikely events.

Regulatory measures that have been taken for prevention and mitigation purposes include: strict building codes (earthquakes and wind loading); land use measures for snow avalanches, warning systems for earthquake, volcanic eruption, and snow avalanches; barriers against snow avalanches and floods;

hazard mapping; and awareness programs, for instance for earthquake and volcanic risks.

Major catastrophe risks are handled by a publicly owned company called Iceland Catastrophe Insurance (ICI), thus minimizing the involvement of private insurance markets in catastrophe lines. This state-owned corporation established in 1975 under the *Iceland Catastrophe Insurance Act*, functions as a special purpose insurance company that provides insurance coverage against the following disaster risks: volcanic eruptions, earthquakes, landslides, snow avalanches, and floods. All owners of fire-insured property (fire insurance of houses is compulsory) and related contents in Iceland - whether individuals, corporate entities, or state and public bodies - are insured. Since 1982 so-called “lifelines” are also covered by ICI even if they are not insured against fire: geothermal heating systems; waterworks and sewage systems owned by municipalities or the National Treasury; harbor installations owned by municipalities and the National Treasury; permanent bridges of 50 meters or longer; electric installations, including distribution systems, dams and transformer facilities that are publicly owned; telephone systems and communications networks that are publicly owned; and ski lifts. ICI does not cover windstorm risks which are covered by homeowners’ insurance and some all-risk programs, including all-risk automobile insurance.

Buildings are insured according to their valuation for fire. There is a deductible of 5 per cent for each loss. Policyholders are only insured against direct losses resulting from the above-mentioned catastrophes. Structures that are erected in violation of a regulation or order set by the authorities, or which violate the provisions of enacted law in a manner which can be deemed to make them more susceptible to incurring damage from natural catastrophes, are not deemed to be insured against catastrophes, irrespective of whether they are insured against fire.

Premium rates are 0.025 per cent for residential and commercial property and contents; and 0.02 per cent for lifelines. Fire insurance companies collect the premiums for ICI. ICI is liable, for each individual event, for up to 1 per cent of total insured capital at the time of the loss event. Should the total of payable claims in Iceland exceed this amount, the claims of all of the insured are proportionately reduced. There is no trigger for compensation aside from the occurrence of the event itself. Indeed, ICI makes no distinction, in terms of its catastrophe insurance coverage, between a loss for a single individual person and losses flowing from a national-level disaster.

ICI reinsures its exposure on the global market. To meet its liabilities ICI may obtain a loan and, under the *Iceland Catastrophe Insurance Act*, the State Treasury is required to guarantee such loan.

Given the presence of ICI, catastrophe losses have not impacted private insurance markets. Moreover, ICI has not been adversely affected by recent disaster events; indeed, it has not needed to call on its reinsurers in any event since its founding in 1975. Separately insured windstorm losses are as a rule not severe due to the wind loading of buildings in a country that is used to stormy weather.

ICI is permitted under the *Iceland Catastrophe Insurance Act* to grant funds to subsidize research and projects that are meant to ward off damage caused by natural catastrophes. ICI is further empowered to grant funds for the education and training of national relief organizations that have entered into an agreement of cooperation with the Civil Defense Authority on disaster relief work. Total grants each year may not exceed 5 per cent of the gross written premiums of the previous year.

In terms of *ex post* provision of government disaster compensation, separately from any ICI insurance payments, the government of Iceland has assisted with temporary housing and provided compensation for some business interruption, relocation and so on.

Post-disaster reviews have been conducted after major events such as the snow avalanches of 1995 and the earthquakes of 2000 where the performance of various agencies was assessed. These reports are not available in translation. After the avalanches, it was found that earlier hazard mapping and measures were inadequate and that recent build-up in the affected areas was found to be in hazardous areas with fatal effects. As a consequence, the whole system was overhauled and a special avalanche fund set up to deal with mitigation measures. A special government appointed committee reviewed the performance of Iceland Catastrophe Insurance after the 2000 earthquakes.

ITALY

According to a report published by the European Environment Agency (EEA) in 2004, Italy ranks very high among the 31 EEA member countries in terms of overall exposure to natural disasters³⁷. In particular, Italy is especially vulnerable to **floods, landslides, earthquakes, forest fires, volcanic eruptions** and **drought**. Up to 40 per cent of the Italian population lives in seismic areas where 64 per cent of buildings are not constructed according to anti-seismic rules and where over 120 000 people died for earthquake-related causes in the

last century³⁸. Almost two million people are exposed to volcanic risks in Italy, where there have been as much as 5 400 floods and 11 000 landslides and avalanches over the past 80 years. Victims of hydro-geological risks in the last 50 years have reached 3,500, while the overall costs for natural disasters in this country have been estimated at approximately EUR 100 billion in the last two decades³⁹.

From the point of view of Italian citizens, catastrophes — whether they be natural or caused by man — are events that generate a strong expectation of state intervention and aid. The traditional Italian idea of the state, which developed in the last century and especially after World War II (state based on the principle of solidarity, fully recognized in Article 2 of the Italian Constitution), brings people to rely upon the state for any unexpected, unaffordable, unbearable matter, which implies that persons expect government intervention as a right and demand full restoration of damages whenever a disaster occurs. This expectation is cumbersome for the state in terms of costs⁴⁰.

In Italy, man-made catastrophes can most often be classified as torts or crimes and thus fall under the related legal qualifications and proceedings⁴¹. However, although victims will seek recovery from the alleged wrongdoers, they will equally be expecting the state to provide some sort of compensation for the damages occurred⁴².

The state on its part never spared its aid in this respect: according to available statistics, in the last 10 years the government has spent over EUR 35 billion for damages caused by natural catastrophes, and yearly expenses are progressively growing. The compensation of disaster losses is handled on a case-by-case basis, whereby the Italian government intervenes in emergencies by providing *ex post* financial aid and enacting *ad hoc* laws (so called emergency legislation).

In most cases, state indemnification of disaster losses follows a routine procedure. Whenever a natural catastrophe involves a given area, the local government proposes a declaration of state of emergency for that particular area, which may involve the territory of a town, of a province or of an entire region according to the extent of the disaster. The Italian Cabinet must approve the proposal in order for the state of emergency to be officially declared. Approval opens the way to government intervention. The state of emergency may be very well declared for all sorts of man-made and natural catastrophes affecting the population, public and private property and the environment.

A relevant share of the state's yearly budget is devoted to restoring damages incurred as a result of catastrophes. In the absence of a well organized

set of rules of reference and legal guidelines, state funding is basically inspired by provisions aimed at covering emergency situations connected to specific, unexpected disastrous events, so that *ad hoc* provisions are enacted that vary over time and are highly discretionary. Unexpected, concentrated and extremely exorbitant expenses have often been granted without there being any prevention plans to avoid future similar disasters⁴³. At the same time, the enactment of special laws and provisions indemnifying the owners of properties affected by single disasters have generated a level of reliance on the government, as individuals and businesses count on the government for recovery, which may explain why private insurance covering natural disasters has never fully developed in Italy.

In Italy, insurance coverage of risks related to natural catastrophes is and remains basically limited to private insurance stipulated on a voluntary basis. At present, this kind of insurance coverage is fairly infrequent and it mostly concerns the industrial sector, covering devices, machineries, installations and ancillary services.

To address this situation and to reduce government expenses, several proposals to develop a more efficient model have been presented and debated. Some stakeholders have argued that governmental expenditures in this field could be thoroughly reduced should an insurance mechanism covering losses from natural disasters be introduced, on the basis of a partnership between the public and private sectors.

In 1996 ANIA, the National Association of Insurance Companies (*Associazione Nazionale fra le Imprese Assicuratrici*) drafted a plan to develop flood maps covering the entire Italian territory⁴⁴. Although it was limited to flood-related issues, the plan divided the Italian territory into areas of low, medium and high risk of flood and identified six thousand towns particularly subject to floods. By means of this study, ANIA suggested that a system providing insurance coverage against natural catastrophes should be preceded by a careful evaluation of actual risks in relation to the Italian territory.

In 1999, the government presented a bill intending to address the issue of natural catastrophe insurance. The draft authorized the government to enact provisions regulating insurance covering natural catastrophes. The rules were based on the French CAT NAT scheme; the draft legislation would have required fire insurance policies to include coverage of natural catastrophes (also following the Norwegian approach), though it was characterized by several peculiarities. In order to promote demand for insurance coverage, the draft legislation would have ensured that all victims of natural catastrophes were indemnified for the first five years from the enactment of the law regardless of

the fact that they had or had not sought insurance coverage against natural catastrophes. However, after this initial 5-year term, the draft legislation provided for a limitation (from 30 per cent to 60 per cent) of state compensation to private victims of disasters whose assets were not covered by insurance against natural catastrophes. The 30-60 per cent range depended upon the economic status of the victim hit by the disaster. This would have led to a general increase of insurance policies (and related amount of tax revenues) in the fire/disaster field, and a general increase in the number of persons and entities insured. The establishment of consortiums grouping insurance companies would have been permitted, but only for the purpose of facilitating catastrophe reinsurance.

Insurance premiums would have been determined by the government according to the different areas of risk, and would have been published by the Ministry of Industry based upon an initial average premium defined by the market. Furthermore, the draft legislation provided for a premium cap for disaster coverage (no more than 50 per cent of the premium for fire coverage). This provision was highly criticized because establishing premiums and insurance policy terms and conditions common to all insurers was and is contrary to existing Italian and European rules on competition.

The antitrust authorities expressed concerns regarding the extension of fire insurance policies to natural disaster risks, claiming that this linkage would affect competition in the fire insurance business⁴⁵. Furthermore, there was a concern that by grouping fire insurance (i.e., a non-regulated market) and natural catastrophe insurance (i.e. a market subject to specific regulation), the fire insurance market would inevitably be affected by the proposed restrictions on competition intended to facilitate natural catastrophe insurance coverage. The authorities also held the view that while adopting an alternative state-led solution, i.e., an entirely *mandatory* insurance system covering natural disasters, would ensure a widespread collection of premiums, it could lead the community to interpret the new compulsory insurance as an indirect form of taxation⁴⁶. The draft was never approved by Parliament, but led most political parties to agree on the need for reform in the natural catastrophe field.

In 2003, ANIA proposed to include in the Financial Law for 2004 a set of rules establishing a risk partnership between government, the insurance market and the insured parties. The reform would have provided for the compulsory extension of fire coverage to coverage for catastrophes. The law would have given a full definition of the term 'catastrophe' and a list of catastrophes to which the law would have applied. The reform would also have provided for risk differentiation, and for specific, clear parameters to determine the value of the assets damaged by the disaster. Deductibles would have been defined in

detail, together with compensation limits. Finally, the law would have regulated and implemented the establishment of a co-reinsurance pool between insurers, providing for general yearly limits to the pool's aggregate exposure.

Soon after the government announced that it intended to regulate insurance coverage of natural disasters by implementing a mixed system in compliance with applicable competition rules and regulations and existing insurance legislation. Following ANIA's suggestions, the government intended to include provisions regulating natural disaster insurance coverage in the Financial Law for 2004. The proposed provisions were very similar, if not almost identical, to ANIA's 2003 proposals.

The text provided for a compulsory extension of natural catastrophe insurance coverage to all and any new fire insurance policies entered into by private businesses and individuals after the enactment of the new law, with a gradual extension to all previously existing fire insurance policies. Insurance coverage under the mandatory catastrophe extension would be triggered by the Cabinet's declaration of state of emergency. There would have been detailed parameters of reference determining the value of goods and assets damaged by natural catastrophes and unauthorized buildings would not have been entitled to any form of compensation. Insurance premiums would have been defined also on the basis of different risk indexes characterizing different areas, thus encouraging a system based on deductibles and indemnification limits. The legislation would have implemented a strict definition of catastrophes and excluded state indemnification for any buildings and assets not covered by insurance. It would have also established a system of co-reinsurance through a co-reinsurance consortium or pool grouping insurance companies and responsible for the collection of premiums paid for natural catastrophe risk coverage. A cap would have been introduced on the co-reinsurance consortium's yearly aggregate exposure, beyond which the state would have covered any residual compensation, including any amounts paid to non-insured victims of natural catastrophes.

The legislation was never approved as it did not find full acceptance by all political parties involved in the elaboration of the Financial Law for 2004. Opponents argued, in particular, that the introduction of a semi-compulsory insurance mechanism disguised a new tax on housing. Moreover, the Italian antitrust authority voiced another negative opinion on the draft⁴⁷. The authority was concerned especially with the provisions calling for: (i) compulsory extension of catastrophe coverage to all fire insurance policies (assuming that it would constitute an illegitimate *tie-in*)⁴⁸; (ii) strict regulation of the terms and conditions of coverage; (iii) mandatory participation of all insurers in a single co-reinsurance pool; (iv) minimum pricing mechanisms. Apart from the detailed

reasons that may support the negative outcome of this opinion, the Italian antitrust authority seemed to be in principle against the idea of a public/private partnership in the management of catastrophe risks⁴⁹.

Financial legislation drafted in 2005 reintroduced the concept of a public-private system involving insurance companies in the coverage of natural catastrophe losses. Legislation passed at the end of 2004 stated that, with a view to fostering the development of a voluntary market for natural catastrophes insurance, the government would contribute a share of the capital dedicated reinsurance company, thus enhancing the reinsurance capacity of the market and supporting a consortium of primary insurers. The plan created a guarantee fund with a 2005 endowment of EUR 50 million, to be managed by Consap SpA (*Concessionaria di servizi assicurativi pubblici*). Notwithstanding the deadlines established by the law, the implementing regulations governing the setup of the new reinsurance company, together with rules pertaining to fund operations and the measures aimed at favoring the development of the voluntary market for natural disasters insurance, have never been approved.

LUXEMBOURG

In terms of natural perils, Luxembourg is mostly exposed to *floods*, *storms*, and *hailstorms*. Different preventive measures have been taken by the authorities in relation to country planning and regional development: for example, dykes and retention basins have been constructed. There is no national agency in charge of risk assessment and monitoring.

Catastrophic risk insurance is marketed on a voluntary basis in this country, where there is no national scheme to compensate losses due to disasters. Insurance coverage of storm risk is almost systematically included in multi-peril property insurance policies taken out by private citizens and the current penetration rate is quite high (roughly 80-90 per cent of the population and 70-80 per cent of businesses are insured against storm). On the other hand, coverage of flood risk still remains very rare (5 per cent penetration rate). Premiums are not linked to the level of prevention measures taken by the policyholder. Storm and flood risks located in Luxembourg are reinsured on the international market. There are no specific regulations or incentives regarding catastrophic risk reserving by insurance companies.

JAPAN

Due to natural geographical, topographical and meteorological conditions, Japan is subject to various disasters, for example *earthquake*, *typhoons*, *tsunami*, *volcanic blast*, *torrential rain*, *heavy snowfall*, *flood* and *landslide*.

Since Japan is subject to a recurrence of natural disasters, the Japanese *Building Standard Law* defines minimum standards concerning the siting, construction, equipment, and use of buildings. In addition, the *Housing Quality Assurance Act* establishes a standard for the quality of a house and a related evaluation system. The Headquarters for Earthquake Research Promotion is in charge of risk assessment and monitoring of earthquakes. Risk modeling techniques are widely developed and used in the insurance market.

The *Disaster Countermeasures Basic Act* was passed in 1961 to establish consolidated measures for a more systematic prevention of disasters and to promote a consistent approach at national level. In 1962, permanent legislation concerning special aid provided in the context of disasters was passed (Law concerning Special Financial Aid in Case of Severe Disaster). The passage of these two laws established and reinforced the system for coping with disasters.

Under the *Disaster Countermeasures Basic Act*, the Central Disaster Management Council, chaired by Prime Minister of Japan, establishes the national Basic Disaster Management Plan⁵⁰. This Plan provides the foundation of contingency planning and outlines basic policies on establishing disaster prevention schemes, facilitating prevention programs, expediting and optimizing emergency restoration and promoting research, science and technology that are relevant to disaster prevention and emergency response. Based on this Plan, designated administrative agencies and institutions develop a Disaster Management Operation Plan, while local municipal entities develop a Local Disaster Management Plan. In addition, against envisaged giant earthquakes, the Plan provides for *General Principles Regarding Countermeasures for Earthquakes* and the *Guidelines for Emergency Activities for the Prevention of Earthquake Disasters*.

In addition, the *Disaster Countermeasures Basic Act* requires that the government take all necessary financial measures to achieve its objectives. Accordingly, when a disaster occurs, the Financial Services Agency keeps in close contact with relevant financial institutions and requests insurers to take measures concerning claims management when deemed necessary, according to such factors as local conditions and financial needs. The *Disaster Countermeasures Basic Act* and other laws relevant to disaster management implement various disaster contingency planning such as indemnification, financing and tax exemptions. Drawing on the enormously disastrous experiences on the Great Hanshin-Awaji Earthquake in 1995, the *Disaster Countermeasures Basic Act* was amended and various measures against disasters were strengthened.

According to the Japanese authorities, key challenges relating to disaster risk prevention and mitigation include, for large-scale earthquakes, seismic retrofitting of existing buildings, the preparation and dissemination of a “tsunami hazard map”, and the encouragement of disaster-prevention activities undertaken by business sector. For windstorm and flood, key challenges include ensuring the rapid distribution of information and evacuation of the elderly.

Japanese system of earthquake insurance

With Japan suffering periodically from giant earthquakes and the frequency and damage attributed to them being without parallel in any other country, insurance and reinsurance companies are significantly exposed to earthquake risk.

Insurance for natural disasters is not mandatory in Japan. However, with respect to earthquake insurance, it is, in principle, incidental to fire insurance for residences covering buildings for residential use or movables for living. Residential policyholders can purchase earthquake shock and fire-following insurance from local insurance companies. Coverage is added by way of endorsement, and an additional premium is payable. Policyholders who purchase fire insurance policy for residential buildings, but do not wish to purchase earthquake insurance, are required to submit written consents. Since earthquake coverage is relatively expensive and its purchase is not mandatory, the penetration level remains quite low⁵¹.

Since private non-life insurance companies would find it difficult to pay insurance claims on their own account only when seismic damage is heavy and there is a large amount of losses, the government provides coverage for damages in excess of certain threshold amounts. This system of earthquake reinsurance covering residential properties has been in place since 1966. The *Earthquake Insurance Act* entered into force in that year and has been reformed several times since its enactment⁵². In accordance with the promulgation of this law and following the launch of sales of earthquake insurance for residential properties to be written in conjunction with dwelling and shop owners’ comprehensive insurance policies, the Japan Earthquake Reinsurance Company (JER) was established by 20 domestic non-life insurance companies. Under the Japanese earthquake reinsurance program, primary carriers sell earthquake policies with large deductibles on the voluntary market (insurers are obliged to offer the optional earthquake coverage with all residential fire insurance policies, but policyholders may decide not to purchase it) and then fully reinsure their risk with JER, which, in turn, retrocedes part of the risk to the Japanese government (approx. 50 per cent), and part of it to the private insurance market (approx. 20 per cent)⁵³.

Under this system, the aggregate limit of indemnity for earthquake insurance liabilities (JPY 5,500 billion, since 1 April 2008) is shared by the private and public sectors as follows: for earthquake insurance liabilities up to JPY 110 billion: the JER is liable for 100 per cent of insurance claims; over JPY 110 billion and up to JPY 1,730 billion, the government is liable for 50 per cent while the JER and private insurers (due to retroceded risk from the JER) are liable for 50 per cent; and from JPY 1,730 billion to JPY 5,500 billion, the government is liable for 95 per cent and private insurers (including the JER) are liable for 5 per cent. Under the *Earthquake Insurance Act*, where earthquake insurance liabilities for one event exceed the indemnity cap of JPY 5,500 billion, residential policyholders' claims are reduced proportionately.

Under this state-led system of earthquake insurance, policyholders can obtain earthquake coverage of residential buildings and household property in the amount of 30 to 50 per cent of the sum insured under the fire policy. The amount insured for earthquakes is limited to a maximum of JPY 50 million for a building and JPY 10 million for household property. Policy conditions are identical for all non-life companies. The insurance premiums collected by insurers do not remain with the insurers but are managed and operated by the JER and the government⁵⁴.

Under the *Law concerning the Non-Life Insurance Rating Organization of Japan*, risk premium rates are calculated by the Non-Life Insurance Rating Organization of Japan (NLIRO). The NLIRO computes earthquake risk premium rates by computing the estimated insurance claims to be paid per year using the data from damage estimation simulation taking into consideration approximately 400 destructive earthquakes that have occurred in the past 500 years. Premiums are linked to the level of prevention measures. For example, the application of different rates depends on the material used in the building (wood or non-wood). Special discounts are also applied according to construction age and the installation of particular quake-resistance structures. Premium rates include a "loading rate" for non-life insurance company expenses and agency commissions⁵⁵.

A new premium tax deduction system for earthquake insurance has been introduced as a means to promote self-reliant efforts of individuals to prepare for earthquakes. Under this scheme, individuals can deduct the amount of premiums paid from their income. The maximum deductible amount is JPY 50 000 under the Income Tax Law and JPY 25 000 under the Local Tax Law.

The General Insurance Association of Japan ("GIAJ") conducts various activities, such as public relations activities, to raise public awareness on, and promote earthquake insurance.

MEXICO

Due to its geographical position, Mexico is exposed to different kind of natural disasters, such as *tropical storms* that cause severe floods as well as *soil and mud avalanches* affecting coastal and rural zones of the country. As well, Mexico is located in an intense *seismic* and *volcanic* region. The vulnerability of the country is diverse due to its natural and social characteristics. The magnitude of the damages produced by these natural disasters depends on the vulnerability level of the populations: the risk of catastrophic losses is greater for those populations with deficient urban planning, riverbed settlements or within reach of volcanoes.

The Mexican government provides the conditions for the management of major risks. Accordingly, public authorities are responsible for the safeguarding and protecting of the civilian population against such events. Government actions may include the protection of the population at risk and reduction of damage through mitigation regulations. In some cases, such as volcanic eruptions, hurricanes or other possible catastrophic events, public authorities must highlight the threats and promote risk awareness among the population.

The country has emergency plans at the local and federal levels to address natural disasters and which involve collaboration between civil society, governmental and military institutions. The National System of Civil Protection (SINAPROC) and the National Center of Disasters Prevention (CENAPRED) were created as a result of the consequences of the major earthquake in Mexico City in 1985. Their objective is to prevent disasters, provide alerts and develop a culture of self-protection and reduce the populations' risk against natural catastrophes and man-made disasters through research, inspection, training, and diffusion of information. The National System of Civil Protection, established on 12 May 2000, is a group of structures, methods, and procedures established by public sector organizations, with the support of state and municipal authorities and private and social voluntary groups, for the coordination of actions relating to disaster prevention and recovery. The System includes the President of Mexico, a National Council for Civil Protection (chaired by the President), departments and agencies of the federal public administration, CENAPRED, voluntary, local and nongovernmental groups, and federal and municipal civil protection systems. It also includes financial mechanisms such as FONDEN and FOPREDEN⁵⁶.

The National Seismologic Service (*Servicio Sismológico Nacional*, SSN) of the Institute of Geophysics of the Universidad Nacional Autónoma de México (UNAM) provides information on the occurrence of earthquakes within the national territory, as well as information necessary to improve the

populations' capacity to evaluate and prevent seismic and volcanic risk. It also develops studies, elaborates models, and monitors seismic and volcanic activities in Mexico.

In general, private entities have diverse programs of prevention against the possible occurrence of natural disasters, adapted to the particular conditions of each company. Nevertheless, the National System of Civil Protection contemplates the need for the development and consolidation of *Internal Programs of Civil Protection* in all business entities, and has issued *Technical Directives for the Production and Instrumentation of Internal Programs of Civil Protection*. Such guidelines recommend compliance with the Mexican Norm of Signals and Warnings for Civil Protection, which serves to specify and harmonize the characteristics of the signaling system for disasters. The Norm allows people to identify information for prevention, precaution and obligation messages, so that they can correctly act under certain situations.

The aftermath of a natural disaster is carried out with the participation of the private sector in the mitigation of its effects, basically through two schemes. On the one hand, there are the contributions of nongovernmental organizations, such as the Red Cross and other non-profit entities that mainly compile the contributions destined to assist the affected population. On the other hand, the private insurance sector pays the indemnities for the casualties inflicted by the natural disaster under the corresponding insurance contracts⁵⁷.

There are no fiscal incentives for policyholders to purchase insurance for catastrophic risks. The 1986 report of the National Commission on Reconstruction, which provided the basis for a new national system of civil protection in Mexico, considered it necessary to establish, by stages, regions and population segments, a financial fund and an insurance system to grant economic protection to those exposed to natural disasters. It is important to note that the concept of catastrophic insurance coverage was adopted only as a recommendation and not as a binding obligation on the government for adoption⁵⁸.

The relatively low penetration level of earthquake and other catastrophic risks coverage limits the risk of insolvency of Mexican insurance and reinsurance companies in the aftermath of disasters. Insurance undertakings are required to constitute an unearned premium reserve (including an earthquake and other catastrophic risks reserve), an outstanding reserve, and other reserves, benefiting from favorable tax treatment under certain conditions. Insurers must currently take into account, for the constitution of the unearned premium reserve, a specific methodology for the calculation of the part that is destined for the coverage of catastrophic risks. In addition, applicable regulations

establish an obligation to constitute (or increase) a special reserve for catastrophic risks relating to earthquakes and/or volcanic eruptions, as well as a special reserve for catastrophic risks relating to hurricanes and/or other hydro meteorological risks.

The Mexican authorities acknowledge that a key challenge is that even though governmental and private organizations work to prevent and mitigate risks, a lack of financial culture related to the prevention of catastrophic risks exists among the whole population. The authorities have noted that it is important to point out the relevance of the promotion of an insurance culture among population as well as social awareness of the possible occurrence of catastrophic risks. These initiatives have improved the level of penetration of the insurance sector in relation to the whole economy providing a basis for a solid and consistent insurance market, as well as protecting the population.

Natural Disasters' Fund (FONDEN)

The Natural Disasters' Fund (FONDEN) is a financial mechanism created by the federal government in order to provide financial support, in a complementary manner and within the limits of its resources, for emergency and natural disaster events. Likewise, the Natural Disasters Prevention Fund (FOPREDEN) was created to provide resources for actions and as a mechanism to prevent and reduce risks, as well as to avoid and reduce the negative impact effects of catastrophic natural disasters.

The participation of the public sector takes place only when an official declaration of emergency or natural disasters is executed by the Natural Disasters' Fund (FONDEN). For the recovery of public infrastructures, forest resources, protected natural areas, coastal zones, riverbeds and lagoons, archaeological, artistic and historical patrimony, as well as in the assistance of disaster victims, the resources of the FONDEN Program are complementary to the resources of federal entities. The resources of the FONDEN are public and the Ministry of Government in the preparation of the budget, accounting and federal public expense law includes the resources for the Natural Disasters' Fund in the corresponding project of the Federal Expenditure Budget.

The types of disaster in relation to which the Ministry of Government can issue a Natural Disaster's Declaration in order to access to the FONDEN resources are: (a) geological (earthquake; volcanic eruption; avalanche; tidal wave; landslide); (b) hydro meteorological (atypical drought; cyclone - in its different manifestations: tropical depression, tropical storm and hurricane -; extreme rains; snowfall and hailstorm; atypical floods; tornado); and (c) others (forest fire).

In May 2006 the Mexican government issued a parametric catastrophe bond to cover certain financial consequences of catastrophic earthquake risks (transaction value: USD 160 million). The transaction provides catastrophe cover to the Mexican government for financing emergency costs if an earthquake of moment magnitude 7.5 or 8 hits regions near Mexico City or along the Pacific Coast. The cat bond was sold to institutional investors in the United States and in Europe and it was part of a larger transaction combining securitization and reinsurance instruments to the benefit of FONDEN⁵⁹.

NETHERLANDS

During the past decade, the Netherlands has been hit by different types of natural and man-made catastrophes, including an *earthquake* in Southern Limburg, *flooding* in the south-eastern part of the country and the explosion of the fireworks factory in Enschede.

Flooding is the most important natural peril in the Netherlands, where the purchase of natural disaster insurance by the population or by corporate entities is not compulsory. Flood risk has never been covered by private insurance in the Netherlands and citizens have received compensation from the government on an *ad hoc* basis.

With only storm risk being covered in existing policies, insurance and reinsurance companies are not highly exposed to natural disaster risks. Insofar as catastrophic risk is covered in insurance policies, normal insurance regulation applies. The coverage of catastrophic risks by insurance and reinsurance companies, in other words, is based on normal insurance principles and there are no special fiscal incentives regarding catastrophic risk reserving in the Netherlands.

After several years of intense political debate, in 1998 the *Calamities Compensation Act* (WTS) on compensation of damages in case of catastrophes and large accidents was passed with a view to providing a more structured response to the compensation of victims of disasters. The WTS of 1998 covers non (commercially) insurable property losses due to fresh water floods and earthquakes that are considered catastrophes under the law and it has a subsidiary character. A Royal Decree must be issued for the WTS compensation system to be applicable to a specific disaster event⁶⁰.

The association of insurers in the Netherlands has a catastrophe contingency plan (*rampenplan*). The contingency plan includes a special plan for loss assessment and claim management in the aftermath of disaster. An example of the operation of this special plan was the loss assessment and claim

management performed following the large damages resulting from the fireworks explosion in Enschede.

After the flooding in Limburg and Wilnis and the explosion in Enschede evaluations of disaster management practices and of the WTS were performed. In general, it was concluded that the management of disasters ('rampenplannen') functioned reasonably well but that improvements could be made. One of the conclusions of the evaluation of the WTS was that the sense of personal responsibility and private insurability should be stimulated.

The Netherlands Reinsurance Company for Terrorism losses (NHT - *Nederlandse Herverzekeringsmaatschappij voor Terrorismeschaden*) is a dedicated reinsurance company writing terrorism risks. In 2003 a "Terrorism Cover Clause", was added to all new and/or amendable policies providing for overall terrorism exposures to be limited to EUR 1 billion per year. Participating insurers are charged for the reinsurance premium and, once having decided to become a member of the NHT, they are deemed to cede all their terrorism exposure to the pool. Pursuant to an agreement with the government, if needed, emergency legislation will restrict terrorism exposures in non-amendable life insurance policies to conform to the overall NHT exposure limit of EUR 1 billion.

NEW ZEALAND

As a country on the Pacific Ring of Fire and in the Roaring Forties of the Southern Ocean, New Zealand is seriously at risk from ***storms (wind damage, river flooding and storm surges), volcanic events, major earthquakes tsunami, and landslides.***

New Zealand has a National Civil Defence Emergency Management Plan that replaced the previous National Civil Defence Plan. It was approved by Cabinet in November 2005 and became operational in conjunction with the *Guide to the National Civil Defence Emergency Management Plan* on 1 July 2006⁶¹. The plan was developed by the Ministry of Civil Defence and Emergency Management (MCDEM) and key stakeholders including representatives from CDEM Groups, local authorities, emergency services, government agencies, and lifeline utilities, and was made pursuant to sections 39(1) and 45(b) of the *Civil Defence Emergency Management Act 2002*. The purpose of the Plan is to state and provide for hazards and risks to be managed at the national level and to have the necessary arrangements to meet these hazards and risks. The Plan also provides support to the management of local emergencies. The Plan gives effect to the principle of supporting the management of and recovery from emergencies in the community and provides

the framework for support from the national level to the regional level and then local level.

Under the *Civil Defence Management Act*, it is the responsibility of CDEM groups (consortia of local and regional councils) to identify, assess and manage the hazards and risks in their region. It is also their responsibility to identify and implement cost-effective risk reduction measures. The MCDEM and other departments support CDEM groups and councils in these activities. The MCDEM has developed an education programme for use in schools and has engaged in a public education campaign.

The assessment of hazards and consequent risk, and related monitoring, are primarily a CDEM group responsibility. However:

- GNS Science, a New Zealand government-owned research organisation, monitors seismic and volcanic risks;
- Under the *CDEM Act*, the Director, Civil Defence Emergency Management, is supposed to identify hazards and risks that he considers are of “national significance” (as defined in the *CDEM Act*). MCDEM is currently considering how best to advance that work; and,
- Other departments are responsible for assessing other types of risk, e.g., the Department of Building and Housing and the risks posed by different types of housing.

The National CDEM plan makes reference to warning systems. The Plan contains some of the relevant regulations affecting emergency services, lifeline (infrastructure) services, and welfare organizations. CDEM groups are responsible for disseminating warnings to their local public.

In terms of financial compensation or assistance, other relevant departments include MSD (financial support to households), MAF (adverse events programme), Treasury which looks after the legislation controlling the Earthquake Commission, and Land Transport New Zealand (which provides substantial road repair subsidies). In terms of remaining shortfalls and problems regarding risk prevention and mitigation in your country, the New Zealand authorities indicated that there are no legal powers to move people from at-risk sites unless a specific event is very imminent.

Earthquake Commission (EQC)

The Earthquake Commission (EQC) is New Zealand's primary provider of seismic disaster insurance to residential property owners⁶². The EQC is a Crown Entity, wholly owned by the government of New Zealand and controlled by a board of commissioners. Crown Entities are not government departments or state-owned enterprises but nevertheless belong to the government and are subject to public sector finance and reporting rules.

EQC administers the Natural Disaster Fund. The government guarantees that this fund will meet all its obligations. It does this by securing New Zealand residential property owners against the cost of these disasters and by helping organize repair and replacement after the event. The main mechanism for this is the provision of seismic disaster insurance to property owners who insure against fire. All residential property owners who voluntarily buy fire insurance from private insurance companies automatically acquire EQCover, the Commission's seismic disaster insurance cover⁶³. EQCover premiums are added to the cost of the fire insurance and passed on to EQC by the insurance company.

EQC's administration of the natural disaster insurance scheme involves: collecting premiums via insurance companies; processing and meeting claims by insured people; administering a disaster fund; investing the fund in accordance with government directions; organizing reinsurance as a potential supplement to the fund; accounting to its shareholder (the government). EQC also encourages and funds research about matters relevant to natural disaster damage and it educates and otherwise informs people about what can be done to prevent and mitigate damage caused by natural disasters.

Home and contents insurance policies in New Zealand usually cover floods and storms as well as fire. EQC is in effect a first loss insurer and provides cover on a replacement value basis for NZD 100 000 plus taxes on the dwelling, NZD 20 000 plus taxes on contents and unlimited cover for land within certain constraints in the **perils** [e.g. floods, hurricanes, earthquakes, storms, landslides, tsunamis, hailstorm, dryness, fire (not man-made) of catastrophic consequences, volcanic eruptions, etc.] and **lines** [e.g. commercial/personal property, business interruption, worker's compensation, life, crops, grounds, livestock, public infrastructure etc.] covered under the Earthquake Commission Act 1993.

Coverage is triggered by the occurrence of any of the events noted above. If an owner of a dwelling or contents insures the dwelling or contents against fire damage, EQC cover is compulsory and is collected on EQC's behalf by the Fire Insurer. A standard premium has been charged since 1945 of 5 cents per

NZD 100 sum insured. Deductibles are imposed according to the following scale: dwelling ► NZD 200 or 1 per cent of the amount payable per dwelling; contents ► NZD 200; land ► the greater of NZD 500 or 10 per cent of the amount payable to a maximum of NZD 5 000. The minimum sum insured is NZD 1 000 per square meter of the dwelling. The maximum compensation is NZD 100 000 plus tax for a dwelling, NZD 20 000 plus tax for contents and unlimited on land. The private sector can provide cover above the EQC limits. The system is managed by the EQC and it is funded by premiums income and investment income on a fund of approximately NZD 5 000 million.

NORWAY

National Fund for Natural Disaster Assistance (Statens Naturskadefond)

During the first half of the 20th century, insurance against natural disasters such as landslide, flood, storm and tempest was not widely available in Norway⁶⁴. Against this background, a Law was passed on 9 June 1961 and the Norwegian National Fund for Natural Damage Assistance (*Statens Naturskadefond*) was established with the aim of compensating damage caused by natural perils and promoting the adoption of preventive measures against such perils. Compensation according to the Law of 1961 was granted to damage to real property and movables caused by natural perils which were defined as landslide, flood, inundation, storm and tempest, earthquake, volcanic eruption or similar disasters. There was no compensation for damage directly caused by lightning, frost, or drought. Nor was damage caused by rainfall and breaking up of ice compensated, and there were also other exceptions and limitations *e.g.*, for damage to forests and non-harvested crop. The amount of compensation was also limited.

Although the Law on natural perils represented an advance over the previous state, the situation was not considered to be satisfactory and, in 1971, a committee was appointed to study the possibility of amending the Law of 1961 and the possibility of covering damages caused by natural perils through insurance.

With a view to providing adequate cover at reasonable premiums for those who were exposed to catastrophic risks, it was considered necessary to link the coverage against natural perils to an already existing form of insurance. In this perspective, a proposal was made to make insurance against natural perils a compulsory part of all fire insurance of objects and property in Norway. Insurance against natural perils has always been included in motor hull insurance, machinery insurance and other types of all-risk insurance.

Further to the proposal of the committee, the Law on Natural Perils and the Law on Insurance Contracts were amended in 1979. A special Law on Natural Perils Insurance was then approved on 16 June 1989 and it entered into force on 1 July 1990 (Law n.70 of 16 June 1989). According to Article 1 of Law n.70, insurance of objects against fire shall also comprise natural perils to the extent the damage is not covered by other insurance contracts (e.g. motor hull insurance).

Norwegian Natural Perils Pool

The activity of the Norwegian Natural Perils Pool is authorized in Law no. 70 of 16 June 1989 related to natural disaster insurance with amendments, Law no. 98 of 17 December 2004 and Rules for the Norwegian Natural Perils Pool established by Royal Decree of 21 December 1979 with subsequent amendments set forth by the Ministry of Justice. The Pool is organized as a distribution pool, which means that the participating companies keep direct contact with their policyholders, while the Pool settles natural disaster damage compensation among members and makes reinsurance arrangements. All non-life insurance companies writing fire insurance in Norway are obliged to become members of the Norwegian Natural Perils Pool. At present, approximately eighty companies are members of the Pool, which now covers losses caused by landslide, storm, flood, earthquake and volcanic eruption⁶⁵.

POLAND

In terms of natural disasters, Poland is mostly exposed to ***flooding*** and ***storms*** and the most exposed areas are those along the rivers shores.

There is no central institution in Poland in charge of disaster management or compensation. However, there are agencies in charge of risk assessment and monitoring:

- A governmental Crisis Coordination Agency operating under the auspices of the Ministry of Interior and Administration;
- Local organizations linked to the Ministry of Environment, for example the Regional Agencies of Water Management and the Centre for Coordination of Anti-flood Protection: these organizations are responsible for minimizing the risk of natural catastrophe and creating crisis response plans in the event of a disaster;

- The Meteorology and Water Management Institute, which provides information on flood or hurricane dangers on its website or by traditional media; and,
- Local authorities (communes, districts and other local authorities) are obliged to prepare crisis response plans, which include detailed assessments of the risks, initial disaster responses, and systems of mitigation of further damage.

In addition, the insurance industry, under the auspices of the Polish Insurance Chamber, has drawn up an assessment system for flood threat and risk accumulation, which will offer insurers a view of flood risk in their insurance portfolio. This system may lead to a diversification of premium rates, in accordance with geographic location. In terms of risk modeling, insurers create models to estimate the damages caused by the natural forces for purposes of reinsurance and to protect their own insurance portfolios. Reinsurance brokers already have some models adjusted to the Polish environment.

With the limited exception of the agricultural sector, where there is a system of compulsory insurance covering farm building damages against flood, hurricane, or fire, insurance coverage against natural disasters is marketed on a voluntary basis in Poland. The penetration rate stands at approximately 12 per cent of the population and 28 per cent of businesses. While ARTs are not commonly used in Poland, with the growing cost of reinsurance and the frequency of catastrophes, these instruments may become an attractive alternative to traditional reinsurance of catastrophic events and may also become an alternative to classic direct insurance against natural disasters.

The Polish supervisory authority has developed a system for the collection of information from insurers regarding the estimated amount of compensations paid by insurers following a natural catastrophe. This system has enabled a monitoring of the effects of natural catastrophes on the financial stability of insurers.

The development of a legal regime related to the reduction of the effects of natural disasters and assistance to insured parties began in earnest after the major flooding of July 1997. There are two components: (i) *ad hoc* compensation of disaster losses; and (ii) permanent acts and regulations that apply when specified conditions are met, providing for a more structured mechanism of state funding for the compensation to victims of catastrophes. This system includes various different measures, including: assistance provided to support the affected population and small and medium-sized businesses; reconstruction of technical infrastructure of regional self-government units;

reconstruction of public roads, bridges, and railroads; reconstruction and construction of water containers, and repairs of flood protection structures; rebuilding the elements of protection against natural disasters, such as modernization of flood protection systems, hydromechanics infrastructure, forecasting, monitoring and warning systems; repair, reconstruction, and modernization of water land improvement systems in regions endangered by flood; preferential loans for repairs and reconstruction dwellings and houses; and payment of damages for persons who suffered losses in connection with collective actions aimed at fighting natural disasters. The most important sources of financing are the state budget (including targeted reserves and ministerial budgets), the budgets of regional self-government units, the national assistance funds (the National Fund for Environment Protection and Water Management, Ecofund, and others), and non-budget means obtained through public fundraising.

According to the Polish authorities, the major remaining shortfalls and problems regarding risk prevention and mitigation in Poland include the very low risk awareness among population, the lack of a system of compulsory insurance against natural disasters, the lack of a comprehensive emergency management legislation, and the inadequacy of the financial means allocated to disaster mitigation and prevention in relation to existing needs.

PORTUGAL

As far as natural disasters are concerned, Portugal is mostly exposed to *seismic risk*. According to a technical study prepared by the Portuguese Insurance Association (APS – *Associação Portuguesa de Seguradores*), the Portuguese territory is divided in five zones: the whole region of Algarve and the southwest coast, including the city of Lisbon, are the most exposed areas.

Regarding the quality of buildings, the first anti-seismic construction appeared in the time of Marquês de Pombal, which was applied with rigidity after the massive 1755 earthquake. However, the first anti-seismic legislation only appeared in 1958.

Earthquake insurance is not compulsory in Portugal, but several banks require insurance coverage for seismic risk (together with mandatory coverage for fire risk) as a condition for financing the purchase of a house. Available statistical data show that only near 18 per cent of buildings covered against the risk of fire are also insured against seismic risk. The proportion of buildings insured against seismic risk is much higher in more exposed areas (near 24 per cent) than in northeast zones (only 8 per cent), showing some degree of risk awareness.

Given its small dimension, the Portuguese insurance market does not absorb catastrophic risks alone: reinsurance arrangements – usually in the form of excess of loss treaties – are made with large international reinsurance players, essentially from German and Swiss markets. With the benefit of these reinsurance programs, Portuguese insurance companies apply the same underwriting procedures and pricing models as those used by the large international reinsurers specialised in seismic risk. In light of the above, the Portuguese market has not felt any significant impact from recent disasters. However, a major question relates to some level of incapacity to deal with aggregate losses if a major earthquake occurs, without a pooling or other mitigation mechanism in place specifically devoted to seismic risk management. The Portuguese private insurance sector, in cooperation with the government, has been studying a possible pooling mechanism to cover losses due to seismic risks.

The Portuguese legislation requires insurers, among other things, to constitute an equalization reserve, which is intended to meet exceptionally high claims in those classes of insurance that, by their nature, are expected to produce the greatest variations. Regarding seismic risk, Portuguese regulation determines that the provision should be made in the form of an annual allocation until the accumulated amount of the provision reaches no more than the equivalent of 75 per cent of the insurer's own capital. The establishment of the equalization reserve – like any other technical reserve imposed by Portuguese insurance legislation – is tax exempt.

SLOVAK REPUBLIC

In terms of natural disasters, the Slovak Republic is mostly exposed to *floods* and *windstorms* but the value of the potential damage is not significant compared with general insurance claims. The last significant windstorm in 2004 inflicted serious damage over an area of more than 200 square kilometers. The storm affected more than 5 000 people and caused financial losses estimated at approximately USD 400 million.

Due to the low level of disaster insurance penetration, the government was called upon to provide *ex post* compensation especially in case of extreme hardship for the victims. At present, there is no compulsory natural disaster insurance for any type of perils/insurance lines in this country. No special measures have been taken by public bodies or private entities to develop an adequate financial coverage of population and corporate entities. Insurance companies do not make any special provisions for potential catastrophic losses.

A flood risk management platform including a detailed flood risk map of the Slovak Republic has been successfully developed during the past years under the auspices of the Slovak Association of Insurers and, according to the Slovak authorities, flood risk coverage is not granted in the most flood prone areas. The Slovak Hydro-Meteorological Institute (SHMU), in cooperation with the Slovak Insurance Association, has recently entered into an agreement with a private company for the cooperative development of a windstorm evaluation and risk management tool that will complement the existing risk management platform. The partnership will create a new product for the insurance industry that evaluates and performs risk assessment of windstorms. The windstorm risk layer will seamlessly integrate into the existing risk management platform for the Slovak Republic.

SPAIN

Spain is mostly exposed to *flood* in terms of actual damages experienced and *earthquake* and *tsunami* in terms of potential damages. The main vulnerabilities arise from the concentration of people and values in flood-prone areas and in areas exposed to the risk of tsunami.

Risk mitigation measures have included building codes, earthquakes retrofitting, basins management, and river warning tools. Private insurance companies are not very active in the field of prevention, which is mainly addressed by governmental bodies.

The *Law on Civil Protection* (2/1985) establishes the main concepts in order to protect population against disasters and refers to the responsibilities of all stakeholders: national, regional and local administrations, and the citizens. The 1992 *Basic Rule on Civil Protection* (Royal Decree 407/1992) establishes guidelines for the elaboration of Emergency Plans: (a) Special Plans for floods, earthquakes, wildfires and volcanic eruptions with national consequences, and which are national in scope, requiring the intervention of the each Administration level (national, regional and local); and (b) Territorial Plans for other natural perils, and which require the intervention of the regional and local administrations. Special Plans must be elaborated under the Civil Protection Basic Planning Rules, regarding aspects like risks assessment (degree of danger, vulnerability, etc), alert systems, and emergency measures.

The major remaining identified shortfalls regarding risk prevention are overall country risk maps and coordination among different official bodies and public institutions. In terms of post-disaster reviews, competent official bodies review the performance in all management fields after a disaster in order to

resolve eventual gaps and weaknesses. Normally, reports about these reviews are not published.

Consortio de Compensación de Seguros

Catastrophic risks coverage is carried out in Spain by the *Consortio de Compensación de Seguros*, a public non-profit institution attached to the Ministry of Economy and Finance. Set up in 1941 as a provisional body⁶⁶ to face the needs for indemnities resulting from the Civil War (1936-1939), the Spanish *Consortio de Compensación de Seguros* was given its permanent status from 1954⁶⁷. After that date, the activity of the *Consortio* focused on the coverage of the so-called extraordinary risks and it began to play a central role in the related indemnity system. Since the approval of its Charter in 1990⁶⁸, which came into force in 1991, the *Consortio* lost its legal monopoly for covering extraordinary risks in Spain and it is no longer a self-running body of the Ministry of Economy and Finance, but a state-owned company - currently a public business entity - with full powers to act.

The *Consortio* has its own assets and liabilities, separate from those of the state, and its activity is governed by private law. This means that the new company, when doing insurance business, apart from being governed by the terms of its own Charter, is subject, like any other private insurance company, to the legal rules laid down in the *Private Insurance Ordering and Supervision Act* and its enacting regulations, and to the *Insurance Contract Act*. Just like any other insurance company, therefore, the *Consortio* is subject to prudential rules for the solvency margin and for setting up technical reserves. The equalization reserves to be created by the *Consortio* for the catastrophic risks coverage enjoy favorable fiscal treatment.

The aim of the *Consortio* is to indemnify claims made as a result of extraordinary events, such as natural disasters or other events with heavy social repercussion, that occur in Spain and cause injuries and damage to people and assets in Spain⁶⁹, whenever any of the following conditions are met: a) the extraordinary risk is not specifically and explicitly covered by another insurance policy; b) the extraordinary risk is covered by another insurance policy but the company that issued this policy cannot meet its obligations. The risks included in the Spanish system for the coverage of extraordinary risks in practice are not assumed by insurance companies, even if the system legal rules permit insurance companies to cover these types of risks. The *Consortio*, in a subsidiary manner, assumes these risks; the insurance companies underwrite and manage the policies (with the compulsorily coverage attached) and the *Consortio* collects surcharges. The *Consortio* manages claims, losses adjustment, and indemnifications. The *Consortio* does not reinsure its risks, and

thus retains all the extraordinary risks covered. This state-sponsored system for the coverage of extraordinary risks is backed by an unlimited State guarantee. This guarantee has never been used.

The perils covered under the Spanish system for the coverage of “extraordinary risks” are listed in the applicable Regulation and include: extraordinary floods, earthquakes, seaquakes, volcanic eruptions, atypical cyclonic storms (tornadoes and gusts of wind above 135 km/h included) and fall of sidereal bodies and meteorites. The lines of insurance that must include coverage for extraordinary risk are the following: fire and natural events; land vehicles (vehicle damage, not civil liability); railways vehicles; other damages produced to goods (robbery, plate glass, machinery breakdown, electronics equipments and computers); business interruption; and life. Accident insurance is also included, even if contracted additionally to another type of insurance, as life or motor vehicles, or within the framework of a pension plan.

The purchase of insurance is generally optional, but in certain lines of insurance (see the lines of insurance mentioned in the preceding paragraph) it is compulsory to include in the policy base an extraordinary risks coverage clause. These lines mainly refer to losses on properties (material damages and business interruption) and personal accidents. It should be noted that protection against extraordinary risks is entirely separate from protection against other risks provided for in the policy. In other words, the coverage of extraordinary risks protects the same property or persons for at least the same amount insured.

Coverage is triggered by any loss from any ‘extraordinary risk’. This coverage is qualitative, not quantitative (there are no minimum or maximum damage amount requirements). The maximum amount of compensation depends on the amount insured in the policy base. With respect to property damage, the indemnity paid by the *Consortio* covers material losses, regarded as being the destruction or deterioration of the property insured, and direct losses, so damage caused directly by the event. The coverage includes business interruption. In respect to the cover for natural catastrophes, a change was made in 1986 from a system of indemnities based on a prior official declaration of a disaster area which took the geographical area of the loss and the volume of losses into account to a system of automatic indemnity, which provides cover subject only to the prerequisite that the policies, the damage and the events giving rise to the loss meet the legally established parameters.

In recent times, the deductibles applied in the system have been reduced. Currently, concerning direct damages to goods, a deductible of 7 per cent of compensable loss is retained by the insured. This deductible is not applied to vehicles insured through motor car insurance policy, to buildings, or to

communities of dwelling owners. Concerning insurance covering persons, no deductible applies. For business interruption cover, the deductible is the same provided by the base policy.

As mentioned, the coverage provided by the *Consortio* for extraordinary risks is financed by surcharges applied to the policies in the lines cited above and which are paid by policyholders. The surcharges rates are applied nationally, and are fixed depending on type of the exposures covered (offices, housing, industrial, commercial, etc). In 1986, a change was made regarding the surcharge used to fund the *Consortio*; instead of charging a percentage on the base premium, a system of own rates is now applied on the sums insured in the policies. The *Consortio's* surcharge must be compulsorily incorporated into the premium charged for every policy of insurance in the above-mentioned classes, irrespective of whether said policy provides for the coverage of extraordinary risks to be effected by the private company, or whether this is excluded (in which case the *Consortio* shall be responsible).

The *Consortio* is governed by a board of directors with members from government and the private insurance market. The chairman, a government official, is the General Director of the Directorate-General for Insurance and Pensions Funds.

SWITZERLAND

Switzerland's morphology, climate, weather and natural history have made the population well aware of the natural hazards (especially **avalanches**, **floods** and **landslides**), and of the need for prevention, mitigation and insurance cover.

Under Swiss federal law, the coverage of flood, inundation, windstorm, hail, avalanche, snow pressure, rock and stone fall, and landslide (but not earthquake) is mandatorily included in the scope of fire insurance for buildings and chattels. In the 26 cantons of Switzerland there are two different systems to cover such risks.

In the cantons Geneva, Uri, Schwyz, Ticino, Appenzell Inner Rhodes, Valais and Obwalden, coverage is provided by private insurance companies. In 1939 a group of Swiss insurers, under the auspices of the Swiss Insurance Association (SVV), formed the *Natural Perils Pool* to share natural catastrophe risks. Participants in the *Natural Perils Pool* extensively reinsure the coverage they provide in the international reinsurance market.

In the remaining 19 cantons, coverage is provided by the Cantonal building insurance companies (KGV - *Kantonale Gebäudeversicherungen*). These

institutions, governed by public law, enjoy a monopoly in their respective cantons. The Intercantonal Community for Risks from Natural Elements (IRG), a system of mutual contingent obligations, allows participating cantonal insurance companies to share natural disaster losses. Stop-loss reinsurance coverage for natural disaster risks is available through the Inter Cantonal Reinsurance Union (IRV - *Interkantonaler Rückversicherungs-Verband*), which in turn reinsures in the international market.

Given the high value and density of assets located in Switzerland, earthquake insurance is being considered for inclusion in the coverage provided by the *Natural Perils Pool* and the Cantonal building insurance companies.

The premiums in respect of natural hazards covered under fire insurance are based on industry tariff rates. The Federal Council issues detailed rules on the basis for calculating premiums, the scope of cover, limits on liability, and statistics to be compiled by insurers. The Federal Office for Private Insurance (FOPI), the Swiss insurance supervisor, checks that the premium rates are fair in terms of risks and costs.

Swiss insurers seek to enhance disaster risk awareness and the need for prevention and mitigation on a continuous basis. Moreover, there exists a culture of prevention and mitigation of natural catastrophes. Federal and cantonal authorities assess and monitor natural perils on a continuous basis, and post-catastrophe reviews are made routinely at the local level. According to the Swiss authorities, emergencies have been handled effectively and mitigation measures have been efficient.

TURKEY

Turkey is one of the countries that have long been affected by many natural disasters, particularly, *earthquakes* and *floods*. The existing earthquake map of Turkey demonstrates that 96 per cent of the land is susceptible to earthquake risk with varying degrees. Earthquake counts for two thirds of the natural disasters occurred over the last 60 years. The latest two major earthquakes occurred in 1999: August 17 (magnitude 7.4) and November 12 (magnitude 7.1) in the Marmara region caused loss of thousands of lives and imposed a large financial burden on the economy and the government.

Turkish Catastrophe Insurance Pool (TCIP)

The impact of recent natural disasters and the low level of insurance penetration led the government to initiate studies to promote disaster insurance and to establish a widespread and effective earthquake insurance system⁷⁰.

Following the 1999 earthquake disasters that occurred in the Marmara Region and Duzce, earthquake insurance was made compulsory primarily for dwellings through an Earthquake Insurance Program. The *Turkish Catastrophe Insurance Pool* (TCIP) was launched by the Turkish government in cooperation with the World Bank in September 2000. In addition to the legal framework of TCIP, a new code on building inspection was enacted by the Parliament. Earthquake insurance premiums are ceded to the TCIP, which is managed by the Natural Disasters Insurance Council, DASK in the Turkish abbreviation.

The TCIP was set up in fulfillment of the government decree-law as a separate state-owned legal entity to provide compulsory earthquake insurance to all registered residential dwellings that fall within municipality boundaries in Turkey. The pool provides earthquake coverage up to certain limits for a premium which varies across the country depending upon seismicity, local soil conditions, and the type and quality of construction. The TCIP is managed through the TCIP Management Board consisting of members from public and private sectors and academic community. The Management Board consists of representatives of Prime Ministry, Undersecretariat of the Treasury, Ministry of Public Works, Capital Market Board, Insurers Association, Operational Manager, and an earthquake scientist.

The compulsory scheme covers only residential buildings that fall within municipality boundaries. Under Decree No. 587, the taking out of earthquake insurance was made compulsory for all residential buildings that fall within municipality boundaries starting from September 27, 2000. Industrial and commercial risks as well as residential buildings in small villages (with no municipality established) can be insured on a voluntary basis. Eligible policyholders are owners or usufructuaries of dwellings that fall within municipality boundaries. Before September 2000, earthquake insurance in Turkey was mostly provided as an allied peril to the fire policy and engineering policy.

The compulsory earthquake insurance is a stand-alone product sold separately from fire (or homeowner's) insurance. It covers building damages for the following risks: earthquake; fire related to earthquake; explosion related to earthquake; and landslide related to earthquake. As an enforcement mechanism, homeowners have to present their insurance policy to the land register office every time they want to start an administrative procedure concerning the building subject to mandatory insurance coverage. Recently, a proposal was made to extend such a requirement to other public services and to create some new checkpoints.

The aim of the TCIP is to provide an adequate level of protection with affordable premiums. Therefore, the maximum coverage limit of compulsory insurance is currently NTL 110 000. This limit is adjusted annually according to changes in the construction price index. Policyholders are free to buy additional coverage in excess of this limit from insurance companies if the value of their dwelling is more than this amount. When assessing claims, the TCIP takes into account market reconstruction prices at the date of the event for each type of building. Any loss payment is limited to the sum insured. In the case of masonry type of buildings or small dwellings, the sum insured is usually below the maximum coverage limit. The sum insured is calculated by multiplying the gross square meter of dwelling by the relevant unit reconstruction cost. There is also a two per cent deductible applied on the sum insured.

Local insurance companies act as distributors of the TCIP policies. Coverage in excess of the TCIP coverage can be obtained on a voluntary basis from private insurance providers. To issue policies, the pool agents and insurance companies can, in addition to insurance company underwriting systems, use an internet-based underwriting platform that enable the TCIP to control its risk accumulations in real time and maintain the quality of underwriting. The TCIP operates as a catastrophe risk transfer and risk financing facility.

Established under the supervision of Undersecretariat of the Treasury as the national sole-source provider of earthquake insurance, it is expected that the TCIP will raise the financial preparedness of Turkey for future disasters, reduce government fiscal exposure to major catastrophic events, and will make liquidity readily available to insured homeowners affected by such future events. The TCIP is modeled after the California Earthquake Authority and New Zealand EQC programs, which provide similar earthquake coverage for homeowners and rely mainly on international reinsurance and capital markets for their risk capital capacity. The TCIP in fact cedes, and will cede, a large amount of its risk to international reinsurance markets until sufficient financial resources are accumulated within the TCIP.

The compulsory earthquake insurance scheme aims to alleviate the financial burden of earthquakes on the government budget, to ensure risk sharing by residents, to encourage standard building practices, and to establish long-term reserves in financing future earthquake losses. Although the original design of TCIP envisaged a multi-peril coverage, it currently provides only compulsory earthquake insurance coverage. New products for other natural disasters such as flood and landslide may be offered in the future.

Most of the functions and operations of TCIP are outsourced to minimize cost and create an efficient operational structure. For example, operational management has been contracted out to leading reinsurance companies of Turkey (Milli Reinsurance Company from 2000 to 2005 and Garanti Insurance Company since August 2005). Likewise, insurance companies and their agencies are carrying out distribution of policies and marketing functions, and independent loss adjusters are carrying out loss assessment. Currently, more than twenty insurance companies are entitled to distribute TCIP policies.

The TCIP has a simple pricing matrix as show below. Pricing accounts for seismicity and construction type. Prices range from 0.4 per mille at the lowest to five per mille at the highest. The earthquake map used by TCIP divides Turkey into five different categories of land according to the vulnerability factors whereas the tariff divides buildings into three categories according to their construction types. As the result of two groupings, fifteen different rates (per mille) are applicable for buildings according to location and the type of the construction.

Table 1. TCIP region-based rates according to construction type (per mille)

Type of Construction	Risk Regions				
	I	II	III	IV	V
Steel, reinforced concrete	2.20	1.55	0.83	0.55	0.44
Masonry	3.85	2.75	1.43	0.60	0.50
Other	5.50	3.53	1.76	0.78	0.58

Source : TCIP

The TCIP has accumulated premium revenue since the beginning of the program. The TCIP uses this financial resource to pay claims and buy reinsurance coverage. As a result, building damages because of earthquake can be compensated quickly without reverting to government budget.

Enforcement problems have been reported, and penetration rate remains relatively low. To improve the current enforcement level, for instance, homeowners could be obliged to present their insurance policy when opening an

account for such services as gas, water, electricity and telecommunications. Increasing the level of insurance penetration, in fact, remains the key challenge of the TCIP.

The Undersecretariat of the Treasury is responsible for overseeing of the program, and auditing of all operations and accounts of the TCIP. Annual accounts are also audited by an independent auditing firm. The TCIP and its revenues are exempt from all kinds of taxes, levies and charges and accumulated funds are kept in segregated accounts. Funds are being managed by the Operational Manager and invested in diversified financial instruments following the TCIP Board's investment guidelines.

UNITED KINGDOM

As concerns the compensation of losses due to catastrophes, the general trend in the British system has been to opt for individualized solutions. According to some commentators, in fact, in the UK there is a strong tradition of the State distancing itself from compensation payments⁷¹. In terms of exposure⁷², the main risks faced in this country are *storms, flood* and *terrorism*.

Coverage of flood damages

The majority of both commercial and residential policies in the UK currently include coverage for the full array of natural perils. Unlike in most OECD countries, insurance coverage against flood damage has been a standard feature of household policies in the United Kingdom since the early 1960s. The British insurance industry was able to make this commitment to its customers on the understanding that the Government would provide effective flood defences⁷³.

Insurance enables householders and businesses to minimize the financial cost of damage from flooding. In the modern competitive insurance market, the old tariff pricing system has been replaced by risk-based pricing where good information is available on risk levels for example on local crime levels, or on the fire hazard of specific house construction types. This enables insurance to be offered at very competitive prices to customers living in low risk areas.

Following the floods of autumn 2000, and because insurers recognized that the government needed time to put new policy plans in place, the insurance industry - via the Association of British Insurers (ABI) - created a two year agreement on flood cover. This industry initiative committed ABI member companies to continue to insure their existing domestic and small business policyholders, save in exceptional circumstances.

In November 2005 the ABI issued a Revised Statement of Principles, in which they declared that is the intention of ABI members that flood insurance for existing domestic properties and small businesses should continue to be available for as many customers as possible. The premiums charged and other terms - such as excesses - will reflect the risk of flooding but will be offered in a competitive market. The revised Statement of Principles applies from 1 January 2006, but is subject to review in the event of significant external shocks such as withdrawal of flood reinsurance⁷⁴.

ABI made clear that successful operation of the Statement is dependent on action by the government to manage flood risk effectively. In particular, ABI requested that government shall be engaged in: (a) reducing the annual probability of flooding each year for a substantial number of properties in the UK, a proportion of which currently have a significant chance of flooding (greater than 1.3 per cent annual probability); (b) maintaining investment in flood management each year, so that outputs can be sustained in real terms, with a commitment to evidence-based discussions on future funding needs, taking account of climate change and other factors affecting risk; (c) implementing reforms to the land-use planning system to ensure that new developments do not lead to an increase in national or local flood risk; (d) communicating flood risk effectively, including providing higher quality and more detailed information on flood risk, and on existing, new and upcoming flood protection schemes; (e) developing an integrated approach to urban drainage that alleviates the risks of sewer flooding and flash-flooding.

Coverage of terrorism risk

After frequent terrorist attacks from the IRA, insurance coverage for terrorism risk became unavailable in the UK and this led to the establishment of Pool Re in 1993. Pool Re is a mutual reinsurance company authorized to transact reinsurance business in the United Kingdom. The scheme covers damage to property and business interruption losses resulting from such damage (if that cover has also been selected) resulting from an Act of Terrorism, as defined in the enabling Act of Parliament, the Reinsurance (Acts of Terrorism) Act 1993⁷⁵.

A large number of the most significant providers of commercial property insurance operating in the UK, including syndicates operating within the Lloyd's market, are members of Pool Re, and have agreed to offer terrorism cover as defined under the scheme to any client or prospective client who requests it to be included in their commercial property policy. On request by a policyholder, an insurer participating in the Pool Re scheme will quote a premium for the inclusion of terrorism cover. If the quote is accepted, terrorism

cover will then be added to their commercial property policy. Alternatively, the insurer may simply include the cover within its standard policy without the need for separate consideration by the insured. Pool Re has arrangements with all its members under which it will reimburse them the cost of the claims they pay under the terrorism cover they provide to their policyholders, subject to a loss retention which they must pay themselves. Insurers pay premium to Pool Re for this cover; the retention varies between insurers depending upon the size of their terrorism insurance portfolio.

Since 2002 the cover provided by members of the Pool Re scheme was extended to an “all risks” basis, and not restricted to fire or explosion as hitherto. In addition, exclusions relating to chemical, biological, radiological or nuclear attack were removed, leaving the scheme able to respond to events which include damage arising from such causes⁷⁶.

Most types of commercial property are eligible for coverage under the scheme: buildings, their contents, site property, construction projects and plant and machinery, as well as transport, communication and energy infrastructure⁷⁷. To be eligible for the scheme, the property must be located in England, Scotland or Wales; it does not apply to property in Northern Ireland, the Isle of Man or the Channel Islands. Since terrorism cover is not provided under the scheme on a ‘stand-alone’ basis, the property must be insured under a general commercial property policy issued by a Pool Re member covering conventional fire and explosion damage.

Pool Re’s Retrocession Agreement with HM Treasury provides funding in the event that it exhausts all its financial resources following claim payments⁷⁸. The government, therefore, is acting as lender of last resort⁷⁹.

UNITED STATES OF AMERICA

Traditionally, in the United States, local and state governments are charged with the primary responsibility of responding to disasters. The federalist structure, which authorizes states to execute general police powers, means that a majority of resources are distributed on a local level⁸⁰. Virtually every state has adopted statutes which grant emergency or disaster authority to local governments. Most state statutory schemes are divided into two separate categories; emergency planning and emergency response. Moreover, in each state, the governor has the authority to declare a state of “emergency” on a state-wide basis, while mayors are charged with declaring “emergencies” on a local level.

Contrary to popular misconceptions, the federal government does not view itself as the primary caretaker for disaster relief. Indeed for most of the United States' history, federal disaster relief was only provided for on an *ad hoc* basis⁸¹. No comprehensive federal emergency management system was in effect, and thus disaster mitigation was never a federal pursuit. However, with the expansion of the federal government under new deal legislation, the federal government slowly began extending the reach of its disaster relief efforts.

US Disaster Mitigation Pre 9/11

In 1979, President Jimmy Carter created the Federal Emergency Management Agency (FEMA), an independent cabinet level agency aimed at coping with national hazards⁸². Even at its inception, FEMA's mission was ambitious and ambiguous. Its mission was to respond to "all hazards", coordinating efforts to keep the nation safe from a spectrum of domestic dangers created by "acts of god"⁸³. Subsequently, the Regan administration, engrossed in the trawls of the cold war, focused most of FEMA's resources on the "continuity of government", that is, on salvaging the nation in the event of a nuclear attack. Indeed it was not until the end of the cold war that FEMA began focusing a majority of its resources on handling natural disasters.

However, FEMA had relatively little experience in handling natural disasters, as demonstrated by its response to Hurricane Andrew in 1992. The storm devastated Florida and Louisiana, killing 23 people⁸⁴. Once in office, Bill Clinton appointed his former Arkansas Emergency Management director, James L. Witt to head FEMA⁸⁵. 1993, Witt announced plans for a major overhaul of the Agency's approach to disaster response. Witt desired to create closer coordination with local and state emergency offices. Perhaps more significantly, Witt focused FEMA's attention and resources for the first time on the benefits of disaster mitigation. Witt established "Project Impact" a federal mitigation program designed to foster partnerships between federal, state and local governments, as well as with local private business and non-profit organizations.

In 2000, the Disaster Mitigation Act of 2000 replaced the Stafford Disaster Relief and Emergency Assistance Act⁸⁶. For the most part, the Disaster Mitigation Act of 2000 reconfirmed the pre-existing mandate by congress to "provide an orderly and continuing means of assistance by the Federal Government" to state and local governments charged with responding to disasters⁸⁷. In particular, USCS § 5121(b)(4-5) states that Congress shall "encourage individuals, States, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance" and "encourage hazard mitigation measures to reduce losses from

disaster, including development of land use and construction regulations.” This language is significant because it demonstrates an awareness of the utility of hazard mitigation but an increasing reluctance on the part of the federal government to take full initiative for mitigation programs.

Before 9/11, a new department within FEMA was dedicated entirely to the threat of weapons of mass destruction: in July 2001 the Office of National Preparedness (“ONP”) was established to “lead the management of the consequences of the use of the weapon of mass destruction in the United States, if such use should occur despite the efforts of our Government to prevent it”⁸⁸.

US Disaster Mitigation Post 9/11

Due to the tragic events of 9/11, the federal government shifted its focus from disaster preparedness to disaster response. Moreover, the nature of the disaster focus changed dramatically from natural causes to threats of terror.

Perhaps the most notable and immediate structural change made to FEMA post 9/11 was its loss of status as an independent, cabinet level agency. In response to the catastrophic events of 9/11, President Bush quickly announced the creation of a new federal agency, the Department of Homeland Security (“DHS”). FEMA was subsumed, along with 21 other agencies into the DHS. Many analysts immediately cautioned against the subsuming of FEMA into the DHS. The Brookings Institution, a respected Washington think-tank, stated that a merged FEMA would, “likely become less effective in performing its current mission in case of natural disaster as time, effort and attention are inevitably diverted to other tasks within the larger organization”⁸⁹. Indeed even Congress’ Government Accountability Office called the merger “high risk” for FEMA. Despite much comment and criticism, the reorganization of FEMA under the super-department of DHS, took effect on 1 March 2003. This structural change has proven quite significant for FEMA.

The first consequence of FEMA’s loss of independence is that the director of FEMA no longer reports directly to the president and his staff. Instead, the undersecretary of DHS must report to the secretary of DHS, who, upon his own discretion, relays the matters to the President. This extra layer of bureaucracy is significant because in order for a majority of federal disaster mitigation programs to be triggered, the president must first declare a state of emergency.

The second major consequence of the restructuring of FEMA into the DHS is the process for which funds must now be distributed. Prior to becoming part of the DHS, FEMA was responsible for reviewing, awarding and distributing all mitigation grant funds. Now, FEMA currently has domain over only three

mitigation grant programs; the Hazard Mitigation Grant Program (“HGMP”), the Pre-Disaster Mitigation Program (“PDM”) and the Flood Mitigation Assistance Program (“FMA”) ⁹⁰. The HGMP, as authorized under §404 of the Stafford Act, provides grants to States and local governments to implement long-term hazard mitigation measures, but only after the president declares a major disaster. The PDM, on the other hand, provides technical and financial support to States and local governments for “cost-effective” pre-disaster mitigation activities. The FMA provides funding to assist States and communities “in implementing measures to reduce or eliminate the long-term risk of flood damage.” The FMA is also responsible for overseeing the National Flood Insurance Program.

By contrast, the newly created Office of State and Local Government Coordination and Preparedness ⁹¹, also part of the DHS, is now charged with distribution of several key former FEMA grant programs. For example, the Office of State and Local Government Coordination and Preparedness has sole responsibility for the distribution of Emergency Management Performance grants, Firefighter Assistance grants, and Emergency Preparedness grants. ⁹² However, the problem with this distribution structure is that, in the event of a national emergency, FEMA is still ultimately responsible for the coordination of the personnel and equipment procured with those funds.

The third major consequence of the restructuring of FEMA is that all pre-disaster mitigation grants must now be awarded on a competitive basis. This change reflects the overall policy choice to privatize more and more disaster management responsibilities. However, there is a risk that in a purely competitive grant program, lower income communities will likely be hindered in their ability to effectively compete with more prosperous communities ⁹³. Considering the fact that low-income communities are the very communities most often at risk for great damage in a natural disaster, an exclusively competitive grant program may undermine mitigation measures on the whole.

The final major consequence of the FEMA restructuring is that of loss of personnel. The loss of FEMA personnel is, in part, a direct result of the merger under DHS. However, an indirect consequence is also being felt in the flight of disaster professional leaving the department for the private sector. This is problematic for the agency because it translates to the loss of years of experience and knowledge. Thus, as a result (both direct and indirect) of FEMA’s recent restructuring, a significant number of FEMA personnel no longer exist to effectuate disaster mitigation measures.

These four main changes in FEMA post 9/11 may have hindered the agency's ability to adequately respond to the disaster caused by hurricanes Katrina and Rita in the Gulf Coast.

Catastrophe Insurance Programs

In the United States, most property insurance policies, both residential and commercial, are written on an all-risk basis⁹⁴. This means they cover the perils of wind, including tornado and hurricane, as well as fire and explosion. Flood and earthquake perils are normally excluded. Beyond private insurance, marketed on a voluntary basis, there are state mandated pools for certain risks, as well as a few catastrophe funds. Disaster insurance is not compulsory as a matter of law, but it is often required by lenders.

(a) National Flood Insurance Program (NFIP)

The US Congress established the NFIP on August 1, 1968 - with the passage of the National Flood Insurance Act of 1968 -, as a response to the growing financial impact of flood related damages and the related increasing cost of taxpayer funded disaster relief for flood victims. The NFIP makes federally-backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage⁹⁵.

The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994, signed into law on 23 September 1994. The NFIP is administered by the Mitigation Division within the FEMA, which in turn is part of the DHS.

The NFIP is a federal program enabling property owners in participating communities to purchase insurance protection against losses from flooding⁹⁶. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the Federal Government that states if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHA), the federal government will make flood insurance available within the community as a financial protection against flood losses.

After the 2005 hurricane season⁹⁷, however, the NFIP's current financial situation became unsustainable and the program came under scrutiny. According to recent reports⁹⁸ FEMA lacks the financial resources to cover the

program's costs and the authority to make changes that might ensure that future obligations could be met. It is also stipulated that even if FEMA increases the premiums charged for flood insurance by the maximum percentage allowed by law, premium income in the next several years is unlikely to cover claims, debt service, and other costs of the program⁹⁹.

As a part of NFIP – related reform efforts, the Senate recently¹⁰⁰ passed its version of the Flood Insurance Reform and Modernization Act of 2007 that would extend the National Flood Insurance Program through 2013¹⁰¹. The bill provides for reforms to the NFIP, which include measures to restore financial stability of the flood insurance program, such as increasing premiums and reduced subsidies, aimed to put the program which is billions of dollars in debt after hurricanes Rita and Katrina in 2005 on stronger financial footing, modernize the flood mapping, enhances level of consumer protection and encourages a broader participation in the program.

The House of Representatives voted its version of the bill in September 2007. The main differences between two versions of the bill lie in the addition of windstorm coverage, an amendment to the bill agreed by the House of Representatives, and the proposal by the Senate to forgive some USD 17.5 billion in debt, which is not included in the House version. Members of the Senate and House Representatives will be now working together to produce the final compromise version before it can be signed into law.

(b) California Earthquake Authority (CEA)

California law requires all insurers to offer earthquake insurance with every residential property policy. Residential property insurance includes coverage for homeowners, condominium owners, mobile home owners, and renters. Established in 1996 to relieve pressure on private insurers, the California Earthquake Authority (CEA) is a privately financed, state-run insurance program that sells a “mini-policy” (or “base-limits policy”) with a relatively large deductible (15 per cent of coverage limit) and limited coverage of dwellings, personal property and additional living expense/loss of use. In offering earthquake coverage, private insurance companies can become a CEA participating insurance company and offer the CEA's residential earthquake policies or they can manage the risk themselves. To date, companies that sell over two-thirds of the residential property insurance in the state have opted to become CEA participating companies. The state offers no guarantee: therefore, if losses from an earthquake drain the established fund, the CEA may run out of business and claims will be paid out on a pro-rated basis. In 1998 the CEA was permitted to offer an optional supplementary policy to broaden coverage. Nevertheless, only a small portion of the state's property owners buy earthquake

insurance and the percentage appears to grow smaller as the time span since the last major quake increases¹⁰².

(c) Florida Hurricane Catastrophe Fund (FHCF)

In 1993, the State of Florida established the Florida Hurricane Catastrophe Fund (FHCF) a state-run catastrophe reinsurance program that allows insurers to transfer a portion of their catastrophic risk. The Fund reimburses a fraction of insurers' losses caused by severe hurricanes and it is funded by premiums paid by insurers that write policies on personal and commercial residential properties. An important provision limits the Fund's obligation to pay losses to the sum of its assets and borrowing capacity. This fund is tax-exempt, enabling it to accumulate funds rapidly. The industry is responsible for losses up to a certain level; the premiums they pay for the reinsurance can be passed onto policyholders. In addition to premiums, these programs can use bonding and other financing arrangements if they have a shortfall. The policyholders, however, would have to foot the bill for the financing through assessments on their policies. If the funds are not adequate, claims are paid on a pro-rated basis so policyholders have no guarantee claims their losses will be covered¹⁰³.

(d) Hawaii Hurricane Relief Fund (HHRF)

In 1993, Hawaii created a voluntary homeowner's catastrophe fund in order to provide hurricane insurance for customers of insurers which would no longer voluntarily offer such coverage. The Hawaii Hurricane Relief Fund (HHRF), a state-run insurance company, was made up of premiums paid, loans from the federal government, bond proceeds, mortgage fees and insurer assessments. The Fund discontinued its operation by the end of 2000, in light of improved private market conditions.

(e) Terrorism Risk Insurance Act of 2002 (TRIA) and its extensions

Pursuant to the Terrorism Risk Insurance Act of 2002 (TRIA), while insurers are required to make available, in all property and casualty insurance policies, coverage for losses arising from an act of terrorism - as defined under Section 102 of the Act -, a special risk-sharing arrangement has been set up by the federal government to limit market exposure. In particular, the federal government offers a backstop facility aimed at limiting private sector exposure in commercial insurance lines¹⁰⁴. TRIA, therefore, established a temporary Federal program of shared public and private compensation for privately-insured commercial property and casualty losses resulting from acts of terrorism. The Department of the Treasury administers TRIA through the Terrorism Risk Insurance Program (TRIA Program).

TRIA requires that insurers make available coverage for acts of terrorism on the same terms and conditions as other types of coverage offered as part of their commercial property and casualty insurance policies. While TRIA requires insurers to make coverage generally available, it does not contain provisions relating to the pricing of terrorism risk insurance coverage, but rather leaves pricing to whatever provisions may apply under state law and regulation, or to the free market for policies exempt from state rate regulation. TRIA does not require that a policyholder purchase terrorism risk insurance (although, as with workers' compensation insurance, state law may). Thus, if a purchaser declines the offer of terrorism coverage, the insurer can then exclude terrorism losses from coverage under the insurance policy or negotiate other limited forms of coverage, if allowed by state law.

Although TRIA requires insurers to make terrorism coverage offers on the same terms and conditions as other coverage, insurers are not required to make coverage available for losses from a chemical, nuclear, biological, or radiological ("CNBR") terrorist act if coverage for CNBR exposure is excluded in the overall policy, regardless of the cause of the CNBR damage (*i.e.*, the same terms and conditions). Thus, insurers are not required to offer terrorism coverage from CNBR losses if such an exclusion is also applied to losses arising from events other than acts of terrorism, and if permitted by state law.

The TRIA Program covers losses from certified acts of terrorism. In order to qualify as act of terrorism, an event must be certified by the Secretary of the Treasury with the concurrence of the Secretary of State and Attorney General of the United States.

If a certified terrorist act occurs, insurers may be eligible to receive the Federal government's share of the insured losses above a deductible, as specified under TRIA. Insurance companies will cover 100 per cent of the insured losses below their deductible. The insurer's deductible, which has gradually increased through the life of the TRIA Program, is currently set at 17.5 per cent of all the insurer's previous year's premiums earned from policies insuring US risks (including the premiums of any of the insurer's affiliates in the case of insurance groups) through the types of insurance (referred to as "lines" or "lines of business") covered under the TRIA Program. This includes premiums received from all policies sold under commercial lines covered by TRIA, including policies in which terrorism risk insurance was not accepted. Thus, the insurer deductible is the same regardless of the individual insurer's terrorism risk insurance take-up rate. The TRIA deductible has increased from 7 per cent in the first year of the TRIA Program to 17.5 per cent in 2006, and is to rise to 20 per cent in 2007 (though in 2006 and 2007 there are fewer types of insurance in the TRIA Program from which the deductible is calculated).

Insured losses above the insurer's deductible amount will then be shared between the insurance company and the Federal government, with the Federal share equal to 90 per cent of the losses above the insurance company's deductible (and 85 per cent in the final year of the TRIA Program). Neither the Federal government, nor private insurers will be liable, however, for any amount exceeding an annual cap of USD 100 billion in aggregate insured losses (each individual insurers must pay at least its TRIA deductible, however). Beyond that point, TRIA provides that Congress will determine the procedures and source of any further payments.

TRIA does not require participating insurers to pay premiums, rather it provides authority for Treasury to recoup its Federal payments via surcharges on the commercial policyholders of these insurers. A certain amount of recoupment is mandatory, based on insurance marketplace aggregate annual retention amounts specified in TRIA. In other circumstances, however, TRIA authorizes discretionary recoupment.

According to the US Department of the Treasury, the availability and affordability of terrorism risk insurance has improved over the past years. Despite increases in risk retentions under TRIA, insurers have allocated additional capacity to terrorism risk, prices have declined, and take-up rates have increased. The take-up rate has reportedly increased from 27 per cent in 2003 to 58 per cent in 2005, while the cost of coverage has generally fallen to roughly 3 per cent to 5 per cent of total property insurance costs. Insurers' retention of risk has steadily increased under the TRIA Program: deductibles have increased from 7 per cent of direct earned premium in 2003 to 17.5 per cent in 2006, and other changes made to TRIA in 2005 have also increased insurer retentions. The general trend observed in the market has been that as insurer retentions have increased under TRIA and policyholder surpluses have risen, prices for terrorism risk have fallen and take-up rates have increased.

The TRIA Program was originally set to expire on December 31, 2005, but on December 22, 2005, the President signed into law the Terrorism Risk Insurance Extension Act of 2005 (TRIEA), which extended the Program through December 31, 2007 with modifications. The overall structure of TRIA was retained, however. On December 26, 2007, President Bush signed into law the Terrorism Risk Insurance Program Reauthorization Act of 2007 which extends the Terrorism Risk Insurance Act through December 31, 2014.

Recent Developments

In the wake of Hurricane Katrina, several proposals were made in the United States to establish a national catastrophe fund. The NAIC's proposal envisions a three-layer plan encompassing

- sound land use planning, support for loss mitigation, integration of the flood and earthquake perils into basic policy forms that are sold by individual insurance companies;
- state or regional catastrophe pools that provide reinsurance for insurers doing business in the state; and,
- a national mega-catastrophe fund that provides a federal backstop for large-scale insured losses¹⁰⁵.

Others believe that the private sector is best able to meet the challenges, if empowered to do so. For example, the American Insurance Association has put forward a holistic agenda for action that focuses on mitigation and prevention through such measures as better building codes and land use controls, more insurance market freedom to expand insurance capacity and to base insurance prices more on risk, and improvements to the National Flood Insurance Program¹⁰⁶. The Reinsurance Association of America, in turn, has expressed its strong opposition to the establishment of government catastrophe funds¹⁰⁷.

THE EUROPEAN UNION SOLIDARITY FUND

In European countries, funding for disasters is also provided by the European Union Solidarity Fund (EUSF). Established under the General Directorate for Regional Policy by Council Regulation (EC) n. 2012/2002 of 11 November 2002¹⁰⁸, the EUSF aims at enabling the Community to express its solidarity rapidly, efficiently and flexibly with the population of a Member State that has suffered a major disaster. The Fund is aimed at intervening mainly in cases of major natural disasters with serious repercussions on living conditions, the natural environment or the economy in one or more regions.

Pursuant to the regulation, a disaster is considered as 'major' if it results in damage estimated either at over EUR 3 billion (2002 prices), or at more than 0.6 per cent of the affected State's gross national income. By way of exception, the EUSF may also respond to extraordinary regional disasters resulting in damage inferior to this threshold, affecting the major part of its population, with serious and lasting repercussions on living conditions and the economic stability of the region. In this context, particular attention is paid to remote and isolated regions, for example the outermost and island regions. Assistance from the EUSF takes the form of a single and global grant, with no necessary co-financing, complementing the public efforts of the beneficiary State.

Intended to finance measures alleviating non-insurable damage in principle, the urgent actions eligible for the EUSF are the following: (i) immediate restoration to working order of infrastructure and plant in the fields of energy, drinking water, waste water, telecommunications, transport, health and education; (ii) providing temporary accommodation and funding rescue services to meet the immediate needs of the population concerned; (iii) immediate securing of preventive infrastructures and measures of immediate protection of the cultural heritage; (iv) immediate cleaning up of disaster-stricken areas, including natural zones¹⁰⁹.

The EUSF has an annual budget of EUR 1 billion: 25 per cent of this amount must remain available on 1 October of every year to meet possible needs through to the end of the year. In exceptional cases and if the resources remaining for the rest of the year are insufficient, the shortfall may be met out of the next year's budget.

SELECTED NON OECD ASIAN COUNTRIES

CHINESE TAIPEI

Residential Earthquake Insurance Pool (TREIP)

Chinese Taipei is located in an active seismic area and it is also exposed to *windstorm* and *typhoon* risks. Due to intense collision between the Philippine Sea and Eurasian plates, Chinese Taipei has experienced many large-scale *earthquakes* over the years. The September 1999 Chi-Chi earthquake was by far the largest earthquake to hit Chinese Taipei in over 100 years, with a magnitude of 7.6 (Mw). As part of the implementation of a comprehensive disaster prevention and risk management program, the Ministry of Finance (MOF) of the government of Chinese Taipei introduced the Residential Earthquake Insurance Pool (TREIP), originally managed by Central Reinsurance Corporation (Central Re), a government owned reinsurance company. Since 2006, after privatization of Central Re, the management of the scheme has been entrusted to TREIF (Residential Earthquake Insurance Fund), a governmental entity¹¹⁰.

TREIP was created according to Article 138-1 of the Chinese Taipei Insurance Act, in July 2001. Regulations and directives followed in November 2001, TREIF was established on 17 January 2002 and TREIP policies became effective from 1 April 2002. The pool was designed to share earthquake risk between private insurance companies and the government and to diversify such risk through a combination of local co-insurance, a non-profit fund (TREIF), international reinsurance, capital markets¹¹¹ and government funds¹¹².

In the original structure, private insurers retained the first TWD 2 billion of risk, and the government acted as a backstop, assuming the risk above that level and up to a total limit of TWD 50 billion. Since 2007, the limit was raised to TWD 60 billion (see **Box 1**)¹¹³.

Box 1. TREIP's Layers of Coverage

Since 2007 TREIP has five layers totaling TWD 60 billion in capacity as follows:

1st layer of TWD 2.4 billion - domestically licensed insurers (private sector coinsurance pool).

2nd layer of TWD 17.6 billion - TREIF.

3rd layer of TWD 20 billion - domestic and overseas reinsurance market and/or capital market [during the first three years of operation (2002-2005) part of this risk layer was ceded to capital markets by means of an indemnity based cat bond].

4th layer of TWD 8 billion – TREIF.

5th layer of TWD 12 billion – Government.

The scheme caps losses at TWD 60 billion. In the event that losses exceed the capped amount, the losses paid to policyholders will be proportionally reduced (proration).

Prior to the creation of TREIP, earthquake insurance was provided as an endorsement to a long-term residential fire policy. Since 1 April 2002, new residential fire policies have been issued on an annual (rather than long-term) basis, and have been changed to automatically cover earthquake risk. Existing long-term policies can also be voluntarily endorsed at any time to provide annual cover for the earthquake peril. As of 31 May 2008, the take-up rate equals 24.98 per cent (22.93 per cent in 2007 / 20.53 per cent in 2006 / 16.67 per cent in 2005) of total estimated 7.8 million households in Chinese Taipei.

The new policies provide indemnity on a replacement cost basis for buildings, with a maximum insured amount of TWD 1.2 million. In addition, a further TWD 180 000 of reimbursement is provided per household for Contingent Living Expenses. No deductible applies. TREIP coverage is provided for an annual flat premium per household (currently: TWD 1,459). For the small number of houses valued at less than TWD 1.2 million, the premium is calculated on a pro-rata basis. Pricing, therefore, is not risk-based¹⁴.

Insurers will pay the indemnity to insured parties only for: (a) a damaged building that a government agency or civilian authority has declared no longer

fit for habitation or (b) the repair cost for a damaged building, where said cost is more than 50 per cent of the replacement cost. TREIP's portfolios are written by domestic and foreign insurers in Chinese Taipei.

Perils covered include: earthquake shock, fire or explosion caused by earthquake, landslide, land subsidence, earth movement and rupture caused by earthquake and, since 2006, tidal wave, surge and flood caused by earthquake. In addition to earthquake risk, the Financial Supervisory Commission (the supervisory authority in Chinese Taipei) is now planning to establish mechanisms to cover other natural hazards, including typhoons and floods¹¹⁵.

INDIA

The territory of the Republic of India is extremely vulnerable to natural catastrophes. Technological disasters and terrorist attacks are also threats faced by the Indian population. The basic responsibility for disaster response measures is entrusted to state governments. In case of major calamities the central government provides additional financial and logistic support¹¹⁶.

A new Disaster Management Bill was passed by the Indian Lok Sabha (Parliament) in December 2005. The government decided to enact a central legislation on disaster management in the aftermath of the tsunami disaster on 26 December 2004¹¹⁷. The national and state authorities shall be responsible for laying down the policies, plans and guidelines for disaster management. The district authority shall act as the district planning, coordination and implementing body for all disaster management related functions. These functions will include mitigation and preparedness measures also, besides response, relief and rehabilitation. A key role has been assigned to the local authority for ensuring training of its officers and employees; maintenance of resources so that these are readily available for use in the event of a disaster and ensuring that all construction projects in their area of jurisdiction conform to the prescribed standards and specifications. The local authority shall also carry out relief, rehabilitation and re-construction activities in the affected areas.

Calamity Relief Fund (CRF)

As concerns the funding of disaster response measures and compensation to victims of calamities, a central role is played by the scheme called Calamity Relief Fund (CRF). The scheme will be operative from financial year 2005-06 and continue till the end of the financial year 2009-10. CRF shall be used only for meeting the expenditure for providing immediate relief to the victims of cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloud burst and pest attack.

The amount of annual contribution to the CRF of each state for each of the financial years 2005-06 to 2009-10 has been indicated by the Ministry of Finance¹¹⁸. Of the total contribution indicated, government of India will contribute 75 per cent of the total yearly allocation in the form of a non-plan grant and the balance 25 per cent amount will be contributed by the state government concerned.

The share of the central government shall be remitted to the state governments in two installments on June 1, and December 1, in each financial year. Likewise, the state governments shall also transfer their contribution to the CRF in two installments in June and December of the same year, provided that if Ministry of Finance is satisfied that exigencies of a particular calamity so warrant, the State shall be able to draw 25 per cent of the funds due to the state in the following year from the Centre to be adjusted against the dues of the subsequent year.

A state-level Committee, constituted by the state government, administers the CRF. The Chief Secretary to the state government chairs the Committee, which consists of officials who are normally connected with relief work and experts in various fields in the State affected by natural calamities¹¹⁹. The Committee shall decide on all matters connected with the financing of the relief expenditure from CRF. The Committee arranges to obtain the contributions from the concerned Governments, administers the CRF and invests the accretions to the CRF in accordance with the norms approved by the government of India. The Committee shall also be responsible to ensure that the money drawn from the Calamity Relief Fund is actually utilized for the purposes for which the CRF has been set up, and only on items of expenditure and as per norms contained in the guidelines issued by the Ministry of Home Affairs.

The accretions to the CRF, together with the income earned on the investments of the Fund, will be used by the Committee to meet items of expenditure covered by the norms contained in the guidelines released by the Ministry of Finance. No further financial assistance (beyond the central government's yearly contribution to the CRF) will ordinarily be available for the purpose. The expenditure on restoration of damaged infrastructure and capital assets should be met from the normal budgetary heads, except when it is to be incurred as part of providing immediate relief. The provision for disaster preparedness and mitigation needs to be built into the State plans, and not as a part of calamity relief.

The operations of CRF are monitored by the Ministry of Home Affairs. The Ministry shall, *inter alia*, undertake evaluation of the expenditure incurred

out of CRF. Financial assistance is also provided to the States by the National Calamity Contingency Fund (NCCF).

Terrorism Risk Pool

Following the withdrawal of the cover for the risks of terrorism and sabotage by the international reinsurers, private non-life insurance companies licensed to operate in India have pooled their resources to establish a Terrorism Risk Insurance Pool starting from 1 April 2002¹²⁰.

The Terrorism Risk Insurance Pool fully reinsures all terrorism risks underwritten by the primary companies participating in the venture. Excess of loss retrocessional coverage is then purchased on the international market. The General Insurance Corporation of India (GIC), on behalf of all the non-life insurance companies manages this pool including maintenance of accounts, investment of funds, etc. For this purpose a handling fee of 1 per cent of the premium on the cessions is recovered from the participants. The cover is available only in respect of fire, engineering and fire/engineering sections of miscellaneous policies. The rates charged for this cover are administered by Tariff Advisory Committee (TAC). The entire premium charged for this cover is ceded to the pool after deducting 2 per cent as service charges for the cedant company.

At the beginning, Indian corporations - especially power utilities - were reluctant to take terrorism covers. The few corporations that had decided to purchase terrorism risk coverage included petroleum refiners and some ports¹²¹. Power utilities' reluctance to take terrorism cover was partly driven by the potential adverse impact on their bottom lines. Insurance costs of power utilities are restricted to 2.5 per cent of the operation and maintenance costs. Consequently, taking terrorism risk implied that the costs of the high premiums would have to be treated as additional expenditure, with the concomitant impact on the rates of return. Few power utilities, especially independent power producers, were prepared to accept this rate of return reduction.

Moreover, domestic insurers were also not very enthusiastic on selling such terrorism risk covers¹²². This was partly because of the steep reinsurance premia and tight caps on maximum reinsurance liabilities. Reinsurers had capped their liabilities to a maximum of Rs 200 crore (USD 43 million). Besides, reinsurers starting from 2002 were not willing to accept terrorism as part of the treaty arrangements any more. As a result, most of the domestic non-life insurers had to pool their risks or take reinsurance on a facultative basis, which were prohibitively expensive.

In a circular issued to all the non-life insurers in the Country, the Tariff Advisory Committee (TAC) of the Insurance Regulatory and Development Authority (IRDA) reduced the premium from 0.05 per cent per mille (50 paise per Rs 1000 of sum assured) to 0.03 (30 paise per Rs 1000). Industry sources said that reduction in the premia was partly driven by the low claims ratios in terrorism insurance. In fact, very few corporations in the country have made claims on terrorism-related losses. The reduction might also be driven by the reduced risk perception and/or reduce cost of international retrocessional coverage¹²³. After an initial period in which the maximum coverage per risk was set at Rs. 200 crores (USD 43 million), from January 2004 the Pool had the financial capacity to offer terrorism cover up to Rs. 300 crores (USD 65 million) per location. Along with the above mentioned premium reductions, the coverage limits have been raised first to Rs 500 crore (USD 108 million) per event per location¹²⁴, and then, in June 2006, to Rs 600 crore (USD 130 million)¹²⁵.

INDONESIA

Due to the geographical location of the Indonesian Archipelago, the Republic of Indonesia is extremely vulnerable to natural catastrophes such as *earthquakes, volcanic eruptions, tsunamis and floods*¹²⁶.

PT. Asuransi MAIPARK Indonesia

PT. Asuransi MAIPARK Indonesia (MAIPARK)¹²⁷ was established on 23 December 2003. It commenced business operations with effect from 1 January 2004. MAIPARK is a joint undertaking of the Indonesian General Insurance Industry, endorsed by Decree No. 63 of the Directorate of Insurance, Republic of Indonesia. All insurance and reinsurance companies licensed to operate in the Republic of Indonesia are shareholders of the company. MAIPARK was established as a Special Risk Reinsurance Company with the objective to become the National Reinsurer for catastrophic risks. At present MAIPARK focuses on earthquake reinsurance only.

Deregulation of the financial sector in the late 1980's led to a drop of premium rates in Indonesia to levels similar to countries without catastrophe risk exposure. Due to excessive competition it became market practice to provide earthquake insurance without charging risk adequate premiums. There was increasing concern whether insurers could meet their obligations towards policyholders in the event of a large earthquake impacting one of the major metropolitan or economically and industrially vital provincial areas.

In response to the above situation and via a succession of administrative and regulatory directives, the government required all licensed general insurance and reinsurance companies operating in Indonesia to cooperate in insuring special risks through a joint undertaking of all companies. The vehicle for this undertaking was the Indonesian Earthquake Reinsurance Pool or Pool Reasuransi Gempa Bumi Indonesia (PRGBI). Participating in the Earthquake Pool was made compulsory for all general insurance and reinsurance companies. The PRGBI began operations from 1 January 2003. At the same time a compulsory earthquake tariff was introduced and endorsed by the government. With effect from 1 January 2004 the PRGBI was transformed into a public liability company, MAIPARK.

The earthquake and tsunami event on 26 December 2004 off the coast of West Sumatra, which was widely covered by the international media, will be a lasting reminder of the destructive forces of nature. The insurance industry plays an important role in supporting economic growth by diversifying risks and absorbing volatility. Insurers act like an engine for economic recovery after major natural disasters. The objective is to form a community of insured who pay enough premiums to cover the cost of damage caused by a natural catastrophe.

While insurance cannot prevent natural catastrophes and loss of lives to occur, it can help people protect against the financial consequences of loss or damage to their homes and business by means of buying earthquakes insurance. While insurances offer earthquake insurance, there is no state requirement that consumer purchase earthquake insurance or that mortgage lenders require it. With the help of reinsurers, both local and international, to whom most catastrophe risk is transferred, the insurance industry and the government reduce their respective financial and fiscal risk exposures.

Besides its function as a reinsurer MAIPARK engages in research support, education of the public about natural disaster, risk mitigation and more stringent and safer construction standards and building codes. As a result of the devastating impact of the 26 December 2004 tsunami, insurance companies in Indonesia were faced with a large number of claims, even if insurance penetration in the most affected regions (especially Aceh) is extremely low¹²⁸.

PHILIPPINES

National Calamity Fund (NCF)

The Philippines have set up a comprehensive all hazard disaster management system (Philippines Disaster Management System - PDMS),

covering mitigation, preparedness, rehabilitation and response¹²⁹. The funding of the response measures is managed through the National Calamity Fund (NCF) and the Local Calamity Fund (LCF).

The National Disaster Coordinating Council (NDCC) administers the NCF under the Philippines' General Appropriation Act. The fund shall be used for aid, relief and rehabilitation services to areas affected by man-made and natural calamities and repair and reconstruction of permanent structures. The limited budget allocation of the national calamity fund prompted the NDCC to rationalize its use so that urgent and immediate needs in affected areas are duly addressed based on the priority levels set. Reportedly, an insurance solution to cover the financial consequences of large scale disasters is currently being considered in the Philippines¹³⁰.

NOTES

1. In 2004-05, NDRRA expenditures were just under AUD 70m, with most funding going to NSW (receiving just over AUD 38m); Queensland received just over AUD 15m in funding, while Western Australia received over AUD 11m. NDRRA assistance is provided in accordance with terms and conditions determined by the Minister for Local Government, Territories and Roads.
2. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 67 ff.
3. A related point is the issue of non-insurance and underinsurance. The Insurance Council of Australia has estimated that as many as 20 per cent of home buildings are insured for between 70 and 90 per cent of their replacement value and that as many as 25 per cent of home contents may be uninsured, the bulk of which would be rental accommodation.
4. A copy of the code is available at www.codeofpractice.com.au. Specific provisions are comprised in section 4 of the Code, entitled: "Responding to Catastrophes and Disasters".
5. More information is available at <http://www.insurancecouncil.com.au/>

6. OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, Paris, OECD Publishing: 2005.
7. The report, released on 15 September 2006, is available at: <http://www.treasury.gov.au/contentitem.asp?NavId=037&ContentID=1162>
8. See: www.hochwasserrisiko.at; see also: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 23 ff.;
9. See: D. Hinghofer-Szalkay, and B.A. Koch, AUSTRIA, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Tort and Insurance Law Vol. 14, Vienna/New York: Springer 2006, 7 ff.
10. OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, cit.
11. For: “CAstrophes Naturelles / NAtuurRAmpen”.
12. The cap is the lesser of: (i) EUR 3.000.000 + 0.35 x P + 0.05 x S; or (ii) 1.05 x (EUR 3.000.000 + 0.35 x P), where: P is the premium income for simple fire insurance (excluding catastrophe coverage) received by the insurance company in the financial year preceding the loss; S is the amount of indemnities that the insurer has to pay for a natural catastrophe in excess of EUR 3.000.000 + 0.35 x P. In case of an earthquake, the coefficient 0.35 and the sum EUR 3.000.000 are respectively replaced by 0.84 and EUR 8.000.000.
13. *“Une action ou une menace d'action organisée dans la clandestinité à des fins idéologiques, politiques, ethniques ou religieuses, exécutée individuellement ou en groupe et attentant à des personnes ou détruisant partiellement ou totalement la valeur économique d'un bien matériel ou immatériel, soit en vue d'impressionner le public, de créer un climat d'insécurité ou de faire pression sur les autorités, soit en vue d'entraver la circulation et le fonctionnement normal d'un service ou d'une entreprise”* (Law 1 April 2007, Article 2, para. 1)
14. See: *OECD Check-List of Criteria to Define Terrorism for the Purpose of Compensation*, Recommendation of the OECD Council of 15 December 2004.
15. See: <http://www.tripasbl.be/>

16. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 9 ff.
17. Once the threshold is exceeded, the federal share of eligible expenses is determined by the formula in the following table:

Eligible Provincial Expense Thresholds (per capita of population)	Government of Canada Share (percentage)
First CAD 1	0
Next CAD 2	50
Next CAD 2	75
Remainder	90

18. See <http://www.2003firestorm.gov.bc.ca/firestormreport/toc.htm>
19. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 29
20. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 51
21. “12. *La Nation proclame la solidarité et l'égalité de tous les Français devant les charges qui résultent des calamités nationales.*” See: M. Cannarsa, F. Lafay and O. Moréteau, FRANCE, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Tort and Insurance Law Vol. 14, Vienna/New York: Springer 2006, 81 ff.
22. Household insurance coverage is mandatory for tenants under French law, while most lenders require home owners to show proof of adequate insurance in order to obtain a loan.
23. The underground cavities considered may be natural or man-made. In the latter case, damage resulting from the former or current exploitation of a mine is excluded from the application of this special regime.
24. The compensation for such losses is governed by the provisions of Law n.64-704 of 10 July 1964, as amended, which establishes a scheme to cover agricultural disasters (National Guarantee Fund for Agricultural Disasters). See *Code Rural* (Rural Code) Article L361-1 to 21. See: M. Cannarsa, F. Lafay and O. Moréteau, FRANCE, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, cit., 87.

25. Article 1 of the Law 82-600 states: « *Les contrats d'assurance, souscrits par toute personne physique ou morale autre que l'Etat et garantissant les dommages d'incendie ou tous autres dommages à des biens situés en France, ainsi que les dommages aux corps de véhicules terrestres à moteur, ouvrent droit à la garantie de l'assuré contre les effets des catastrophes naturelles sur les biens faisant l'objet de tels contrats. En outre, si l'assuré est couvert contre les pertes d'exploitation, cette garantie est étendue aux effets des catastrophes naturelles, dans les conditions prévues au contrat correspondant. Sont considérés comme les effets des catastrophes naturelles, au sens de la présente loi, les dommages matériels directs ayant eu pour cause déterminante l'intensité anormale d'un agent naturel, lorsque les mesures habituelles à prendre pour prévenir ces dommages n'ont pu empêcher leur survenance ou n'ont pu être prises. (...)*». For the detailed legislative provisions of the French *Insurance Code* currently in force, see: *Code des Assurances* (Partie Législative) Titre II - Chapitre V: L'assurance des risques de catastrophes naturelles (Articles L125-1 to L125-6).
26. Pursuant to a decree of 10 August 1982 (defining standard clauses), the catastrophe insurance guarantee must cover the cost of direct material damage suffered by the property up to the value stated in the policy and subject to the terms and conditions of the said policy at the time the risk first occurs. As anticipated, the natural disaster coverage is also extended to in all business interruption policies; in this case, it covers loss of gross profit and additional operating costs during the indemnity period specified in the policy. Claims are settled on the basis of the "damage" cover under the policy with the widest scope and indemnity is provided in the same way as under the basic cover.
27. These coefficients rise as follows: 1 to 2 declarations: normal application of the statutory deductibles; 3 declarations: doubling of the statutory deductibles; 4 declarations: tripling of the statutory deductibles; 5 or more declarations: quadrupling of the statutory deductibles. See e.g., *Les catastrophes naturelles en France. Natural disasters in France*, CCR: April 2007.
28. See e.g. *Les catastrophes naturelles en France. Natural disasters in France*, cit; see also: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*.
29. It should be noted that, under French law, insurance and reinsurance companies are allowed to place up to 75 per cent of their profits for each year into an "equalisation reserve" on a tax-free basis provided that the total amount of the reserve does not exceed 300 per cent of their annual income.

The funds that are, each year, allocated to this reserve are released after ten years.

30. *Les catastrophes naturelles en France. Natural disasters in France*, CCR: June 2001.
31. See: Articles L422-1 and L-422-2 of the *Insurance Code*.
32. See: OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, cit.
33. This provision does not apply to the nuclear accidents defined by the convention on the public liability on nuclear energy signed in Paris on 29 July 1960.
34. See U. Magnus, GERMANY, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, cit., at 123-124
35. See U. Magnus, GERMANY, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, cit., 119 ff.
36. See: OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, cit.; see also: <http://www.extremus.de>
37. *Mapping the impacts of recent natural disasters and technological accidents in Europe*, Environmental Issue Report n. 35, EEA: 2004. The EEA report brings together information about natural disasters and technological accidents that have occurred across Europe over the 1998-2002 period and their impacts on the environment and society. The natural disasters covered are floods, storms, forest fires, droughts, landslides, snow avalanches and earthquakes. Among technological accidents, oil spills, industrial accidents and mining accidents are considered. The report does not deal with biological hazards (e.g. epidemics), social hazards (terrorism, war) or certain types of technological risks such as nuclear accidents. Nor does it cover hazards related to chronic exposure to harmful substances or transport accidents other than those involving dangerous substances.
38. Source: Servizio Nazionale di Protezione Civile (National Service of Civil Protection). Pursuant to Law n.225 of 24 February 1992, the National Service of Civil Protection is coordinated by the President of the Cabinet of Ministries: <http://www.protezionecivile.it/> see also: *Catastrophes and Insurance in Italy*, Report by Mr. Aldo Marzano, ANIA (Italian National

Association of Insurance Companies) Conference – Milan, 11 November 2003.

39. Sources: Servizio Nazionale di Protezione Civile (National Service of Civil Protection) and ANIA (Italian National Association of Insurance Companies).
40. This problem is common to other Western democracies: as we shall see in more details, *infra*, in the US, government funding of natural catastrophes has been perceived to be an increasingly serious issue. See: G. Priest, *The Government, the Market and the Problem of Catastrophic Loss*, 12 *Journal of Risk and Uncertainty* (1993) 219. See also: K.A. Froot (ed.), *The Financing of Catastrophe Risks*, University of Chicago Press, 1999.
41. Sometimes human misconduct combines with natural phenomena generating catastrophic losses and, thereby triggering liability in tort as well as under criminal law. This is the case, for instance, of the Vajont disaster.
42. See A. Monti and F.A. Chiaves, ITALY, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, cit., 145 ff.
43. See e.g. the Report by Prof. Giovanni Manghetti, former President of ISVAP, at the Conference on “*Catastrophic Events and Connected Consequences. The Insurer’s Approach and the Role of Brokers*”, Rome 31 October 2000.
44. ANIA, *Progetto di classificazione del territorio italiano ai fini della garanzia alluvione*, Milan, 1996, 1-10.
45. Antitrust Authority Bulletin, n. 13-14 of 26 April 1999, 95.
46. Report by Prof. Giovanni Manghetti, former president of ISVAP, at the Conference on “*Catastrophic Events and Connected Consequences. The Insurer’s Approach and the Role of Brokers*”, Rome, October 31, 2000, p. 6 et seq.
47. Antitrust Authority Decision AS270 of 20 November 2003, Bulletin n. 47/2003.
48. The antitrust problem with tie-ins is that the leverage generated by economic power in one market is used by the seller to accomplish sales in another.
49. « *In conclusion, the Authority hopes that the Parliament and the Government, with a view to reforming the current system of compensation for natural*

catastrophes losses, will make a clear decision between public and private intervention.» Antitrust Authority Decision AS270 of 20 November 2003, Buletin n. 47/2003, last sentence.

50. Article 1 of the *Disaster Countermeasures Basic Act*: “For the purpose of protecting the national territory, the life and limb of the citizens and their property, this Act shall have for its aim the establishment of a machinery working through the State and local governments and public corporations and the clarification of where responsibilities lie, and provide for the formulation of disaster prevention plans and basic policies relating to preventive and emergency measures and rehabilitation programs to deal with disaster, and other necessary measures as well as financial action, thus ensuring an effective and organized administration of comprehensive and systematic disaster prevention with a view toward the preservation of social order and the security of the public welfare.”
51. According to data provided in June 2008 by the Japan Earthquake Reinsurance Co., Ltd., the penetration rate in 2007 exceeded 20 per cent, reflecting an upward trend that begun in the mid-nineties. Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 81 reports that: “In 1992, for example, just 7 per cent of policyholders purchased earthquake coverage. Since that low, however, the take-up rate has been steadily rising and now stands at 17.2 per cent, its highest level since 1969. Coverage is also available under commercial policies for earthquake shock and fire-following. Historically, the earthquake endorsement gave limited coverage for industrial and commercial risks, mainly on a reduced indemnity basis. However, there has been a recent trend toward the issuance of first-loss (no penalty for underinsurance) or layered coverage on both single- and multiple-location policies. It is now estimated that three-quarters of all commercial and industrial earthquake cover is provided on a first-loss basis.”
52. The most recent amendment was introduced on 1 April 2008 to increase the aggregate limit of indemnity per one event to JPY 5 500 billion. See also: Disaster Risk Management in Japan, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 303 ff.; Guy Carpenter & Co., Inc. (2005), *The World Catastrophe Reinsurance Market: 2005*, 19.
53. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 81.
54. Japan Earthquake Reinsurance Co., Ltd. Annual Report 2007, pp. 3-4
55. Japan Earthquake Reinsurance Co., Ltd. Annual Report 2007, p. 5

56. See *Manual de organización y operación del Sistema Nacional de Protección Civil* available at <http://www.proteccioncivil.gob.mx>.
57. Regulation in Mexico makes it obligatory to contract earthquake and other catastrophic risks' insurance (as well as fire insurance) for the following goods: a) INFONAVIT Housing (Institute of National Workers' Housing Fund), regulated by the Law of the INFONAVIT and the Rules under Financing Auctions for the Building of Housing Sets; b) FOVISSSTE Housing (Institute of Security and Social Services for Government Workers' Housing Fund) regulated by the ISSSTE's Law and the Rules under Financing Auctions for the Building of Housing Sets; and c) Timesharing Houses Regulated according to the Mexican Official Norm Project NOM-029-SCFI-199.
58. See *Bases para el Establecimiento del Sistema Nacional de Protección Civil* (1986), pp. 170-171 at: http://www.proteccioncivil.gob.mx/upLoad/Publicaciones/1986_Bases_Sinaproc_wdef2sec.pdf.
59. See: *Disaster risk financing: Reducing the burden on public budgets*, Focus Report, Swiss Re, 2008.
60. See: M. Faure and T. Hartlief, THE NETHERLANDS, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Tort and Insurance Law Vol. 14, Vienna/New York: Springer 2006, 195 ff.
61. More information can be obtained at www.civildefence.govt.nz
62. See: <http://www.eqc.govt.nz/>
63. Perils insured by the EQC catastrophe coverage are: earthquake, natural landslip, volcanic eruption, hydrothermal activity, tsunami and, in the case of residential land, also storm or flood.
64. See: <http://www.naturskade.no/>
65. Largest losses in Norway have been caused by storm and flood.
66. The original name was: *Consortio de Compensación de Riesgos de Motín* - Consortium for the Compensation of Riot Risks.

67. See: The Spanish Experience in the Management of Extraordinary Risks, Including Terrorism, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 337 ff.
68. See: Law 21/1990 of 19 December 1990, amended by Law 30/1995 of 8 November 1995.
69. See Article 1 of the Regulation concerning Extraordinary Risks Insurance (approved by Royal Decree 300/2004, dated 20th February 2004, and amended by Royal Decree 1265/2006, dated 8th November 2006).
70. See: The Turkish Catastrophe Insurance Pool (TCIP) and Compulsory Earthquake Insurance Scheme, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 349 ff.
71. See M. Huber and T. Amodu, UNITED KINGDOM, in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, cit., 261 ff.
72. See Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 60 ff.
73. See: D. Crichton, *Flood Risk & Insurance in England and Wales: Are there lessons to be learned from Scotland?*, Technical Paper 01, Benfield Hazard Research Center, 2005. Available at: http://www.benfieldhrc.org/activities/tech_papers/tech_paper1/pages/intro/cover_page.htm
74. See: <http://www.abi.org.uk/flooding>
75. Reinsurance (Acts of Terrorism) Act 1993: “*Acts of persons acting on behalf of, or in connection with, any organisation which carries out activities directed towards the overthrowing or influencing, by force or violence, of Her Majesty’s government in the United Kingdom or any other government de jure or de facto.*”
76. See: <http://www.poolre.co.uk>
77. The scheme does not cover property insured under marine, aviation or motor policies and it does not cover property on licensed nuclear sites, for which separate arrangements are in place.
78. If losses should be so large that all Pool Re’s reserves are exhausted by claims made upon it by its member insurers, Pool Re would be able to draw

funds from the UK government to enable it to meet its obligations. Pool Re, in turn, pays a premium to government for this cover, and would be required to repay any funds drawn down in this way from its future income. See: <http://www.poolre.co.uk>

79. OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, cit.
80. H. Swanson. *The Delicate Art of Practicing Municipal Law Under Conditions of Hell and High Water*. N. Dak. L. Rev. 487, 490 (2000).
81. M. Davis, *The Legal Community's Response to 9/11: Re-envisioning Disaster Legal Relief in the Era of Homeland Security*, 31, Fordham Urb. L.J. 959, 966 (2004).
82. Id. at 967
83. www.DepartmentofHomelandSecurity/FEMA/history.gov.
84. www.DepartmentofHomelandSecurity/FEMA/mission.gov.
85. Elliston, Jon. A Disaster Waiting to Happen. www.thebestofneworleans.com
86. 42 USCS §5121
87. Id.
88. United States Senate, Environment and Public Works Committee Hearing, Testimony by Joe Allbaugh, Oct. 16, 2001. Federal Document Clearing House Congressional Testimony.
89. Clarren, Rebecca. *Program Nixed in 2001 Could Have Curbed Gulf Coast Damage*. The New Standard, Sept. 2005.
90. www.DepartmentofHomelandSecurity/FEMA/Programs.gov
91. The Office of State and Local Government Coordination and Preparedness also assumed several of the responsibilities of the ONP, demonstrating a tension between the distribution of funds for natural hazards programs and anti-terror programs.
92. United States Senate, Environment and Public Works Committee Hearing, Testimony by Joe Allbaugh, Oct. 16, 2001. Federal Document Clearing House Congressional Testimony.

93. National Emergency Management Association, Congressional Testimony, 2005. Federal Document Clearing House Congressional Testimony.
94. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 11 ff.
95. See: R. P. Hartwig and C. Wilkinson, *The National Flood Insurance Program (NFIP)*, Insurance Information Institute, October 2005.
96. See <http://www.floodsmart.gov/>
97. The hurricane season of 2005 generated the largest and costliest flood disaster in the United States' history.
98. See: *CBO's Response to Questions About the National Flood Insurance Program*, 31 May 2006 available at: <http://www.cbo.gov/ftpdocs/72xx/doc7233/05-31-NFIPLetterGregg.pdf>
99. Reportedly, the NFIP has operated on an actuarially unsound basis, with many property owners paying premiums that do not account for the full risk of insuring their properties. See: *CBO's Response to Questions About the National Flood Insurance Program*, cit.
100. The Senate version of the bill was voted on 12 May 2008.
101. The current authorization for NFIP is set to expire at the end of the 2008 fiscal year.
102. Based on data provided by the CEA in 2008, while in the year following the 1994 Northridge Earthquake approximately 35 per cent of homeowners decided to buy earthquake insurance, at present only 12 per cent of California residents purchase coverage. See also: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 13-14.
103. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 14-18.
104. See: OECD, *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, cit.
105. "The White House has criticized proposals to provide a federal backstop for natural catastrophes as totally inappropriate and characterized the insurance availability problems in coastal states as 'self-inflicted', meaning that if a state sets a ceiling on what can be charged and, as a result, insurers are unable

to make a profit and leave the state, the state is to blame. Proposals for a federal backstop generally envisage a three-layer plan: 1) policies sold by individual insurance companies; 2) state or regional catastrophe pools that provide reinsurance to insurers doing business in the state; and 3) a national megacatastrophe fund. Some insurance groups are in favor of a federal role while others are not. Some say that under the current system the federal government (and hence taxpayers) pay for rebuilding in any case through government grants and low interest loans and that the funds would be better spent in an organized and predictable fashion. Other insurers say that worldwide there is enough reinsurance capacity to protect US primary insurers against catastrophe losses and that people who choose to live in disaster-prone areas should not be protected from the cost of their decisions through subsidies from people who choose to live in a less risky location. They believe the solution is for Congress and state legislatures to develop more stringent building codes and tax incentives for homeowners to prepare for hurricanes. If there is a federal role, it should be limited to providing liquidity through temporary loans to state or regional catastrophe pools rather than serving as a reinsurer” See: Insurance Information Institute, *Catastrophes: Insurance Issues*, June 2008, available at: <http://www.iii.org/media/hottopics/insurance/xxx/>

106. Information on this approach is available at <http://www.aiadc.org/aiadotnet> and by going to "Natural Disasters" on the website.
107. See: Reinsurance Association of America, *Government Catastrophe Funds: An Idea That's Bad for America's Insureds*, June 2006. Available at: <http://community.reinsurance.org/StaticContent/Download/govtcatfunds.pdf>

See also:
<http://www.reinsurance.org/files/public/SmartNatCatPolicyCoalition.pdf>
108. Official Journal L 311 of 14 November 2002.
109. No later than ten weeks after the first damage caused by the disaster, the State affected should submit an application to the Commission for assistance from the Fund. It should provide all possible information on the damage caused by the disaster and its impact on the population and the economy. It must estimate the cost of the foreseen assistance and indicate any other sources of national, Community and/or international funding. Beneficiary Member States must seek all possible reimbursement from third parties.
110. See: <http://www.treif.org.tw/treif/index.asp>

111. In an effort to complement TREIP's reinsurance program and diversify sources of reinsurance capacity, in August 2003 the government successfully issued a landmark USD 100 million catastrophe bond. The three-year bond operated with an indemnity trigger of TWD 20 billion. The bond expired and it was not renewed, due to excessive costs. The layer was then covered by excess of loss (XL) reinsurance.
112. Prior to 1999, fewer than 1 per cent of the residents in Chinese Taipei were covered by earthquake insurance.
113. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 97.
114. See also: Risk Management Solutions, *Creating a Technical Foundation for Earthquake Insurance in China*, RMS (2005), 18.
115. A terrorism risk insurance pool has also been established in Chinese Taipei in 2004. It covers personal accidents up to a maximum insured amount of TWD 2 million per person. See: Guy Carpenter & Co., Inc. (2007), *The World Catastrophe Reinsurance Market: 2007*, 97.
116. See Disaster Management in India, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 381 ff.
117. The salient features of the Bill include setting up of a National Disaster Management Authority under the Chairmanship of the Prime Minister; State Disaster Management Authorities in the States/Union Territories under the chairmanship of Chief Minister or Lt. Governor or Administrator, as the case may be.
118. See:http://finmin.nic.in/the_ministry/dept_expenditure/plan_finance/FCD/Guidelines-CRF.htm
119. The State Governments and/or the State level Committees may constitute sub-committees as may be considered necessary by them in connection with the work of the Committee.
120. See: IRDA Journal, Volume III, Number 3, February 2005, p. 23.
121. See: Shivkumar, *General insurers pitching to provide risk cover to port trusts*, The Hindu Business Line, March 28, 2005.

122. See Management of Extraordinary Risks including Terrorism in India. Achievements and Perspectives, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 393 ff.
123. See A. Monti, *Terrorism Coverage in Selected Non-Member Countries*, in *Terrorism Risk Insurance in OECD Countries*, Policy Issues in Insurance n.9, Paris, OECD Publishing: 2005.
124. The changes took effect on 1 February 2005. See: IRDA Journal, Volume III, Number 3, February 2005, p. 23.
125. See Circular TAC/02/06 of 19 June 2006. Available at: <http://www.tac.org.in/gcir2006.html#c1>
126. See Earthquake Risk Management Policy in Indonesia, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 399 ff.
127. MAIPARK is an abbreviation for Maskapai Asuransi Indonesia (MAI) and Perusahaan Asuransi Risiko Khusus (PARK). MAI was the oldest General Insurance Company in Indonesia and its license was purchased by 32 founding shareholders on 23rd December 2003 at a General Shareholder Meeting. See: <http://www.maipark.com/>
128. See: W. Bugl, *Indonesia: The Recent Tsunami – A Review of the Impact and Lessons Learnt*, Asia Insurance Review, Sirc Special Issue, September 2005, 23-25.
129. See Disaster Management Policy in the Philippines, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 411 ff.
130. See Disaster Management Policy in the Philippines, in *Catastrophic Risks and Insurance*, Policy Issues in Insurance n.8, Paris, OECD Publishing: 2005, 415-417.

CONCLUSIONS

The comparative review and stocktaking conducted in this section of the publication show that there is a wide variety of policy strategies and approaches to the financial management of large-scale disasters, with different degrees of private and public sectors participation and responsibilities, and different types of explicit or implicit coordination mechanisms.

From a normative perspective, bearing in mind that - due to the different exposure to disaster risks, different social and political instances, as well as different legal and cultural backgrounds - finding a standard institutional solution applicable to all countries cannot be the goal of comparative analysis in this field, a clear and transparent allocation of risks and responsibilities among public authorities, firms and individuals emerges as a key component of effective coordination schemes, and a driver to the success of any catastrophe risk management program. Another critical element is the ability to link policy tools (i.e. the technical features of a coordination scheme) with the underlying policy objectives pursued by the government, such as providing adequate financial protection to all individuals and entities, or simply making coverage available.

In those systems that rely on insurance solutions to compensate for property losses due to catastrophes (such as: Belgium, Chinese Taipei, California, Denmark, Florida, France, Iceland, Indonesia, Japan, New Zealand, Norway, Spain, Switzerland, Turkey and the US NFIP), the level of disaster insurance penetration often remains a key concern. Even if disaster insurance coverage is made compulsory by operation of law, the enforcement of the regime may prove to be very difficult (this is the case, for instance, in Turkey), especially if there is a lack of insurance culture among the population. Promoting disaster risk awareness and educating the population to the financial consequences of large-scale disasters becomes, therefore, extremely important. At present, in several countries there seems to be a lack of awareness and a lack of education regarding catastrophic risks: this also applies to central and local governments and the public sector in general.

From a comparative viewpoint, it seems appropriate to distinguish between the situation in developed countries and that in emerging economies. In emerging economies very often the private insurance market is still underdeveloped: the cost of insurance in such economies can be an impediment to growth of the sector¹. In consideration of the above, alternative risk sharing, risk financing and risk transfer tools, such as micro-insurance solutions at community level, or parametric coverage purchased directly by the government to obtain the necessary liquidity for emergency response measures in case of a disaster, may be more appropriate and easier to implement. Developing countries, furthermore, too often rely on foreign donations to finance rehabilitation and reconstruction: this reduces the incentives to adopt a proactive strategy *ex ante*.

In general, the challenge is to identify financial solutions that provide the right incentives to invest in cost-effective preventive measures with a view to reducing vulnerability and the total cost of disasters. The total cost of disasters is the sum of the cost of disaster losses (insured and uninsured), the cost of preventive measures to avoid or mitigate disaster losses, and transaction costs (i.e. the costs of implementing the scheme)². On the other hand, it is important to bear in mind that public and private investments in disaster risk reduction and mitigation measures, by limiting exposure and vulnerability to disaster risks, facilitate the development of new risk financing, risk sharing and risk transfer tools. In light of the above, it becomes clear that disaster risk reduction, mitigation and financing efforts are closely linked to one another, and should be carefully coordinated by policymakers.

The financial management of large-scale catastrophes has become a central topic in the political agenda of OECD and non-member countries worldwide. The situation is rapidly changing in several legal systems and this confirms the need for constant monitoring and information sharing, with a view to being able to learn from the experience of others. Notwithstanding the differences in the policy approaches and in the various institutional solutions adopted by the countries under review, it clearly emerges that disaster insurance is called upon to play an increasingly important role in this field, with the aim to minimize the total costs of disasters and to highlight the importance of individual responsibility in disaster prevention and mitigation.

NOTES

1. In emerging economies, one of the most critical financial threats is the exposure of households and SME. SME, in particular, play a crucial role in many emerging economies and it takes a long time to restart their operations after a major disaster. This also entails additional indirect costs (*e.g.* unemployment, loss of tax revenues, trade disruption, etc.).
2. See: G. CALABRESI, *The Cost of Accidents: A Legal and Economic Analysis*, Yale University Press, 1970.

Table 1

NATURAL CATASTROPHE INSURANCE SCHEMES IN SELECTED OECD AND NON MEMBER ASIAN COUNTRIES: COMPARATIVE TABLE.

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
BELGIUM	2006	Earthquake, flood, storm, landslide and ground subsidence.	Compulsory natural disaster extension on all property damage policies purchased on the voluntary market.	Loss-sharing arrangement between the private sector and the public sector. The <i>Caisse nationale des calamites</i> acts as reinsurer of last resort.	The intervention of the <i>Caisse nationale des calamites</i> is limited on a per event, market aggregate basis, to EUR 700 million in case of earthquake and to EUR 280 million for the other natural catastrophes covered. If this ceiling is reached, the indemnity to be paid to the insured parties is reduced proportionally.

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
CALIFORNIA CALIFORNIA EARTHQUAKE AUTHORITY (CEA)	1996	Earthquake losses.	California law requires all insurers to offer earthquake insurance with every homeowners policy.	The CEA is a privately financed, state-run insurance program.	The State offers not guarantee; if losses exhaust the CEA fund, claims will be paid out on a pro-rated basis.
CHINESE TAIPEI CHINESE TAIPEI RESIDENTIAL EARTHQUAKE INSURANCE POOL (TREIP)	2002	Earthquake shock and, if caused by earthquake: fire or explosion; landslide, land subsidence, earth movement and rupture; tidal wave, surge and flood.	Compulsory earthquake extension on all fire policies.	The pool is designed to share earthquake risk between private insurance companies and the government and to diversify such risk through a combination of local co-insurance, a non-profit fund, international reinsurance and government funds.	TWD 60 billion. In the event that losses exceed the capped amount, the losses paid to policyholders will be proportionally reduced (proration).
DENMARK	1991	Losses resulting from the floods caused by overflowing of sea and windstorm damage in woods. An official declaration of the	All property insured against fire is automatically covered by the scheme.	The scheme is administered by the Storm Council (<i>Stormrådet</i>), a central government entity assisted by the	N/A

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
		Storm Council is required to trigger coverage under the scheme.		insurance companies.	
FLORIDA HURRICANE CATASTROPHE FUND (FHCF)	1993	Hurricane Losses. The Fund reimburses a fraction of insurers' losses caused by severe hurricanes, declared by the National Hurricane Center.	Contribution to the Fund is compulsory for insurers that write primary coverage on personal and commercial residential properties.	The FHCF is tax-exempt. The private industry is responsible for losses up to a certain level.	An important provision limits the Fund's obligation to pay losses to the sum of its assets and borrowing capacity.
FRANCE NATIONAL DISASTER COMPENSATION SCHEME (CAT NAT)	1982	Natural disasters in general. Coverage is triggered when the state of natural disaster is declared by inter-ministerial decree.	Law n. 82-600 of 13 July 1982 provides for a compulsory natural disaster extension on all property damage policies purchased on the voluntary market.	Primary disaster coverage is offered and managed by private carriers, as an extension to property damage policies. Private insurers can obtain full catastrophe reinsurance from the <i>Caisse Centrale de Réassurance</i> (CCR), a state-owned company.	Thanks to the government guarantee, CCR is able to offer catastrophe reinsurance without limits.

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
ICELAND ICELAND CATASTROPHE INSURANCE	1975	Earthquake, volcanic eruption, snow avalanches, landslides and floods.	Purchase of catastrophe insurance is mandatory.	Iceland Catastrophe Insurance is a publicly run company.	ICI is liable, for each individual event, for up to 1 per cent of total insured capital at the time of the loss event. Should the total of payable claims in Iceland exceed this amount, the claims of all of the insured are proportionately reduced.
JAPAN JAPANESE EARTHQUAKE REINSURANCE (JER)	1966	Earthquake, tsunamis, volcanic eruptions	Not compulsory. Primary carriers sell earthquake policies with large deductibles on the voluntary market and then reinsure with JER.	JER, a government entity was established by law in 1966. JER retrocedes part of the risk to the Japanese government and part of it to the private insurance market.	JPY 5,500 billion: if the ceiling is reached, residential policyholders' claims are proportionately reduced. JER's solvency is not guaranteed, but it is improved by arrangements with the Japanese government.

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
NEW ZEALAND EARTHQUAKE COMMISSION (EQC) NATURAL DISASTER FUND	1994	Natural disaster losses. Including: earthquake, natural landslip, volcanic eruption, hydrothermal activity, tsunami and, in the case of residential land, also storm or flood.	Automatic earthquake coverage upon purchase of fire insurance from private market. Premiums are added to the cost of the base policy and passed on to EQC by the insurance company.	EQC, a Crown Entity, administers the natural disaster insurance scheme by: collecting premiums via insurance companies; processing claims; administering the disaster fund; organizing reinsurance.	The Government guarantees that the natural disaster fund will meet all its obligations.
NORWAY NORWEGIAN NATURAL PERILS POOL	1979	Landslide, storm, flood, earthquake and volcanic eruption.	Compulsory natural disaster extension on all fire policies purchased on the voluntary market. All fire insurers are obliged to become members of the Pool.	Insurance coverage offered by the Pool is complemented by the Norwegian National Fund for Natural Damage Assistance.	NOK 12.5 billion
SPAIN CONSORCIO DE COMPENSACIÓ N DE SEGUROS	1954	Extraordinary Risks: <u>natural events</u> (flood, earthquake, seaquake, volcanic eruption, atypical cyclonic storm and fall of sidereal bodies and meteorites)	The extraordinary risk coverage offered by the <i>Consorcio</i> is compulsorily linked with a base policy. The <i>Consorcio</i> 's	Extraordinary risk insurance is administered directly by the <i>Consorcio</i> , a state-owned enterprise, whose solvency is guaranteed by the	Financial capacity is unlimited due to a state guarantee

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
		<p>and <u>socio-political events</u> (including riots and terrorism)</p> <p>The event is covered if it occurred in Spain and caused injuries and damage to people and assets in Spain, provided that: (a) the risk is not expressly covered by the base policy; (b) the risk is covered by the base policy, but the company cannot face its obligations.</p>	<p>surcharge is automatically included in the base policy's premium.</p>	<p>State.</p>	
<p>SWITZERLAND NATURAL PERILS POOL</p>	<p>1939</p>	<p>Flood, inundation, windstorm, hail, avalanche, snow pressure, rock and stone fall, and landslide</p>	<p>Natural perils coverage is mandatorily included in fire insurance for buildings and chattels.</p>	<p>The scheme is administered by private insurance companies</p>	<p>N/A</p>

	Year	Perils Covered and Triggers	Compulsory Nature	Role of Public and Private Sectors	Financial Capacity
<p>TURKEY TURKISH CATASTROPHE INSURANCE POOL (TCIP)</p>	2000	Earthquake losses.	Compulsory. Since 2000, earthquake insurance has been made compulsory to all registered residential dwellings in Turkey.	The TCIP is a separate state-owned legal entity, managed by a Council. Local insurance companies act as distributors of the TCIP policies. Excess coverage could be obtained on a voluntary basis from the private market.	N/A
<p>UNITED STATES NATIONAL FLOOD INSURANCE PROGRAM (NFIP)</p>	1968	Flood losses.	Not compulsory. The NFIP makes federally-backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage.	The federal government reinsures 100 per cent of the losses at subsidized rates.	Coverage limits offered under the NFIP depend on the community's level of qualification. After the 2005 hurricane season, the NFIP's financial situation became difficult to sustain.

Part II

**REDUCING THE IMPACT OF NATURAL DISASTERS:
THE INSURANCE AND MITIGATION CHALLENGE**

Howard C. Kunreuther and Erwann O. Michel-Kerjan *

This Part focuses on the new scale of destruction from natural disasters witnessed in recent years, its impact on disaster insurance and the challenges and opportunities for utilizing mitigation measures to reduce future losses. It discusses the role of cost-benefit analysis in evaluating the effectiveness of mitigation measures and characterizes why people do not always voluntarily invest in cost-effective mitigation measures. The report concludes by proposing the development of a new insurance product: the use of long-term insurance contracts for encouraging the adoption of measures that have the potential to reduce economic and human losses from large-scale disasters.

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INTRODUCTION

Over the past few years, the losses from natural disasters have increased significantly both in OECD and non-OECD countries. In countries that benefit from warning systems and effective mitigation programs, consequences are often much lower than in emerging economies that are deprived of such capacity. In south-east Asia, the tsunami in December 2004 killed more than 280 000 people residing in coastal areas within just a few hours. A month after Cyclone Nargis made landfall in Burma in May 2008, as the deadliest natural disaster in the recorded history of the country, it was estimated that this severe cyclone had killed over 200 000 people. The same month the Great Sichuan Earthquake in China is estimated to have killed nearly 70 000 people and 5 million others homeless though this number could be as high as 11 million.

But even in a country like the United States, which has extensive experience with natural catastrophes, the 2004 and 2005 hurricane seasons have demonstrated the lack of adequate loss reduction measures and emergency preparedness capacity to deal with large-scale natural disasters. Katrina killed 1,300 people and forced 1.5 million people to evacuate the affected area - a historic record for the country. Economic damages are estimated in the range of USD 150 to USD 200 billion.

The insurance industry has played an important role in aiding recovery from natural disasters in recent years. Indeed, except for the terrorist attacks on September 11, 2001 all of the 20 most costly insured events between 1970 and 2007 (using constant prices) were natural disasters. Of these 20, 10 occurred since 2001, nine of which in the United States. Hurricane Katrina alone cost insurers and reinsurers USD 46.3 billion, and total losses paid by private insurers due to major natural catastrophes world-wide were USD 87 billion in 2005. This excludes payment by the US National Flood Insurance Program (NFIP) for damage from 2005 flooding (more than USD 20 billion in claims).

As a result of these increasing losses, insurers are re-examining what role they can and should play in providing protection against mega natural disasters (“super-cats”), as well as their financial ability to do so. Some have decided to stop providing coverage against certain types of risks in locations subject to

potentially catastrophic losses. If the next few years mirror losses suffered by the industry in 2004 and 2005, insurers will very likely rethink its business model for coping with the risks of hurricanes and other extreme events.

In this regard a major challenge today is to better understand the key factors influencing the increased loss from natural disasters. For example, how does new development in hazard-prone areas, increased urbanization, and increased value at risk impact on property damage? What role does climate change play with respect to the frequency and intensity of floods and hurricanes? What steps can be taken in the future to reduce the losses from natural disasters through adoption of cost-effective mitigation measures?

The importance of utilizing mitigation to complement insurance cannot be overemphasized. In some countries there is limited insurance in place to even cover the damage. For example, the large floods in China in 1996 and 1998 inflicted more than USD 50 billion in economic damages; the insured portion represented only 1 or 2 per cent of this amount. Even in some OECD countries the spectrum of a large catastrophe due to a total absence of mitigation measures is well known. Consider the city of Istanbul, Turkey. Seismologists have revealed that it is very likely to experience strong shaking from a large earthquake in the Marmara Sea during the next 30 years¹. Without preparation and prevention, the people of Istanbul face a high risk of suffering significant losses from earthquake damages. There are no steps in place to address the structural fragility of the city's thousands of residential apartment buildings. Approximately 5 000 buildings have been assessed as likely to experience complete structural failure when subjected to strong shaking, risking total loss of life of occupants of these buildings. Another class (40 000+) is likely to experience significant structural damage, also with the potential to cause death or serious injury. Poor performance of buildings in areas east of Istanbul, with similar construction design and quality, was demonstrated in 1999 by two very severe earthquakes².

While the 1990s were declared the “natural disaster decade” by the United Nations, with the goal of encouraging adoption of cost-effective mitigation measures throughout the world, recent events sadly illustrate that there is still a long way to go in effectively preparing countries to face large storms, floods or earthquakes. One question that thus needs to be addressed is: what are the most cost-effective and equitable ways for countries to minimize the impact and recover from large-scale natural disasters?

To address this question, one needs to consider the roles and responsibilities of key stakeholders in the private sector (*e.g.*, insurers, reinsurers, capital markets, rating agencies, banks, construction industry) and in

local, state/provincial and national governments (*e.g.*, emergency preparedness, insurance commissioners, building permit offices). To what extent can they influence the adoption of innovative mitigation programs in combination with insurance, well-enforced regulations/standards and other policy tools? What are the expected benefits of these hazard management measures? In this part of the publication we will mainly focus on residential insurance and mitigation.

The responses to these questions require an understanding of at least two dimensions which this part of the publication analyzes in more detail:

- How people make decisions as to whether to invest in risk reduction/mitigation measures.
- The effectiveness of the private sector in encouraging the adoption of cost-effective loss reduction measures for natural disasters and the role that public sector agencies can play in the process.

NOTES

1. Parsons, T., S. Toda, R.S. Stein, A.A. Barka, and J.H. Dieterich, (2000), "Heightened odds of large earthquakes near Istanbul: An interaction-based probability calculation", *Science*, 288, 661-665.
2. Smyth, Andrew. et al. (2004), "Probabilistic Benefit-Cost Analysis for Earthquake Damage Mitigation: Evaluating Measures for Apartment Houses in Turkey." *Earthquake Spectra*, 20 (1): 171-203.

Chapter 1

A NEW ERA OF LARGE-SCALE NATURAL DISASTERS

This chapter discusses the evolution of insured losses from natural disasters over the past decade, the relationship between insured losses and total economic losses as well as the causes of this increase in damage.

What are the key drivers of the sharp increases in both economic and insured catastrophe losses over the past 20 years? How has development in hazard-prone areas and climate change affected recent damages from hurricanes and flooding? What is the prognosis for the future?

1. Extreme Events: More Devastating, Much More

A New Loss Dimension

The past few years have seen the emergence of a totally new dimension of losses from natural disasters in both OECD and non-OECD countries. While one used to refer to disasters causing catastrophic damage as low-probability events, recent data suggests that these events are more frequent than would have been predicted based on extrapolations from the past.

As pointed out in the *Introduction* catastrophes have been more costly to insurers in the past 15 years than ever before. Between 1970 and the mid-1980s insured losses due to natural disasters were in the range of USD 3 to 4 billion a year with no disaster costing insurers more than USD 1 billion. Hurricane Hugo hitting the US in 1989 cost insurers more than USD 4 billion (1989 prices). In the 1990s, the scale of insured losses from major natural disasters changed radically: USD 17 billion in 1991, above USD 30 billion in 1992, more than USD 20 billion in 1994 and USD 25 billion in 1999. Nine small insurance companies failed because of Hurricane Andrew¹ with large insurers also severely impacted by that disaster. For example, the Florida branch of State Farm Fire and Casualty (the largest homeowner insurer in the U.S.) suffered a USD 4 billion loss (1992 prices) and was rescued by its parent company. The Florida branch of Allstate, the other major player in that market, paid about USD 1.9 billion in claims for Hurricane Andrew and was also rescued by its parent company. To put this figure in perspective, the USD 1.9 billion loss was USD 500 million more than the profits from all types of insurance that Allstate earned from its Florida operations over the 53 years it has been in business in the states².

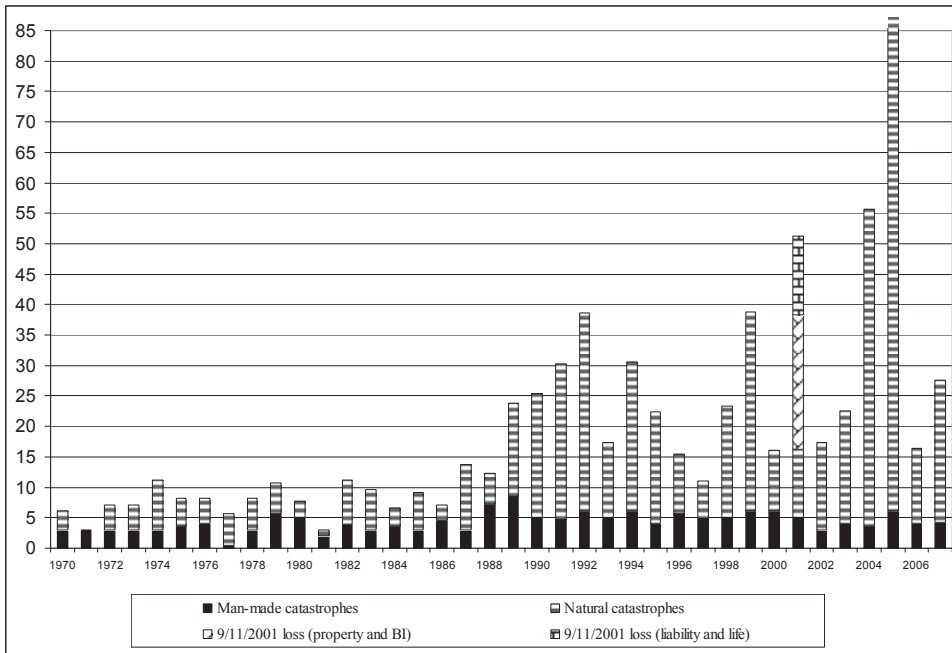
Insurers that survived Hurricane Andrew began to rethink the concept of what it means for a risk to be insurable. They began to utilize catastrophic models to estimate the likelihood and consequences from specific hazards that might cause damage in specific locations³. Since that time, insurers have continuously improved the way they underwrite catastrophe risks: no insurance company was declared bankrupt as a result of the September 11, 2001, terrorist attacks and only one company became insolvent after the series of hurricanes that devastated Florida in 2004⁴.

Extreme events have continued to inflict major insured losses from natural disasters. A new record was reached in 2004 with global financial losses of USD 120 billion, USD 49 billion of which was covered by insurance⁵. This upward trend continued in 2005. Hurricane Katrina alone cost insurers and

reinsurers USD 46.3 billion, and total losses paid by private insurers due to major natural catastrophes were USD 87 billion in 2005 (excluding nearly USD 20 billion in flood insurance claims paid by the US National Flood Insurance Program). Despite this historical scale of losses, only one company (Poe Inc.) became insolvent as a result of the 2005 hurricane season, demonstrating the resilience of the insurance industry⁶.

Losses due to natural catastrophes and man-made disasters were far below the long-term trend in 2006. Of the USD 48 billion in catastrophe related economic losses, USD 16 billion was covered by insurance (USD 11 billion for natural disasters; USD 5 billion for man-made). Insured losses were lower than 2006 in only two years (1988 and 1997) during the period 1987-2006. According to Munich Re, there were 950 natural catastrophes in 2007, the most since 1974 that inflicted nearly USD 27 billion in insured losses.

Figure 1. Worldwide Evolution of Catastrophe Insured Losses, 1970-2007
 (9/11: all lines, including property and business interruption (BI); in USD billion indexed to 2007)



Sources: Wharton Risk Center with data from Swiss Re and Insurance Information Institute

Figure 1 depicts the evolution of worldwide insured losses due to catastrophes between 1970 and 2007 (in 2007 indexed prices). At an event-based level, Table 1 describes the 20 most costly catastrophes for the insurance sector over the past 35 years. For comparative purposes, all costs are in 2007 dollars. Several observations are important here.

First, 18 of the 20 most costly events occurred during the past 17 years (in constant prices). More specifically, in the early 1990s the insured losses from Hurricane Andrew in 1992 and the Northridge earthquake in 1994 led insurers and reinsurers to pay much more attention to the catastrophic potential of natural disasters; these two events are considered as the first two mega-catastrophes that the industry experienced (“super-cats”: insured losses higher than USD 10 billion).

**Table 1. The 20 Most Costly Insured in the World, 1970-2007
(indexed to 2007 prices)**

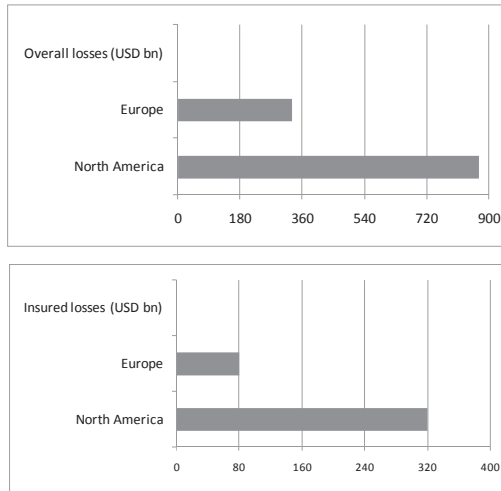
USD billion (indexed to 2007)	Event	Victims (Dead or missing)	Year	Area of Primary Damage
46.3	Hurricane Katrina	1836	2005	USA, Gulf of Mexico, et al
35.5	9/11 Attacks	3025	2001	USA
23.7	Hurricane Andrew	43	1992	USA, Bahamas
19.6	Northridge Earthquake	61	1994	USA
14.1	Hurricane Ivan	124	2004	USA, Caribbean, et al.
13.3	Hurricane Wilma	35	2005	USA, Gulf of Mexico, et al.
10.7	Hurricane Rita	34	2005	USA, Gulf of Mexico, et al.
8.8	Hurricane Charley	24	2004	USA, Caribbean, et al.
8.6	Typhoon Mireille	51	1991	Japan
7.6	Hurricane Hugo	71	1989	Puerto Rico, USA, et al.
7.4	Winterstorm Daria	95	1990	France, UK, et al.
7.2	Winterstorm Lothar	110	1999	France, Switzerland, et al.
6.1	Winterstorm Kyrill	54	2007	Germany, UK, NL, France
5.7	Storms and floods	22	1987	France, UK, et al.
5.6	Hurricane Frances	38	2004	USA, Bahamas
5.0	Winterstorm Vivian	64	1990	Western/Central Europe
5.0	Typhoon Bart	26	1999	Japan
4.5	Hurricane Georges	600	1998	USA, Caribbean
4.2	Tropical Storm Alison	41	2001	USA
4.2	Hurricane Jeanne	3034	2004	USA, Caribbean, et al.

Sources: Wharton Risk Center with data from Swiss Re⁷ and Insurance Information Institute

Second, all of these 20 events except for the terrorist attacks on September 11, 2001 were natural disasters (including forest fires)⁸. Among the top 19 natural disasters that occurred in the past 35 years, more than 80 per cent were weather-related events: hurricanes and typhoons, storms, and floods⁹ with nearly three quarters of the claims in the United States.

Third, economic losses (insured and non-insured) are largely concentrated in industrialized markets. The evolution of losses from natural disasters in different regions of the world indicates that between 1980 and 2005, North America (essentially the U.S.) accounted for losses that were more than twice as large as in Europe. Taking only insured losses into account, this difference is even more significant: the US has accounted for 4 times more than Europe (USD 320 billion in the US versus USD 80 billion for Europe) (see Figure 2).

**Figure 2. Natural catastrophes 1980–2005.
A comparison between Europe and North America**



Sources: Munich Re (2006), “Topics Geo- Annual Review: Natural Catastrophes 2005”, Knowledge series.

Combined Ratio in the US Property and Casualty Market

This increase in insured losses needs to be put into perspective by examining the evolution of premiums collected by insurers to cover these risks. As with every other economic sector, insurance has its own vocabulary. An important measure is the “combined ratio”, defined as the ratio of “incurred losses (including loss adjustment expenses) plus other expenses” over “earned premiums”. We can use the combined ratio for either a specific insurer or the

entire insurance industry. A combined ratio of 100 indicates that the loss plus expenses equals the premiums; that is an underwriting neutral operation. If the ratio is below 100, the underwriting operation is covering its costs¹⁰. Table 2 below shows the evolution of the US Property and Casualty (P&C) insurance industry combined ratio in the last five years.

Table 2. US P&C Insurance Industry Combined Ratio – 2000 to 2006

	2000	2001	2002	2003	2004	2005	2006
Losses incurred	200.9	234.5	238.8	238.7	246.4	-	-
Loss adjustment expenses	37.8	40.9	44.8	50	53.2	-	-
Underwriting expenses	82.6	86.4	93.8	100.7	106.4	-	-
Earned premiums	294.0	311.5	348.5	386.3	412.6	-	-
Combined ratio	109	116	108	101	98	101	92.4

Source: Insurance Information Institute

With the exception of 2004 and 2006, this ratio has always been higher than 100 (premiums do not cover losses and expenses), so that for insurers to make a profit it has to counterbalance their negative underwriting results with sufficient returns from their investment portfolio management.

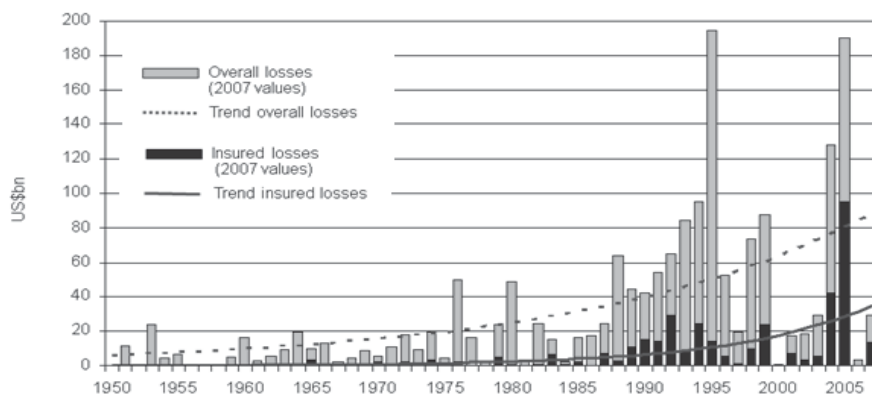
Insured versus Economic Impact

When it comes to reducing the impact of natural disasters, it is also important to consider the total economic and social losses due to these events. The ratio of economic losses to insured losses (L/I) is likely to be very high when there is a limited insurance market as is often the case in developing countries. For example, in 1996 major floods in China inflicted about USD 24 billion in economic loss, less than USD 500 million of which was covered by insurance leading to an L/I ratio greater than 50. Two years later, in 1998, other floods in China cost about USD 30 billion in direct economic loss, but only USD 1 billion was covered by insurance so that the L/I ratio was 30. This difference between L and I has also been observed in industrialized countries where there are no minimum insurance requirements. For example, the large-scale earthquake that devastated Kobe in 1995 cost USD 110 billion (L), only USD 3 billion of which was covered by insurance (I).

Traditionally, the L/I ratio in the US market has been much lower ranging from 2-4 due to higher insurance coverage. In the cases of Hurricane Andrew (in 1992 prices), the Northridge earthquake (1994 prices) and Hurricane Katrina (2005 prices) the L/I ratio was about 1.5 (26/17), 2.8 (44/15.5) and 3.3 (150/46-0) respectively.

Figure 3 compares economic and insured losses for “great natural disasters” from 1980-2007. Economic losses follow the same increasing trend described earlier for insured losses. A comparison of these economic losses over time reveals a huge increase: USD 53.6 billion (1950-59), USD 93.3 billion (1960-69), USD 161.7 billion (1970-79), USD 262.9 billion (1980-89) and USD 778.3 billion (1990-99). The current decade has already seen USUSD 420.6 billion in losses, principally due to the 2004 and 2005 hurricane seasons¹¹.

**Figure 3. Evolution of “Great Natural Catastrophes” Worldwide, 1950-2007
Economic versus Insured impact¹²**



Sources: Data from Munich Re, 2008 Geo Risks Research – in USD billion indexed to 2007

It must also be noted that precise loss analyses and reports are compiled by governments and other official offices only after significant natural catastrophes. Moreover, in many poor and developing countries it is not always clear whether measures of loss assessment have been conducted in systematic and rigorous ways. Without well-defined estimation and international standards, the figures do not reflect total losses. On a positive note, since the 1990s the quality of reporting has risen perceptibly in many countries. According to Munich Re, which has been collecting such data for several decades, the percentage of natural catastrophes with very good reporting of economic losses has significantly increased over the past 25 years (from 10 per cent in 1980 to above 30 per cent in 2005)¹³.

Economic versus Human Impacts

Fatalities are normally not considered in insurance loss rankings. In fact, the correlation between insured losses and fatalities is even less clear than

between insured loss and economic losses. Because a large number of natural disasters occur in emerging economies (where insurance is often absent) or in poor areas of developed countries, one needs to pay attention to fatality factors independent of their impact on the insurance industry. For example, the tsunami that devastated South Asia in December 2004, cost the insurance industry about USD 5 billion (mostly due to tourist activities in the region) but the disaster killed over 280 000 people and constitutes the second most deadly natural disaster event over the past 100 years (a storm and flood killed 300 000 people in 1972 in Bangladesh). More generally, the most deadly natural disasters from the point of view of lives lost have occurred in developing countries, as tragically illustrated earlier in 2008 in Asia. Between 1970 and 2006, 22 catastrophes each killed over 10 000 people. All of them but two (Izmit earthquake in Turkey in 1999 and the 2003 heat wave in Europe) occurred in non-OECD countries. While beyond the scope of this part of the publication, there is a critical need for improving protection and alert systems in these emerging countries. Insurance programs with premiums reflecting risk can provide the appropriate signal to residents of the nature of their risk exposure as well as offering economic incentives for undertaking risk reduction measures.

2. What Is Happening Today? The Question of Attribution

From the perspective of decision making with respect to global warming and its potential impact on weather-related events, it is important to know whether the increase in insured and economic losses observed over the past decades has been influenced by climate change.

In the preceding section, we discussed natural disasters without differentiating between weather-related events (*e.g.*, storms, floods, droughts, heat waves, cold, frost) and non weather-related event (*e.g.*, earthquakes). With respect to the relationship between climate change and insurance, it is important to focus on weather-related events¹⁴.

Storm, floods and temperature extremes (*e.g.*, heat-waves) typically have been responsible for over 90 per cent of the total economic costs of extreme weather-related events each year over the period 1970-2005. Storms (*hurricanes* in the US region, *typhoons* in Asia and *windstorms* in Europe) contribute to over 75 per cent of insured losses. Floods represent about 10 per cent. According to a study published last year by the Association of British Insurers (ABI), every year since 1990, there have been at least 20 weather-related events that are severe enough to be classified by leading reinsurers as significant catastrophes; between 1970 and 1990, only three years experienced more than 20 such significant catastrophes. In constant prices (2004), insured losses due to

weather-related events averaged USD 16 billion annually between 1990 and 2004; there were only USD 3 billion annually between 1970 and 1990¹⁵.

This raises the question as to the key drivers of the observed increase in losses due to weather-related extreme events. How did socio-economic factors affect that trend? How is a change in climate likely to affect the number and severity of catastrophes?

Socio-Economic Factors that Influence Increased Losses due to Catastrophes

All other things being equal, there are two main socio-economic factors which directly influence the level of economic losses due to weather-related events: degree of urbanization and value at risk.

In 1950 about 30 per cent of the world's population (2.5 billion people) lived in cities. In 2000, about 50 per cent of the world's population (6 billion) lived in cities. Projections by the United Nations show that by 2025, that figure will have increased up to 60 per cent to a population of 8.3 billion people. A direct consequence is the increasing number of so-called mega-cities, with populations above 10 million. In 1950, New York City was the only such a mega-city. In 1990, there were 12 such cities. In 10 years, by 2015, there would be 26, including the following: Tokyo (29 million inhabitants)¹⁶, Shanghai (18 million), New York (17.6 million), and Los Angeles (14.2 million inhabitants).

In hazard prone areas, this urbanization and increase of population also translates into an increased concentration of exposure to natural disasters. The development of Florida as a tourism and retirement paradise is an illustrative example. The population of Florida has increased significantly over the past 50 years: 2.8 million inhabitants in 1950, 6.8 million in 1970, 13 million in 1990, and a projected 19.3 million population in 2010 (a nearly 700 per cent increase since 1950)¹⁷ thus increasing the vulnerability of this state to large scale damage from hurricanes. More specifically, the increase in the value exposed in risk areas, which is due to a combination of pure inflation, speculation¹⁸ and rise in standard of living (more difficult to define) increase the potential for significant increases in economic and insured losses.

In order to better understand this new vulnerability, it is possible to calculate the total direct economic cost of major hurricanes that occurred in the US in the past century, adjusted for inflation, population and wealth normalization. More specifically one can estimate what each of these hurricanes would have cost had they hit today. A recent study by Pielke et al. (2008) normalizes to the year 2005 mainland US hurricane damage during the period 1900–2005¹⁹. Table 3 provides estimates for the top 20 most costly hurricanes

assuming they had occurred in 2005. The authors propose two ways to normalize these losses, each of which gives a cost estimate. In Table 3 we provide the range of costs between these two estimates, along with the year when the hurricane originally occurred, the states that were the most seriously affected and the hurricane category on the Saffir-Simpson scale. The data reveals that the 1926 hurricane that hit Miami would have been almost twice as costly as Hurricane Katrina had it occurred in 2005 and the Galveston hurricane of 1900 would have had total direct economic costs as Katrina. This means that independently of any possible change in weather patterns (see below), we are very likely to see even more devastating disasters in the coming years because of the ongoing growth in values located in risky areas.

**Table.3. Top 20 Hurricane Scenarios (1900-2005)
Ranked Using 2005 Inflation, Population, and Wealth Normalization**

Rank	Hurricane	Year	Category	Cost range (USD billion) in 2005
1	Miami (Southeast FL/MS/AL)	1926	4	140-157
2	Katrina (LA, MS)	2005	3	81
3	North Texas (Galveston)	1900	4	72-78
4	North Texas (Galveston)	1915	4	57-62
5	Andrew (Southeast FL and LA)	1992	5-3	54-60
6	New England (CT,MA,NY,RI)	1938	3	37-39
7	Southwest Florida	1944	3	35-39
8	Lake Okeechobee (Southeast Florida)	1928	4	32-34
9	Donna (FL-NC,NY)	1960	4-3	29-32
10	Camille (MS/Southeast LA/VA)	1969	5	21-24
11	Betsy (Southeast FL and LA)	1965	3	21-23
12	Wilma	2005	3	21
13	Agnes (FL/CT/NY)	1972	1	17-18
14	Diane (NC)	1955	1	17
15	4 (Southeast FL/LA/AL/MS)	1947	4-3	15-17
16	Hazel (SC/NC)	1954	4	16-23
17	Charley(Southwest FL)	2004	4	16
18	Carol (CT,NY,RI)	1954	3	15-16
19	Hugo (SC)	1989	4	15-16
20	Ivan (Northwest FL/AL)	2004	3	15

Sources: Data from Pielke et al. (2008)

For example, if Hurricane Andrew had occurred in 2007 rather than 1992, it would have inflicted more than twice the economic loss due to increased coastal development and rising asset values located on the coasts of Florida. Today, this state benefits from a very high density of insurance coverage, as a large portion of all houses are insured against windstorms and there are 2.2 million flood policies in place (or 40 per cent of all flood insurance policy in the United States) covering more than USD 450 billion in assets²⁰.

Indeed, in 2008, the modeling firm AIR Worldwide estimated that nearly 80 percent of insured property assets in Florida are located near the coasts, the high-risk area of the state as shown in Figure 4-a. Insurance density is thus another critical socio-economic factor to consider when evaluating the evolution of insured loss due to weather-related catastrophes. Figures 4-a and 4-b detail for several states in the US the total insured value located on the coast - where the risk of major hurricanes and flood surge is the most important - and insured coastal exposure as a percentage of state-wide insured exposure.

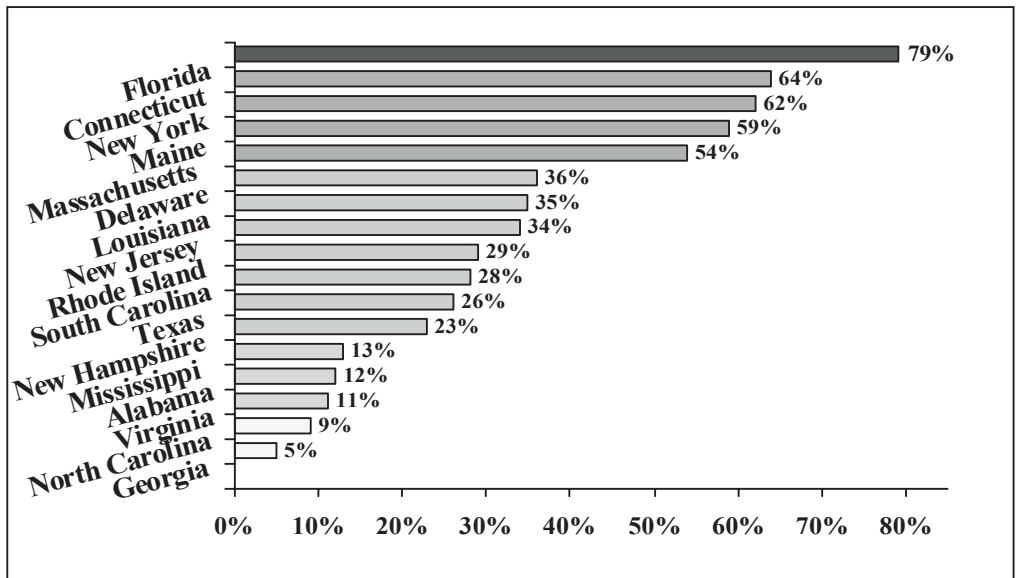
Five states have more than 50 per cent of state-wide insured exposure located on the coast and 11 states have more than 25 per cent of state-wide insured exposure in such high risk areas. In addition to Florida, the state of New York has also nearly USD 2.5 trillion insured value located directly on the coast. Consider the coastal insured value for the top 10 states combined (ranked by that variable). That accounts for more than USD 8.35 trillion (it was “only” USD 6.7 trillion in 2004). (Figure 4-b) Such huge concentrations of insured value in highly exposed areas almost certainly guarantees that any major storm that hits these regions will inflict billions of dollars of insured losses if the residential construction and infrastructures are not properly protected by effective mitigation measures. (see Wharton Risk Center, 2008, for a detailed analysis)²¹.

In summary, increased urbanization, inflation, and higher standard of living in risk areas resulting in increased value at risk, as well as higher density of insurance coverage, will continue to have a major impact on the level of insured losses due to natural catastrophes. Quantifying each of these factors at a local level (rather than national one) remains quite a challenge however. This requires more accurate measurement over time for specific locations at risk. Without such a more granular approach, one is forced to use global economic measures that may not be a good proxy for changes in specific regions.

Mitigation is likely to play a key role in reducing future disaster losses due to increased population and industrialization in high-risk areas. Land use planning and well-enforced building codes can reduce losses from future natural disasters. Better warning and alert systems can reduce the fatalities from these

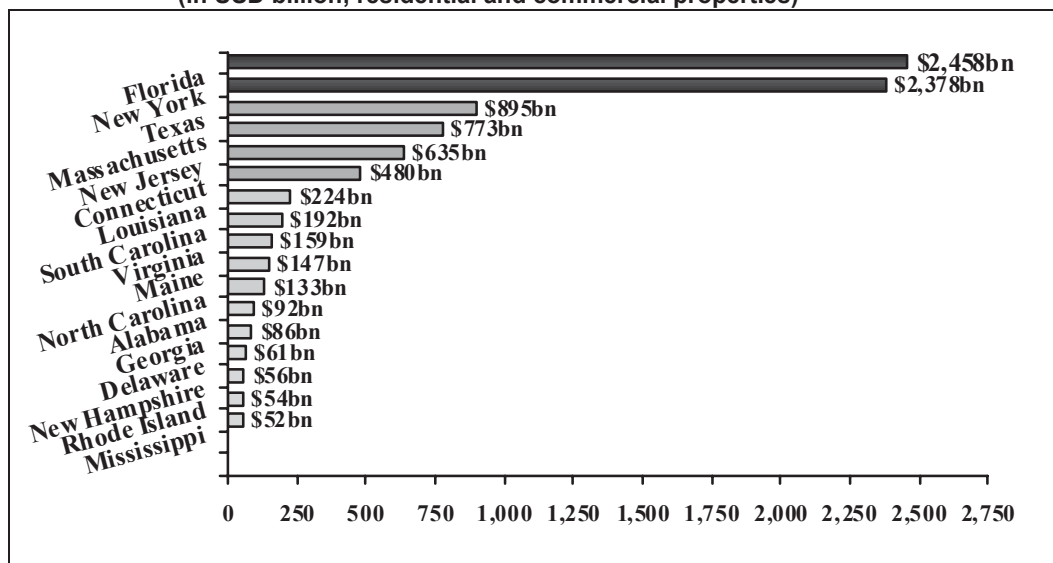
events. To help determine the key drivers of the increase cost of natural disasters, the insurance industry, partnering with government and international organizations (OECD, World Meteorological Organization, World Health Organization, United Nations, and World Bank, among others) might develop more granular data on insurance coverage: how has the coverage evolved for different lines of risk at a specific location? How has the price of coverage there (for the same amount of coverage) evolved? This is likely to be a real challenge. Today insurers do not make publicly available information on the extent of their coverage in hazard-prone areas and data on the composition of their insurance policies (e.g. premium/dollar, deductible and coverage limits), nor how much reinsurance they purchase. These data would be extremely helpful in determining what mitigation measures are likely to be most attractive to residents in hazard-prone areas, a topic covered in the next chapter.

Figure 4.a. Insured Coastal Exposure as a Percentage of Statewide Insured Exposure as of December 2007 (Residential and Commercial Properties)



Source: Data from AIR Worldwide Corporation

**Figure 4-b. Total Value of Insured Coastal Exposure as of December 2007
(in USD billion; residential and commercial properties)**



Source: Data from AIR Worldwide Corporation

Climate Change: Likelihood versus Intensity²²

How is a change in climate likely to affect the number and severity of weather-related catastrophes? According to the US National Hurricane Center, the Atlantic hurricane season officially lasts from June 1 to the end of November; but in 2005 the season only came to an end only with Tropical Cyclone Zeta that was active from December 30, 2005 to January 6, 2006. While there were no reports of damage or casualties from Zeta, it was the 27th storm in the Atlantic during 2005, establishing a record for the most named storms in one year in that region²³. Is global warming and its impact on climate to blame?

Studies on hurricane activity have focused on the relation between global warming and frequency. There have been theoretical developments suggesting that the intensity of these events is likely to be increased by climate change; i.e. an increasing number of “extreme” events could result from a change in climate²⁴. One of the expected effects of global warming will be an increase in hurricane intensity due to an increasing in global mean temperature. Higher ocean temperatures lead to an exponentially higher evaporation rate, which in return increases the intensity of cyclones and precipitation. This is particularly important because of the non-linearity of property damage versus event intensity, which varies as the cube of the sustained wind speed.

Emanuel (2005)²⁵ introduces an index of potential destructiveness of hurricanes based on the total dissipation power over the lifetime of the storm. He shows a large increase in power dissipation over the past 30 years and concludes that this increase may be due to the fact that storms have become more intense, on the average, and/or have survived longer at high intensity. The study also shows that the annual average storm peak wind speed over the North Atlantic and eastern and western North Pacific have increased by 50 per cent over the past 30 years.

Other work by Georgia Institute of Technology and the National Center for Atmospheric Research (NCAR), published a few weeks later in *Science*, studies the number, duration and intensity of hurricanes worldwide from 1970 to 2004. Their results indicate that the number of Category 4 and 5 hurricanes worldwide has nearly doubled over the past 35 years. Category 4 hurricanes have sustained winds from 131 to 155 miles per hour; Category 5 systems, such as Hurricane Katrina at its peak over the Gulf of Mexico, have sustained winds of 156 mph or more. They found that in the 1970s, there was an average of about 10 Category 4 and 5 hurricanes per year globally. Since 1990, the number of Category 4 and 5 hurricanes has almost doubled, averaging 18 per year globally. Focusing only on the North Atlantic (Atlantic-Caribbean-Gulf of Mexico), Category 4 and 5 hurricanes have increased from 16 in the period of 1975-89 to 25 in the period of 1990-2004 (a 56-per cent increase)²⁶.

But this is not to say that there is consensus by scientists on the relationship between hurricane activity and global warming. In a perspective article published in *Science*, Landsea et al. (2006) point out that subjective measurements and variable procedures make existing tropical cyclone databases insufficiently reliable to detect trends in the frequency of extreme cyclones²⁷. This conclusion is reinforced in a recent summary of articles on global climate change by Patrick Michaels, past president of the American Association of State Climatologists, who notes that all studies of hurricane activity that claim a link between human causation and the recent spate of hurricanes must also account for the equally active period around the middle of the 20th century. Studies using data from 1970 onward begin at a cool point in the hemisphere's temperature history, and hence may draw erroneous conclusions regarding global climate change and hurricane activity²⁸. A recent study by Knutson et al. (2008) suggests that the spread in hurricane activity projections obtained using individual models versus an aggregate measure across different models is substantial. Based on the mean estimates across a series of predefined models, the authors predict that by the end of the century the number of hurricanes in the Atlantic will fall by 18 per cent and that the number of hurricanes making landfall in the United States and its neighbors anywhere west of Puerto Rico will drop by 30 per cent because of wind factors. But when applying just one of

these models on a sample of thirteen simulated seasons, they predict relatively little change in tropical storm (–8 per cent) or hurricane counts (+7 per cent), but a relatively large increase (+70 per cent) in major hurricane counts. As stated by the authors, “this sensitivity of the hurricane response to details of the climate model projections highlights the need to better constrain regional climate responses to increased CO₂”²⁹.

A reanalysis of global tropical cyclone data since 1980 that addressed inaccuracies related to the interpretation of satellite recordings was published in 2007³⁰. The reanalyzed data show a lack of global trend in the number and percentage of Category 4 and 5 hurricanes and power dissipation index (PDI) globally, thus contradicting the results of Webster, et al., (2005). An increase in PDI and in the number and proportion of Category 4 and 5 hurricanes was still found for the Atlantic. While this supports the results of Emanuel (2005) for the Atlantic, the lack of a global increase in tropical cyclone activity despite the increase in tropical sea-surface temperatures in all basins “poses a challenge to hypotheses that directly relate globally increasing tropical sea surface temperatures to an increase in long-term mean global hurricane intensity”³¹. The Atlantic also appears to be characterized by large natural variability on the multi-decadal scale with a shift to a more active phase around 1995³².

The current debate in the scientific community regarding changes in the frequency and intensity of hurricanes and its relationship to global climate change is likely to be with us for a long time to come³³. These results, of course, do raise issues for the insurance industry to the extent that an increase in the number of major hurricanes translates into a higher number of them hitting land. Today, hurricanes are more likely to hit a much larger number of personal residences and commercial infrastructures than in previous years due to the development of coastal areas. One type of long-term mitigation measure we will not discuss in this section is coordinating efforts worldwide to stabilize (or even decrease) global warming by reducing carbon dioxide emissions³⁴.

3. What is Likely to Happen Tomorrow?

The trend toward more devastating disasters continues. In the U.S., Hurricanes Katrina, Rita and Wilma have raised the question as to the role of the insurance industry in covering such extreme events. The occurrence of repeated devastating events in the same region or country will likely induce insurers to severely restrict their coverage or drastically increase their premiums, if state insurance regulators permit them to do so.

This revised view of the hurricane risk is driven by an increase of more than 30 per cent in the modeled frequency of major hurricanes (Category 3-5 on

the Saffir-Simpson scale) in the Atlantic basin that are expected to persist for at least the next five years. How the insurance market and regulators will react to this new dimension is still an open issue and will certainly depend on estimates by the leading catastrophe modeling firms.

Insurers are also likely to raise the question as to the responsibilities of the public sector in providing adequate protection (physical and financial) to victims of large-scale disasters. They are also likely to question the ability of local and federal governments to enforce mitigation standards and building codes as well as limit new construction in hazard-prone areas. The next two chapters discuss the challenges associated with the adoption of cost-effective mitigation measures and how insurance can play a creative role in dealing with this problem.

NOTES

1. Hurricane Andrew in 1992 and Northridge earthquake in 1994 cost insurers USD 23.7 billion and USD 19.6 billion, respectively (in 2007 prices)
2. IPCC (2001), *WG2 Third Assessment Report*, Chapter 8. “Insurance and other Financial Services”.
3. Patricia Grossi, and Howard Kunreuther (editors) (2005), *Catastrophe Modeling: A New Approach of Managing Risk*. New York: Springer.
4. Congressional Budget Office (2005), *Federal Terrorism Reinsurance: An Update*, Washington, DC, January
5. Swiss Re (2005), “Natural catastrophes and man-made disaster in 2004: more than 300 000 fatalities, record insured losses”, *Sigma* n. 1/2005, Zurich.
6. According to the Bermuda Monetary Authority, three months after Katrina hit the landfall, 11 new insurance companies had been created in Bermuda (for a total of USD 8.5 billion new capital).
7. Swiss Re (2006), “Natural catastrophes and man-made disasters in 2005”, *Sigma*, n.2/2006, Zurich.

8. The two most costly industrial catastrophes with respect to insurance claims over this 35-year period were the explosion of the oil offshore platform Piper Alfa in the U.K. in July 1988, which cost about USD 3.2 billion, and the explosion of a petrochemical plant in the US in October 1989 that inflicted insured damage of USD 2 billion (2004 indexed price).
9. See Section 2 below for a discussion on the question of attribution.
10. Even if the combined ratio exceeds 100 the insurer may still be making a profit based on the investment income from the premiums collected at the beginning of the insured period.
11. Munich Re (2005), "Topics Geo- Annual Review: Natural Catastrophes 2004", *Knowledge series*, Munich; Munich Re (2006), "Topics Geo- Annual Review: Natural Catastrophes 2005", *Knowledge series*, Munich
12. As discussed earlier, figures differ from one source to another. Munich Re and Swiss Re, the two leading reinsurers in the world, do not use the same definition. Typically, Munich Re's estimation are lower than Swiss Re, the former selecting only the very large natural catastrophe, when the latter being less restrictive in its definition. These differences can be very important. For example, when Munich Re estimates insured loss at about USD 35 billion in 2004, Swiss Re's estimation is USD 49 billion. And again, both these estimation underestimate the real total cost of natural disasters. However, they also constitutes the most extensive (both in time and scale) estimation of that sort.
13. Munich Re (2006), "Topics Geo- Annual Review: Natural Catastrophes 2005", *Knowledge series*, Munich.
14. Earthquakes are a major source of catastrophes as well. While not related to climate change, they can seriously affect insurance capacity as well. An earthquake in California or in major city like Tokyo would be economically devastating and have a large impact on how the insurance industry could handle future catastrophes, including weather-related ones.
15. Association of British Insurers (ABI) (2005), "Financial Risks of Climate Change", June 2005.
16. The experience of the Kobe earthquake in 1995 highlights the potential for real cataclysms in the region. An even bigger quake in Greater Tokyo could inflict economic loss in the range of USD 1-to-3 trillion.
17. Sources: US Bureau of the Census.

18. For example, 6 of the 9 fastest appreciating US real estate markets in the year following the 4 hurricanes of 2004 were in Florida (a 30-to45 per cent increase in just one year).
19. Pielke, R. Jr, J. Gratz, C. Landsea, D. Collins, M. Saunders, and R. Musulin (2008), "Normalized Hurricane Damage in the United States: 1900–2005", *Natural Hazard Review*, February 2008.
20. Michel-Kerjan, E. and C. Kousky (2008) "Come Rain or Shine: Evidence on Flood Insurance Purchases in Florida", Working paper, The Wharton School of the University of Pennsylvania and Kennedy School of Government, Harvard University, February 2008.
21. Wharton Risk Center (2008). *Managing Large-Scale Risks in a New Era of Catastrophes. Insuring, Mitigating and Financing recovery from natural Disasters in the United States*. Philadelphia: University of Pennsylvania, Wharton School. (to be published as a book by MIT Press, 2009)
22. This section is based on Kunreuther, H. and E. Michel-Kerjan (2007), "Climate Change, Insurability of Large-Scale Risks and the Emerging Liability Challenge," *Penn Law Review*, 155 (6): 1795-1842 ; for a comprehensive discussion of the topic see also Höpfe, P. and R. Pielke (eds.) (2006), *Report of the Workshop on Climate Change and Disaster Losses*, May 25-26, Hohenkammer, Germany, October.
23. There have only been five years since 1851 in which hurricane season ended in December: 1887, 1925, 1954, 1984 and 2005 (Epsilon, Category 1; December 2005). Zeta was the second-latest tropical storm to form in the Atlantic basin, only six hours earlier than Hurricane Alice (1954) that also became a tropical storm on 30 December. Zeta and Alice are the only two Atlantic tropical cyclones on record to cross from one calendar year to the next. See Richard D. Knabb and Daniel P. Brown (2006), "Tropical Cyclone Report. Tropical Storm Zeta, 30 December 2005 – 6 January 2006", *National Hurricane Center*, March 17.
24. K. Emanuel (2005), "Increasing destructiveness of tropical cyclones over the past 30 years", *Nature*, vol. 436, pp. 686-688, August. E. Mills (2005), "Insurance in a Climate of Change", *Science*, vol. 309, pp. 1040-1044, August 12. P. J. Webster, G. J., Holland, J., A. Curry, H.-R., Chang (2005), "Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment", *Science*, 16 September 2005: Vol. 309. no. 5742, pp. 1844 – 1846.
25. Kerry Emanuel (2005), "Increasing destructiveness of tropical cyclones over the past 30 years", *Nature*, vol. 436, pp. 686-688, August.

26. P. J. Webster, G. J., Holland, J., A. Curry H.-R., Chang (2005), "Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment", *Science* 16 September 2005: Vol. 309. no. 5742, pp. 1844 – 1846.
27. Landsea, C.W., B.A. Harper, K. Hoarau, J.A. Knaff (2006), "Can We Detect Trends in Extreme Tropical Cyclones?" *Science*, 313: 452-454, July 28, 2006.
28. Michaels, P. (2006), "Is the Sky Really Falling? A Review of Recent Global Warming Scare Stories," *Policy Analysis*, 576, August 23, 2006, Washington, DC: The Cato Institute.
29. Knutson, T., J. Sirutis, S. Garner, G. Vecchi and I. Held (2008), "Simulated reduction in Atlantic hurricane frequency under twenty-first-century warming conditions", *Nature Geosciences*, Letters--advanced online publication, May 18.
30. Kossin, J.P., J.R. Knapp, D.L. Vimont, R.J. Murnane, B.A. Harper (2007), "A globally consistent reanalysis of hurricane variability and trends." *GRL* 34.
31. Kossin, J.P., J.R. Knapp, D.L. Vimont, R.J. Murnane, B.A. Harper (2007), "A globally consistent reanalysis of hurricane variability and trends." *GRL* 34.
32. Goldenberg, S.B., C.W. Landsea, A.M. Mestas-Nunez, W.M. Gray (2001), "The recent increase in Atlantic hurricane activity: causes and implications," *Science*, 293, p. 474; World Meteorological Organization (2006), Statement on Tropical Cyclones and Climate Change. WMO 6th International Workshop on Tropical Cyclones, San Jose, Nov. 2006.
33. See for instance the exchange between Roger Pielke, Jr., Christopher W. Landsea and Kerry Emanuel, published in the review *Nature* in December 2005 ; *Nature*, Vol 438, 22/29.
34. For an overview of the likely impact of climate change on insurance industry (other than references cited elsewhere in this section), see J. Apt, D. Hoffmann, H. Kunreuther, E. Michel-Kerjan, and G. Morgan (2006), "The Insurance Industry and Climate Change", Carnegie-Wharton Workshop, May 8-9, 2006, Washington, D.C.

Chapter 2

THE ROLE OF COST-BENEFIT ANALYSIS IN EVALUATING MITIGATION MEASURES FOR NATURAL DISASTERS

This chapter discusses the role of cost-benefit analysis in evaluating mitigation measures. It analyses the types of mitigation measures that can reduce the physical damage from hurricanes, flood, and earthquake and the costs of these measures. The chapter also discusses the current operation of several insurance programs for providing coverage against natural hazards in the United States and other countries (France, Great Britain and Japan).

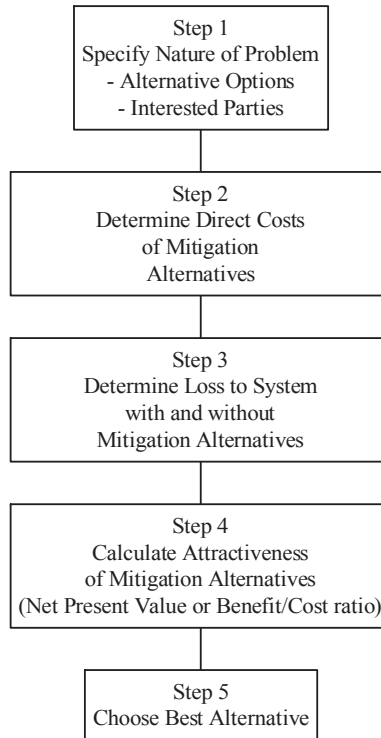
1. Role of Cost-Benefit Analysis

The public sector can play an important role in reducing losses from future disasters by examining measures that will be cost-effective from both the residents' perspective and those of the general taxpayer. To illustrate this point, consider whether the city of New Orleans should require that homes in flood-prone areas in the metropolitan area should be elevated so as to reduce the likelihood that they would suffer serious disaster losses or whether they allow the residents to rebuild to pre-Katrina standards by not imposing any building code. The building code would reflect a balance between the costs of elevating structures and the expected reduction in losses from future hurricanes of different intensities that hit New Orleans. Another alternative would be to provide residents whose homes were destroyed with grants and/or low interest loans and require them to move to other areas and convert the vacated areas to wetlands.

This chapter discusses how benefit-cost analysis can be utilized for determining when well-enforced building codes with respect to mitigating losses from natural disasters would be appropriate. Cost-benefit analysis (CBA) is a systematic procedure for evaluating options, such as the ones specified above. There are different ways to conduct a valid CBA, depending on the information one has and the nature of the problem at hand. A simplified five-step procedure for conducting a CBA is depicted in Figure 1. A more comprehensive approach, which incorporates several additional steps, is discussed in Boardman et al. (2001)¹. Posner (2004)² provides a comprehensive analysis of the use of benefit-cost approaches for determining what measures society will want to invest in for dealing with extremely low probability catastrophes such as an asteroid hitting land.

The five-step CBA procedure includes: defining the nature of the problem, including the alternative options and interested parties; determining the direct cost of the mitigation alternatives; determining the benefits of mitigation, via the difference between the loss to the system with and without mitigation; calculating the attractiveness of the mitigation alternatives; and, finally, choosing the best alternative.

Figure .1 Simplified Cost-Benefit Analysis for Mitigation Measures



Step 1: Specify Nature of the Problem

To initiate a CBA, one needs to specify the options that are being considered and the interested parties in the process. Normally, one alternative is the *status quo*. For the above problem, the status quo refers to allowing homes in New Orleans to rebuild their structures to pre-Katrina standards without having to elevate them. The *status quo* is normally the reference point for evaluating how well other alternatives perform. For this example there are two alternatives: institute a building code that requires all homes in a neighborhood to be mitigated based on flood risk or provide grants and/or loans to residents in this neighborhood to move to safer areas, creating wetlands in the process.

Each of these options will impact a number of individuals, groups and organizations in our society. It is important to indicate who will benefit and who will pay the costs associated with each option when undertaking a CBA analysis. These include residents and business owners affected by the hurricane, state and local government agencies that must administer the building code or provide low interest loans and/or grants, federal agencies that deal with the

consequences and losses following a disaster, and the general taxpayer that will bear some of the costs of administering the code, the low interest loans and/or grants, and the disaster assistance provided by the public sector following a disaster. Depending on the stringency and geographic coverage of mitigation policies and standards for communities, CBA analysis has shown that the spatial heterogeneity of the hazard in a region affects the extent of the regulatory burden and the efficiency of its implementation³.

Step 2: Determine Direct Costs of Mitigation Alternatives

For each mitigation alternative, one needs to specify the direct cost to implement the mitigation measure. For a building code, the property owner incurs the monetary costs associated with making the house more hurricane-resistant. Should residents be required to move to a safer area, the costs include not only the financial expenses of moving but the social and psychological impacts of moving to a new community.

Step 3: Determine the Expected Benefits of Mitigation Alternatives

Once the costs are estimated for each mitigation alternative, one needs to specify the potential benefits to each of the interested parties. In the case of the above hurricane risk, one considers either a scenario hurricane event or a set of scenario hurricanes of different magnitudes, location, duration, and intensity that affect New Orleans. The damage to the property is then estimated for each alternative option and the expected benefits are estimated relative to the *status quo*. For the case where homes are elevated due to a building code, the expected benefits are the reduction in losses from hurricanes of different magnitudes over the life of the home multiplied by the likelihood of each of these hurricanes occurring. The benefits accruing in future years are converted to present value by an appropriate discount rate. Should homes be relocated to safer areas the expected benefits are computed in a similar manner except now they reflect the reduction in damage to these homes from hurricanes of different magnitude because the homes are now relocated in safer areas.

Step 4: Calculate Attractiveness of Mitigation Alternatives

In order to calculate the attractiveness of mitigation, the nature of the expected benefits to each of the interested parties is estimated and compared to the upfront costs of mitigation. The impact of the alternative building code could be evaluated by calculating the ratio of the discounted expected benefits to the upfront costs to determine the attractiveness of the alternative (see the example below and Table 3). Whenever this ratio exceeds 1 the alternative is viewed as desirable. However, there may be budget constraints that make it

difficult for some property owners to incur these extra costs in which case one may have to consider whether subsidized loans or grants be provided to these individuals.

A similar analysis could be undertaken for the alternative of moving residents to lower risk areas. The problem has additional complications since there are social and psychological costs involved in relocating to a new area⁴. For each family there are special considerations that need to be taken into account, many of which are hard to quantify. Many property owners may resist moving to another area and it would be difficult to convince them that it is in their best interest to do so. On the other hand, if one only considered the reduction of future disaster losses in the analysis, this alternative may be highly attractive.

Step 5: Choose the Best Alternative

Once the attractiveness of each alternative is calculated through a net present value calculation or a ratio of the benefits to the costs, one chooses the alternative with the highest benefit-cost ratio. This criterion is based on the principle of allocating resources to its best possible use so that one behaves in an economically efficient manner. As we discuss in section 3, some individuals may perceive themselves as worse off than before and/or feel that they cannot afford the proposed measure.

2. Focus on Specific Mitigation Measures

The damage to property from natural disasters falls into two categories – structural damage and contents damage (damage to the land itself can also occur, but it is generally not a major consideration). Structural damage refers to the damage to the foundation, frame, roof and other features, exterior and interior, of the property at risk. Contents damage refers to the damage to valuable internal contents of a property – automobiles, furniture, fixtures, appliances, electronics and other contents with a monetary or non-monetary value (the latter can include irreplaceable documents and items with sentimental value)⁵.

Individual Perils

Earthquakes would require both contents mitigation and structural mitigation. Contents mitigation consists of attaching itinerant objects and fixtures or storage units to the frame of the property. This includes fixing lighting, bookshelves and large appliances to the structure of the house, making sure that cabinet fasten securely and that windows and doors are secured and

protected from breakage. Fastening the water heater to the wall is a major mitigation measure, not only because of the cost of replacement but because it might start a fire that could damage the house and possibly spread to neighboring properties. Structural mitigation for earthquakes largely consists of tying a structure together⁶. For example, a wood frame structure should have its cripple wall braced and the foundation secured with additional anchor bolt. Other components of the structure, including the roof and exterior components (such as garages, additions and chimneys) should be strong enough to withstand an earthquake.

Windstorms The major danger posed by windstorms is to the structure of a property. The major areas of focus are the roof and windows and doors. Roofs should be secured by replacing old or damaged sheathing, sealing sheathing joints and installing a roof covering that can withstand high winds. Connections, where the roof meets the walls and where the walls meet the foundation, should be well anchored. Windows and doors, the most vulnerable portion of the structure to wind damage, can be breached causing interior structure and contents water damage. Windows can be secured with impact resistant window systems or storm shutters, patio doors should be non-sliding and high wind resistant garage door and track systems are recommended. Another mitigation measure is to ensure that objects on the property that could become debris in a windstorm, especially overhanging tree branches, are cleared.

Wildfires can cause major damage to both the structure and the contents of a property. Exposure to wildfires is highest for those properties in close proximity to unclear wild land. The roof of a structure is most vulnerable to wildfires, and the best mitigation measure is fire resistant roofing materials. The same measure is appropriate for the walls of the structure. Double pane windows will reduce the amount of heat allowed into the structure better than single pane windows. Eaves of roofs should be enclosed and attics and subfloors should be vented. Chimneys should be fitted with spark arrestors overhangs and other structural attachments should be assessed for vulnerabilities. Flammable materials on the property, such as overgrown trees and dry brush, should be kept well maintained (“survivable space”).

A summary of mitigation measures that are likely to be cost-effective for structures in high-risk areas subject to one or more of these hazards is detailed in Table 1.

Table 1. Main Natural Hazards and Mitigation Measures

Peril	Mitigation
Earthquake	<ul style="list-style-type: none">• Secure water heater• Secure structure to foundation• Secure roof to walls
Windstorms	<ul style="list-style-type: none">• Storm shutters• Keep trees trimmed• Secure roof to walls
Wildfires	<ul style="list-style-type: none">• Fire resistant roofing• Maintaining survivable space

All Perils – Building Codes

Building codes mitigate damage from all perils. Two agencies that rate building codes in the US are the International Code Council (ICC) and ISO (formerly the Insurance Services Office). ICC is a membership association which produces model building codes which can then be implemented or modified by individual states. 50 states plus Washington, D.C. use the International Building Code (which focuses on non-residential property), 46 states plus Washington, D.C. use the International Residential Code (which deals with the construction of one- and two-family dwellings and townhouses up to three stories high) and 41 states plus Washington, D.C. use the International Fire Code (which addresses fire safety in new and existing buildings).⁷

ISO's *Building Code Effectiveness Grading Schedule* (BCEGS) "...assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards." The Insurance Services Office (ISO) uses the BCEGS as part of the Community Rating System (CRS), a component of the National Flood Insurance Program (NFIP) which allows communities to achieve lower their flood insurance rates through mitigation⁸.

The enforcement of building codes determines their effectiveness. The BCEGS is one way to judge adherence to building codes since the score is based not only on the building code in place but field inspector staffing and qualifications. However, only a small number of communities (around 100 at

risk from flooding nationwide) participate in the CRS, so it is an incomplete national indicator of code adherence. More detailed assessment of building code enforcement at the local level often takes place on an *ex post* basis with disasters such as the Northridge Earthquake or Hurricane Katrina serving as the impetus for such a review.

3. Mitigation and Insurance for Natural Disasters in the United States

Wind Coverage

Financial protection against tornado damage is part of the basic wind coverage in all residential and commercial property insurance policies. Tornadoes are possible throughout the United States, but historical data indicate that some states are more tornado-prone than others. Tornado alley stretches from west Texas to Kansas, Oklahoma, and the rest of the Midwestern United States. Most of the 900 tornadoes recorded annually in the United States occur in this vicinity. Texas has the greatest number, with almost 100 setting down each year. Since the national weather service began tracking tornadoes in 1953, the three states with the most tornado sightings have been Texas, Oklahoma, and Florida, in descending order.

Hurricane wind damage and wind-blown water damage are included as part of the basic wind coverage in most property insurance policies. Flood damage resulting from hurricane is not included in property insurance policies but can be purchased as a separate coverage under the National Flood Insurance Program.

National Flood Insurance Program (NFIP)⁹

The US Congress passed the National Flood Insurance Program (NFIP) in 1968. Private insurers market coverage and service policies under their own names, retaining a percentage of premiums to cover administrative and marketing costs. Communities that are part of the program are required to adopt land use regulations and building codes to reduce future flood losses. Private insurers provide coverage for larger commercial establishments.

Many homeowners suffering rising water damage do not have flood insurance even though they were eligible to purchase such a policy through the National Flood Insurance Program (NFIP). In the Louisiana parishes affected by Katrina the percentage of homeowners with flood insurance ranged from 57.7 per cent in St. Bernard's to 7.3 per cent in Tangipahoa. Only 40 per cent of the residents in Orleans parish had flood insurance¹⁰.

No program of insurance against flood damage is considered feasible without the assurance that over time the risk exposure that the program takes on, will be reduced through responsible mitigation actions. The standards established by the NFIP are based on a non-structural approach to floodplain regulation and are designed to supplement the federal government's program of structural flood works. While demand continues for the construction of floodworks to provide protection to floodplain residents, many are still sceptical about the efficacy of such structures. Although the NFIP has adopted a non-structural approach to floodplain management, the NFIP rate structure gives credit to structural flood works if they are certified to protect against the base flood.

The responsibility for hazard mitigation under the NFIP is split between the federal government and the local participating community. The NFIP enters into an arrangement with the local community whereby properties built in the floodplain without full knowledge of their degree of flood risk can be insured at less than full actuarial rates. In exchange, the local community makes a commitment to regulate the location and design of future floodplain construction in a way that results in increased safety from flood hazards.

The federal government has established a series of building and development standards for floodplain construction to serve as minimum requirements for participation in the program. These standards use the 100-year flood as the basis for regulation. The primary mitigation action required by the regulations is elevation of the lowest floor of a structure above the level of the base flood as determined by the Flood Insurance Rate Study and shown on the FIRM. The rates for coverage of structures built or substantially improved after the date of the FIRM are based on this elevation.

The local community is responsible for adopting and enforcing these floodplain management standards, and compliance is accomplished through the building permit process. Since local governments have jurisdiction over land use and development, it is only at the local community level that the implementation of standards will be effective. FEMA, working with the state government, conducts periodic reviews at the local level to assess the local community's enforcement of NFIP standards. A determination that a community is not adequately enforcing local ordinances can result in a period of probation, during which a surcharge is added to insurance premiums on all NFIP policies in the community. If the community fails to take corrective actions during this probation period, it can be suspended from the program, which means that NFIP coverage becomes unavailable.

Earthquake insurance

Earthquake insurance can be purchased from the private sector as an additional premium on standard homeowners coverage in all states except California where today one normally buys an earthquake policy for residential damage through the California Earthquake Authority, a state-run privately-founded earthquake insurance program. Earthquake coverage for businesses in California is often included in a commercial policy or can be purchased from private insurers as a separate rider.

Mitigation measures for reducing earthquake damage, such as strapping a water heater with simple plumbers tape, can normally be done by residents at a cost of under USD 5 in materials and one hour of their own time and can reduce damage by preventing the heater from toppling during an earthquake, creating gas leaks and causing a fire. Yet these and other risk reducing measures investments are not being adopted by residents in earthquake-prone areas. A 1989 survey of 3,500 homeowners in four California counties subject to the hazard reported that only between 5 and 9 per cent of the respondents in each of these counties reported adopting any loss reduction measures¹¹.

Turning to the relationship between insurance and mitigation some interesting findings emerge from surveys undertaken by Risa Palm and her colleagues. Palm and Carroll (1998) report that those who had adopted mitigation measures, such as rearranging heavy objects so they were less likely to fall, and investing in measures strengthening the house were also more likely to buy earthquake insurance than those who had not taken these loss reduction measures. Since insurers did not reduce earthquake insurance premiums for those who have mitigated, one would expect that those who take protective measures would have less interest in insurance than before they adopted such measures. Palm's findings raise the interesting question as to what factors influence the demand for risk reducing measures.

As discussed above, one of the challenges associated with mitigation of catastrophic risks lies in demonstrating the effectiveness of mitigation measures and that they provide a sufficient expected return on investment over a certain period of time. As government has been allocating money to support mitigation efforts, an important question relates to the effectiveness of these governmental grants.

That was the purpose of a multi-year study undertaken by the US National Institute of Building Science and released in 2005. This initiative assessed in a systematic way the future savings from hazard mitigation activities supported by the US Federal Emergency Management Agency's grants for a period of 10

years (1993-2003). The study quantified these saving for three types of hazards: wind, flood and earthquake. Benefits were defined as losses avoided and included reduced direct property damage, reduced direct business interruption, reduced indirect business interruption (“ripple” effects), reduced environmental damage (to wetlands, parks or historical structures), and reduced human losses (deaths, injuries, homeless). Benefits also included reduced cost of emergency responses as well as reduced federal funds that would be used otherwise for disaster assistance/recovery (including post-disaster tax revenue decrease because of tax-break or interruption of activities).

Findings are interesting because they demonstrate a high benefit-cost ratio of mitigation grants. The study estimates that aforementioned benefits from FEMA mitigation grants represent USD 14 billion (discounted 2005 present value), compared to USD 3.5 billion for grants spent by FEMA on the studied programs. In other words, using a statistically representative sample of FEMA grants awarded between 1993 and 2003, it can be showed that **1 dollar spent on mitigating the risk of wind, flood and earthquake in the United States saves an average of 4 dollars**¹².

On the human side, it is estimated that these mitigation measures are likely to save over 200 lives and prevent almost 4,700 injuries in the long term (50 years). The Council rightly indicates that federal grants are not only cost effective, but that they also often lead to additional mitigation measures to be implemented that are supported by other sources, especially in communities/parishes that have implemented specific mitigation programs in a systematic way.

As the US National Institute of Building Science’s Multihazard Mitigation Council recommends: the “federal government should support ongoing evaluation of mitigation by developing a structured process for assessing the performance of buildings and infrastructure after all types of natural disasters and by measuring the benefits that accrue from process mitigation activities”¹³. This is certainly something insurers and reinsurers would have an interest in: the implementation of effective risk protection measures will decrease insurance claims after the next disaster as well. We discuss to the need for a more systematic collaboration between the public and private sectors in the next chapter of this section. Nevertheless, such effectiveness studies at a national level remain too rare. That is certainly something the OECD might want to push for in its 30 member countries as part of the activities of the new OECD International Network on the Financial Management of Large-scale Catastrophes.

4. Natural Disaster Insurance in other Countries

While this part of the publication focuses mainly on the US markets for insurance of national disasters, it is interesting to look at how other countries have responded to this insurance and mitigation challenge. Our purpose in this concluding section is not to provide detailed analysis of these other insurance markets, but rather to describe some key features of programs for covering specific hazards in place in several other countries – France, Great Britain, and Japan¹⁴.

*The French System*¹⁵

In France, at least three complementary systems provide French citizens with complete protection for all types of natural hazard damages. Storms and frost, for instance, which are considered as insurable comes under conventional policy covers But damages considered uninsurable by the private sector from agricultural operations are covered by a special fund, the National Guarantee Fund for Agricultural Disasters created in 1964. Under French law, only some catastrophes that occur from specific hazards are considered “natural catastrophes” and are covered by a special 1982-established public-private program, called the “Nat. Cat. system” (for natural catastrophes in French). These hazards are flood, drought, earthquakes, landslide, and avalanches. Contrary to some programs in place in the US (*e.g.* Florida Hurricane Catastrophe Fund), wind coverage in France is not part of this public-private risk-sharing arrangement. Damages from storms are covered exclusively by the private sector.

This subsection focuses on the Nat. Cat. program which is based upon a special arrangement between the government and private insurers. The program, created by the law of July, 13 1982, covers properties located in France and some French overseas territories against natural catastrophes and comprises both compensation and prevention measures.

The compensation scheme works as follows: to apply for compensation, the owner must prove that the damaged property is covered by a “property damage” insurance policy. Since the Nat. Cat guarantee is mandatory for buildings and movable property (including motor vehicle), and comes with a property damage policy (against fire or water damages for instance), all properties in France are insured against natural catastrophes. Second, the “state of natural disaster” must be declared by the prefect of the department (equivalent of the State Governor in the U.S.), based on reports on the nature and the intensity of the damages and other information provided by the mayors

of the cities suffering from the natural disaster. Third, the damage must be directly linked to the natural catastrophe declared.

In addition to the two previous factors fixed by government (i.e., declaration of state of natural disaster and definition of the perils covered) the State also fixes the price and the deductible of the coverage. As of today, the cost of that additional coverage equals 12 per cent of the premium paid by a company for its P&C primary coverage or by an individual for her house. That uniform rate throughout the country raises major equity issues because the price of coverage is identical even though the probability of an event causing damage may differ significantly.¹⁶

On the prevention side, the Nat. Cat system initially has not been very successful. The law defined the “Risk Exposure Plans” (PER) to induce local governments to undertake preventive measures against natural disasters. Although there are potentially 13 000 towns in France exposed to natural disasters, only about 300 towns had approved a PER in 1994. To overcome this initial failure due to local authorities’ concern that the PER would reveal that the area is exposed to natural hazards and to slow urban development, the law of February, 2 1995 defined the “Risk Prevention Plan” (PPR). PPRs are easier to implement and they introduce sliding scales for the deductibles on insurance policies depending on mitigation effort undertaken.

More recently, a new incentive-for-mitigation scale has been introduced which links claims, deductible on the policy and mitigation. Specifically, deductibles are fixed by the State, and they are smaller when the town has an approved PPR than when it has not yet undertaken any mitigation measures. For instance, if over the last 5 years, two (resp. 3 and more) natural catastrophes have been declared in the town and no PPR has been prescribed, the deductible is two (resp. 3 and 4) times higher than if the town has a PPR. These adjustments significantly increased the number of PPR approved.

The Caisse Centrale de Reassurance (CCR) – a State-run reinsurer which benefits from an unlimited guarantee from the French government – offers reinsurance to private insurers that are forced by law to provide coverage against natural disasters.

The risk sharing between insurers and the government is based on a two-tier reinsurance program¹⁷. First, under the ‘quota-share’ solution, the insurer can cede a percentage of each of the accounts in its portfolio to the CCR. In addition, the insurer can adopt a “stop-loss” solution, in which case the CCR and the insurer agree on an amount for the total annual losses (i.e., a percentage of the premium collected) and if the losses exceed this amount, the reinsurer

intervenes. Due to its unlimited resources, it would be extremely difficult for any reinsurer to compete with CCR. As a result, the reinsurance market for “natural disasters” in France is mainly in CCR’s hands.

One major challenge facing CCR is that it has not built enough reserves to pay for claims that would result from a mega disaster in France (e.g., a major earthquake in the French Riviera). Should that happen, the CCR would exercise its unlimited guarantee provided by law by the French government and taxpayers would pay the largest portion of the losses¹⁸.

Subsidence insurance in Great Britain

The British insurance market is interesting because it is one of the most unregulated markets in Europe, as the British government has been unwilling to intervene even for flood insurance and drought insurance¹⁹. With respect to subsidence the warm weather in the 1990s and the 2003 heat wave which killed thousands of people in Europe has raised concern about this risk and who should pay for it. Subsidence is somewhat challenging because contrary to earthquake, flood or storms, it is a continuous process that affects the property over time.

Since the extremely hot summer of 1976, Britain experienced several major incidences of subsidence (e.g., hot summers of 1989 and of 1990) and there has been a substantial increase of subsistence claims. For instance, the total amount of insurance payout for subsidence rose from GBP 89 million in 1987 (about USD 180 million) to GBP 326 million in 1995 (about USD 660 million), with a peak at GBP 540 million in 1991 (about USD 1 billion).

In the free market that exists in Great Britain, insurers have responded to these episodes by significantly increasing their premiums. In 1991, the chairman of the Association of British Insurers warned customers that premiums could “increase about three of four times the rate of inflation”²⁰. More importantly, insurance companies introduced a strong geographical differentiation of both rates and coverage limits for all property damage insurance policies. In Britain, such a policy typically covers subsidence, fire, storm and several other risks. Rates range from GBP 1.80 to GBP 4 per GBP 1 000 insured (about USD 3.64 to USD 8.1 per USD 2 025 insured). Prior to 1991, the uniform rate was GBP 2.20 per GBP 1 000 insured (USD 4.45 per USD 2 025 insured). The average deductible also doubled, from GBP 500 to GBP 1000.

*Earthquake insurance in Japan*²¹

There are two kinds of earthquake insurance in Japan. Earthquake insurance for industrial risks was first introduced in 1956. Later on, in 1966, the Japanese government created a public-private partnership to provide earthquake coverage to the general public. The 1966 “Law concerning Earthquake Insurance” introduces coverage against earthquake damages, but also volcanic eruptions and resulting tidal waves (tsunami), to residential properties, i.e., houses for residential purposes or household goods. This protection scheme includes the Japanese Earthquake Insurance System (JEI); and a government-sponsored system, the Japan Earthquake Reinsurance system (JER), known in Japanese as “*Jisai*”, which provides reinsurance capacity in last resort. The JEI supports private Japanese primary insurers by providing an earthquake policy attached to a standard residential fire policy²². Note that until 1984, fire damages caused by earthquake were excluded from a fire policy. Since then, a fire-following clause has been introduced to cover fire that typically follows an earthquake. This coverage is part of an earthquake policy not a fire policy. In other words, a homeowner who purchased only a standard residential fire policy but not an earthquake policy will not be covered against a fire following an earthquake.

There is a clear difference between earthquake insurance against industrial risks and against residential risks. Coverage against losses to the business sector is provided by private companies and relies on overseas reinsurance markets. Insurance against damage to residential structures is provided with support of a Japanese government reinsurance scheme and does not depend at all on overseas reinsurance markets. This section focuses primarily on the insurance scheme against earthquake damages to residential properties.

Since 1966, there have been several changes in the JEI rating and claim adjustment system in order to better reflect risks while keeping the system simple enough for the customers. For instance, initially, only total losses were covered by earthquake policy. In the early 1980s, the “half loss” concept was created to introduce more flexibility. A similar system of 3 levels applies to earthquake damages and claims to household properties²³. Rates for residential earthquake policies vary according to the location to reflect the regional risk level, and according to the structure of the dwelling (wooden or non-wooden dwelling). In addition, discount options are available to homeowners depending on the age of the building and its performance evaluation class, or quake-resistance quality class.

For the reinsurance tranche, the JER system is a partnership between the Japanese government and private insurers. The price of reinsurance has to

follow a “fair-value” principle stating that the reinsurance should not be subsidized but its price should be sustainable in the long term²⁴. The premiums are collected by insurance companies that are then reinsured by primary insurers, the Japanese government or the JER, depending on the level of loss. The layers are distributed on a per-event basis. The first layer (USD 600 million) is covered by the JER; the second layer (up to USD 5.3 billion) is shared on a 50 per cent basis between the Japanese government and private insurers. The third layer (up to USD 9 billion) is covered by the Japanese government and the JER. For layers 4 (up to USD 23.2 billion) and 5 (up to USD 37.5 billion) the Japanese government covers 95 per cent of the losses and primary insurers (layer 4) or the JER (layer 5) cover the remaining 5 per cent.

Over its 36 years of operation JEI’s capacity has been continuously increasing. As of 2007, the JEI had a total per-event capacity of USD 37.5 billion. To put this number in perspective, the highest pay-out was the 1995 Kobe earthquake that cost the Japanese insurer USD 653 million. One must say, however, that at that time the level of insurance penetration was much smaller than what it is today. In the early 1990’s, the household subscription rate for earthquake insurance was around 7 per cent, since 1995 it has consistently increased, up to 16 per cent in 2001 and nearly 35 per cent today.²⁵

NOTES

1. Boardman, Anthony, Greenberg, David, Vining, Aidan, and Weimer, David. (2001), *Cost-Benefit Analysis: Concepts and Practice* (2nd Edition), Upper Saddle River, NJ: Prentice Hall
2. Posner, Richard (2004), *Catastrophe: Risk and Response*, New York: Oxford
3. Bernknopf, R. L., L. B. Dinitz, S. J. M. Rabinovici, and A. M. Evans. (2001), “A portfolio approach to evaluating natural hazard mitigation policies: an application to lateral-spread ground failure in coastal California”, *International Geology Review*, 43: 424-440.
4. Heinz Center (2000), *The Hidden Costs of Coastal Hazards*, Washington, DC: Island Press

5. These two types of damage also interact in that structural damage can cause contents damage to occur (when a broken window allows in water from a flood or hurricane) and contents damage can cause structural damage to occur (as when an unsecured water heater topples following an earthquake, causing fire damage to the property). Additionally, either kind of damage can cause injury or loss of life, whether from broken glass windows or a structure that collapses or is destroyed by fire.
6. Institute for Business and Home Safety (2001), *Is Your Home Protected From Earthquake Disaster? A Homeowner's Guide to Earthquake Retrofit*.
7. International Code Council (2006); <http://www.iccsafe.org/government/adoption.html>, as of June 2008.
8. ISO (2006); <http://www.isomitigation.com/bcegs/0000/bcegs0001.html>, as of June 2006.
9. The material in this section is based on Kunreuther (2006) "Comprehensive Disaster Insurance: Has Its Time Come?" in *Risk & Disaster: Lessons from Hurricane Katrina* Philadelphia: University of Pennsylvania Press and on Pasterick, Edward T. (1998), "The National Flood Insurance Program." in Howard Kunreuther and Richard J. Roth, Sr. (eds.), *Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States*. Washington, DC: Joseph Henry Press.
10. Insurance Information Institute. (2005), *Flood Insurance Facts and Figures*. Available online at http://www.disasterinformation.org/disaster2/facts/flood_insfacts/.
11. Palm, Risa, Michael Hodgson, R. Denise Blanchard and Donald Lyons. (1990), *Earthquake Insurance in California: Environmental Policy and Individual Decision Making*. Boulder, CO: Westview Press.
12. US National Institute of Building Science (2005), *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*, Multihazard Mitigation Council, Washington, DC.
13. US National Institute of Building Science (2005), *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*, Multihazard Mitigation Council, Vol. 1, p.7, Washington, DC.
14. On the specific feature of these systems, see also the discussion in Part I of this volume.

15. We would like to thank Suzanne Corona-Vallet, Thierry Masquelier and Claude Henry for insightful discussions on this system. For a more detailed description of the operation of the system, see Michel-Kerjan (2001), "Insuring against Natural Disasters. Do the French Have the Answer? Strengths and Limitations," Working Paper, Laboratoire d'économetrie, Ecole Polytechnique, Paris; Vallet (2004), "Insuring the Uninsurable: The French Natural Catastrophe Insurance System," in E. N. Gurenko (ed). *Catastrophe Risk and Reinsurance. A Country Risk Management Perspective*; Michel-Kerjan and DeMarcellis (2006), "Public-Private Programs for Covering Extreme Events: The Impacts of Information Distribution and Risk Sharing," *Asia-Pacific Journal of Risk and Insurance*, Vol. 1 (2), pp. 21-49.
16. If a homeowner can not find an insurer willing to insure his/her property, s/he can indeed ask the Central Rating Bureau to name an insurer. (Note that insurers can also call upon the Central Rating Bureau to ask for removing a customer from their portfolio if s/he does not undertake normal preventive measures).
17. The reinsurance system had also been modified in 1997 and in 2000 to provide insurers with more personalized conditions, in particular regarding cession rates.
18. For an economic analysis of the system (in French), see Julien Ablain, Amine Benyoussef, Cyril Haegeli, Vincent Jarcsek, Marc Leguil, Ismaël Le Mouël, Rémi Maumon Falcon de Longevialle, sous la direction d'Erwann Michel-Kerjan (2007), « Quelques leçons de l'ouragan Katrina: Gestion de la crise, Assurance des risques catastrophiques, et Perspective française », Working Paper, Laboratoire d'économétrie, Ecole Polytechnique, Chaire développement durable, Paris. Project Collectif Scientifique de seconde année à l'Ecole Polytechnique; see also Chapter 5 in Olivier Godard, Claude Henry, Patrick Lagadec and Erwann Michel-Kerjan (2002), *Traité des nouveaux risques*, Folio, Inédit 100, pp. 620, Paris: Editions Gallimard.
19. For a comprehensive analysis of several of the European property insurance programs, see Von Ungern-Strenberg (2004). *Efficient Monopolies. The Limits of Competition in the European Property Insurance Market*. Oxford University Press.
20. *Ibid.*, 37.
21. For a recent analysis of Asian insurance programs to address catastrophe risks, see Charles Scawthorn and Kiyoshi Kobayashi (eds) (2008), *Asian Catastrophe Insurance*, Risk Books.

22. Yuichi Takeda (2004), “Government as Reinsurer of Last Resort: The Japanese Experience”, in Eugene N. Gurenko (Ed.), *Catastrophe Risk and Reinsurance*, Risk Books. As of today, the JEI system comprises 3 levels of damages for residential buildings, *i.e.*, “total loss” when 50 per cent or more of the current value of the building (or more than 70 per cent of the total floor area) have been damaged; “half loss” when the amount of loss reaches 20 per cent or more, but is less than 50 per cent, of the current value of the building (or when more than 20 per cent but less than 70 per cent of the floor area have been damaged); and “partial loss” when 3 per cent or more but less than 20 per cent of the current value of the building have been damaged. These three levels of loss correspond to three levels of claims, 100 per cent; 50 per cent and 5 per cent of the insured amount respectively.
23. See, for instance, the General Insurance Association of Japan website for details, <http://www.sonpo.or.jp/e/index.html>
24. According to Takeda (2004), p. 231 and footnote 3 p. 237: “Within a framework of public-private partnership, making consistent and sustainable reinsurance pricing is by far the most challenging task. Currently the details of JER reinsurance contracts are not fully disclosed, except the names of the counterparties and the amount of reinsurance.” Yuichi Takeda (*Ibid*).
25. In California, the US state most commonly associated with earthquakes, it’s estimated that only 13 percent of homeowners buy the quake coverage in 2006.

Chapter 3

RISK PERCEPTION AND CHOICE IN HOMEOWNERS ADOPTION OF MITIGATION MEASURES: THE NEED FOR LONG-TERM CONTRACTS

This chapter discusses how risk perception affects people and firms in their decisions as to whether or not to invest in protective measures. It also discusses the importance of social norms and interdependencies on their decision processes. Given the reluctance of individuals to invest in cost-effective mitigation voluntarily there is a need to develop innovative strategies that involve public-private sector partnerships. Well-enforced building codes coupled with long-term insurance contracts and mitigation loans are important in this regard.

1. Linking *Ex Ante* and *Ex Post* Disaster Policies

Recent extreme events have highlighted the challenges associated with reducing losses from hurricanes and other natural hazards due to what one of us have termed the “natural disaster syndrome”¹. It consists of *ex ante* and *ex post* components that are interconnected. Before a disaster, most homeowners, private businesses and the public sector do not voluntarily adopt cost-effective loss reduction measures. Hence the area is highly vulnerable and unprepared should a severe hurricane or other natural disaster occur. The magnitude of the destruction following a catastrophe leads the government to provide disaster relief to victims even if it claimed it had no intention of doing so prior to the event. This combination of underinvestment in protection prior to the event and liberal use of taxpayers’ funds after a disaster does not augur well for the future.

One of the reasons for the natural disaster syndrome relates to the decision processes of individuals with respect to low probability-high consequence events, such as a Category 3 or 4 hurricane or a major earthquake. Prior to a disaster, many individuals perceive its likelihood as sufficiently low that they argue “It will not happen to me.” As a result they do not feel the need to invest voluntarily in protective measures, such as strengthening their house or buying insurance. It is only after the disaster occurs that these same individuals claim they would like to have undertaken protective measures.

There is extensive evidence that residents in hazard-prone areas do not undertake loss prevention measures voluntarily. A 1974 survey of more than 1 000 California homeowners in earthquake-prone areas revealed that only 12 per cent of the respondents had adopted any protective measures². Fifteen years later there was little change despite the increased public awareness of the earthquake hazard. In a 1989 survey of 3,500 homeowners in four California counties at risk from earthquakes, only 5 to 9 per cent of the respondents in these areas reported adopting any loss reduction measures³. Burby et al. (1988)⁴ and Laska (1991)⁵ have found a similar reluctance by residents in flood prone areas to invest in mitigation measures.

In the case of flood damage, Burby (2006) provides compelling evidence that actions taken by the federal government, such as building levees, make residents feel safe when, in fact, they are targets for catastrophes should the levee be breached or overtopped. This problem is exacerbated by local public officials who do not enforce building codes and/or impose land-use regulations to restrict development in high hazard areas. If developers do not design homes so that they are resistant to disasters and individuals do not voluntarily adopt mitigation measures, one can expect large-scale losses following a disaster, as

evidenced by the property damage to New Orleans caused by Hurricane Katrina⁶.

Kydland and Prescott (1977)⁷ in their Nobel Prize winning contribution show that a discretionary policy, which may be optimal given the current situation, may not necessarily result in a socially optimal policy in the longer run. As a specific example of this general proposition, the authors note that unless individuals are initially prohibited from locating in a flood plain, it will be very difficult politically to force these people to leave their home. In making their decisions to locate there, Kydland and Prescott indicate that these individuals believe that the Corps of Engineers will subsequently build dams and levees if enough people choose to build homes these flood plains. A large number of homeowners then decide to locate in these high hazard areas for that reason and the Corps of Engineers is forced to invest in flood control projects. Hence the need for having explicit enforced rules, such as land use regulations and well-enforced building codes, rather than giving people the freedom to locate where they want and to build whatever type of structure they would like to live in.

In the U.S., even after the 2004 and 2005 hurricane seasons that considerably raised the level of awareness, a large number of residents have not invested in loss reduction measures with respect to their property or undertaken emergency preparedness measures. In a survey of 1,100 adults living along the Atlantic and Gulf Coasts undertaken in May 2006, 83 per cent had taken no steps to fortify their home, 68 per cent had no hurricane survival kit and 60 per cent had no family disaster plan.⁸

2. Why Individuals Do Not Undertake Mitigation Measures Voluntarily⁹

Consider the Watermans, a hypothetical family whose New Orleans home was destroyed by Hurricane Katrina. They have decided to rebuild their property in the same location but are unsure, however, whether they want to invest in a flood reduction measure (*e.g.* elevate their home, sealing the foundation of the structure and waterproofing the walls).¹⁰ Suppose that scientific experts have estimated that the annual chances of a severe flood in the area where the Watermans live is 1 in 100. If they invested in a flood mitigation measure they would reduce damage from this hurricane by USD 40 000. In other words, the expected annual benefit from investing in such a measure would be USD 400 (*i.e.*, 1 in 100 x USD 40 000). The longer the time period T that the Watermans expect to live in their house, the greater the expected benefit from flood proofing their house. More specifically let B represent the expected net present value of the benefit of mitigation over the entire time horizon T .¹¹

Suppose the extra cost to the Watermans of elevating their house is $C =$ USD 1,200. Let T^* represent the minimum number of years for the loss-reduction investment to be cost-effective. In other words T^* is the smallest time period where $B/C > 1$. The second column in Table 1 depicts the expected benefit-cost ratio as a function of T associated with such an investment if the Watermans' annual discount rate was 10 per cent.

It is clear that if the family planned to live in their home for more than 4 years they would want to elevate their house if they were risk neutral. If the Watermans were risk averse, then $T^* < 4$ because they would be more concerned with the financial consequences of suffering a large loss from the next disaster and would thus find the expected benefits of mitigation even more attractive than if they were risk neutral.

Table 1. Expected Benefit/Cost Ratio of Investing in Mitigation Measure as a Function of Time Horizon, Perceived Loss Reduction and Perceived Probability (p)

Time Horizon Loss Reduction (USD 40 000)

Years	p=1/100	p=1/300
1	.30	.10
2	.58	.19
3	.83	.28
4	1.06	.35
5	1.26	.42
10	2.05	.68
15	2.54	.84
20	2.83	.94
25	3.03	1.01

The Watermans and other residents of New Orleans could have debated whether to elevate their homes prior to Hurricane Katrina but suppose they decided not to do so. It is instructive to ask why they chose **not** to adopt this cost-effective mitigation measure.

Underestimation or Ignoring Probabilities

Many individuals perceive the probability of a disaster causing damage to their home as being sufficiently low that they cannot justify investing in mitigation even if they evaluate the risk systematically by comparing the expected benefits with the cost of protection. Suppose that the Watermans perceived the annual chances of a severe flood damaging their home to be 1 in 300 rather than the scientists' estimate of 1 in 100. As shown in Column 3 of

Table 1, the value of T^* is now more than six times higher, so that the Watermans would have to expect to live in their home for at least the next 25 years in order to want to invest in this mitigation measure.¹²

According to the 2004 Housing survey for the New Orleans Metropolitan Area, the median tenure of occupancy is 11 years for owner-occupied residences, so if most residents with neighboring homes similar to the Watermans' house misperceived the risk in this manner, they would not want to elevate their structure¹³.

Prior to Katrina, the Watermans did not focus on the likelihood of their house being flooded when making decisions on whether it should be mitigated. As a result they did not even think about the consequences of future flooding from a hurricane and hence did not make the tradeoffs between expected benefits and costs. Magat, Viscusi and Huber (1987)¹⁴ and Camerer and Kunreuther (1989)¹⁵ provide considerable empirical evidence that individuals do not seek out information on probabilities in making their decisions. Huber, Wider and Huber (1997)¹⁶ showed that only 22 per cent of subjects sought out probability information when evaluating risk managerial decisions. When consumers are asked to justify their decisions on purchasing warranties for products that may need repair, they rarely use probability as a rationale for purchasing this protection¹⁷.

Those individuals who seek out information on the likelihood of a severe disaster causing damage to their home may find that experts disagree. For example, different methods for interpreting identical geologic information for earthquake-triggered liquefaction showed that there were significant differences in the probability of the earthquake hazard for the same location¹⁸. Those who prefer not to think about the hazard may focus on the lowest probability estimate, so they can justify not investing in any protective measures.

Research shows that decision makers use *threshold models*, whereby if the probability of a disaster is below some pre-specified level they do not think about the event, in making decisions¹⁹. In a laboratory experiment on purchasing insurance, many individuals bid zero for coverage, apparently viewing the probability of a loss as sufficiently small that they were not interested in protecting themselves against it²⁰. Similarly, many homeowners residing in communities that are potential sites for nuclear waste facilities have a tendency to dismiss the risk as negligible²¹. Prior to the Bhopal chemical accident in 1984, firms in the industry estimated the chances of such an accident as sufficiently low that that it was not on their radar screen. If the Watermans took this approach, they would not have any interest in investing in a loss mitigation measure no matter how large the savings would be.

As discussed above in the case of damage from floods or hurricanes, levees or other flood control projects are likely to have given residents a false sense of security. In fact, Gilbert White and his colleagues pointed out many years ago that when these projects are constructed individuals believe that they are fully protected against future disasters and hence there are increased developments in these “protected” areas²². Should a catastrophic disaster occur so that residents of the area are flooded the damage is likely to be considerably greater than before the flood control project was initiated. They termed this behaviour and its resulting consequences as the *levee effect*.

Short Time Horizons

In making decisions that involve cost outlays, individuals are often myopic and hence only take into account the potential benefits from such investments over the next year or two. This is one reason that consumers are often reluctant to buy energy efficient appliances that promise to reduce their monthly electricity bills over the life of the appliance²³. In the example in Table 1, if the Watermans wanted to recoup their investment in less than 4 years, then even if they had utilized the experts’ estimate of the risk, they would still not have elevated their house. In one study, subjects indicated the maximum they were willing to pay for such protective measures as investing in a dead bolt lock for their apartment, purchasing a steering wheel club and strengthening their homes against earthquakes²⁴. By varying the number of years that each of the measures provided protection, we could determine how much more the person was willing to invest in the item as a function of time. If a person was willing to pay USD 50 for a dead bolt lock if he planned to live in his apartment for 1 year then he should be willing to pay up to USD 95.45 if he had a two-year lease and an annual discount rate of 10 per cent.

Many of the arguments used by respondents suggest that they focused on the cost of the product in determining how much they are willing to pay to invest in a protective measure and do not take into account the expected benefits over more than one year. These justifications are consistent with experiments by Schkade and Payne (1994)²⁵ and Baron and Maxwell (1996)²⁶ which revealed that the willingness to pay for public goods was affected by cost information.

This tendency toward myopia is one of the most widely-documented failings of human decision making. As a rule, we have difficulty considering the future consequences of current actions over long time horizons (Meyer and Hutchinson 2001). Behavioural research by psychologists has led to the conclusion that most people have a hyperbolic discount rate for the future²⁷. In other words, that means events T periods away are discounted with factor $(1 + aT)^{-b/a}$, with $a, b > 0$. People will “discount” in order to get the payoff sooner

(over short horizons) at a higher rate, but at a relatively low rate over long horizons.²⁸

Budget Constraints

If the Watermans focus on the upfront cost of elevating their house and they have limited disposable income after purchasing necessities, then they will not even consider taking this step. Residents in hazard-prone areas have used this argument explicitly for their lack of interest in buying insurance.

In focus group interviews to determine factors influencing decisions on whether to buy flood or earthquake coverage one uninsured worker responded to the question “How much does one decide on how much to pay for insurance?” by responding as follows:

“A blue-collar worker doesn’t just run up there with USD 200 [the insurance premium] and buy a policy. The world knows that 90 per cent of us live from payday to payday....He can’t come up with that much cash all of a sudden and turn around and meet all his other obligations.”²⁹

The budget constraint for investing in protective measures may extend to higher income individuals if they set up separate mental accounts for different expenditures. Thaler (1999)³⁰ suggests that dividing spending into budget categories facilitates making rational trade-offs between competing use of funds and acts as a self-control device. He points out that poorer families tend to have budgets defined over periods of a week or a month while wealthier families are likely to use annual budgets. Heath and Soll (1996)³¹ provide further evidence on the role of budget categories by showing how actual expenses are tracked against these budgets.

A response by several individuals when asked why they were only willing to pay a fixed amount for a dead bolt lock when the lease for the apartment was extended from 1 to 5 years supports this mental accounting argument with respect to budgets. One responder said simply:

“USD 20 is all the dollars I have in the short-run to spend on a lock. If I had more, I would spend more - maybe up to USD 50”³².

Social Norms and Interdependencies

Let us return again to the dilemma faced by the Watermans, who are considering elevating their house on piles so as to reduce flood losses from a

future hurricane. If none of their neighbors have taken this step, their house would look like an oddity in a sea of homes at ground level. Should the Watermans choose to move, they would be concerned that the resale value of their home would be lower because the house was different from all the others. Likewise, the effectiveness of mitigation might itself depend on the number of other residents who elect to elevate their homes. If the Watermans decide to elevate their home but their neighbors have not taken this action, then one of these non-elevated homes could be washed away during a flood or hurricane and cause damage to the Watermans' home which would otherwise have been spared. Note that these—very real—considerations would not be easily captured in a traditional cost-benefit analysis of their problem, which assume a decision is made in social isolation. In contrast, mitigation decisions often take the form of coordination games, where the value of mitigation depends on whether neighbors choose to mitigate.

Decisions made by neighbors also carry information value—or at least are likely to be perceived as such. As in an information cascade,³³ if a large number of neighbors have already decided to put their house up on piles, the Watermans might plausibly conclude that that the investment must be cost effective. Of course, such inferences could be wildly mistaken if their neighbors' decisions were also based on imitation; much like a fad, one might observe communities collectively adopting mitigation measures that have little actuarial or engineering basis.

To illustrate such effects, Wharton's Robert Meyer recently conducted a laboratory study of social network effects in earthquake mitigation. In the study, participants were told that they would be living in an area prone to periodic earthquakes, and that they could purchase structural improvements in their homes that potentially mitigated the effects of quakes should one arise. The task was to make these decisions as efficiently as possible in the following sense: at the end of the simulation they would be paid an amount that was tied to the difference between their home value and interest earning minus the cost of mitigation plus damage repairs. Throughout the simulation they could observe the investment decisions being made by others in their virtual community, as well as damage they suffered from quakes. The key source of uncertainty in the simulation was whether the mitigation was cost effective or not; half of the participants were placed in a world where mitigation was not cost effective (hence the optimal investment was 0 per cent), and the other half were placed in a world where it was long-term effective (hence the optimal investment was 100 per cent). Meyer's interest was in observing whether communities could discover the optimal level of mitigation over repeated plays of the game.

The basic result was that they could not; consistent with the findings on learning discussed above, there was little evidence of either community naturally discovering the optimal level of mitigation (the investment level in both worlds averaged 40 per cent). There was, however, a social norm effect: the major driver of individual decisions about how much to invest was the average level of investment made by neighbors³⁴.

Would learning have been enhanced had the communities been populated with a few opinion leaders who had knowledge of mitigation's true effectiveness? To investigate this, we ran a new set of studies where, prior to the simulation, one player in each community was privately informed of the true effectiveness of mitigation. Other players knew that one among them had this information, but that person's identity was not revealed—but could likely be inferred by observing players' investment behavior. For example, a player who is told that investments are ineffective would, presumably, invest 0 per cent from the start. Did this “knowledge seeding” help communities learn? It did but—quite surprisingly—only in the case where investments were ineffective. In these communities, players seemed to immediately recognize the informed player (who was not investing), and after two rounds of the game almost all investments in mitigation had vanished, as it should have.

In contrast, in communities where mitigation was effective, rather than investments increasing over time, they *decreased*. For many of the reasons described earlier in this section, players who were told that mitigation was effective did not play the optimal strategy of investing 100 per cent at the start—they procrastinated. The other players, seeing no one with a high level of investment, then mistakenly concluded that they must be in a world where mitigation was ineffective, hence invested only a small amount themselves. Then, bizarrely, the informed players—who should have been opinion leaders—became followers, reducing their own investments. After multiple plays of the game, few players were making any investments at all, even though it was optimal for them to do so in the long-run.

Of course, one might hope that in real-world settings, opinion leadership and tipping strategies might be more effective, and evidence along these lines has been presented by Schelling (1978)³⁵ and popularized by Gladwell (2000)³⁶. Heal and Kunreuther (2005)³⁷ provide a game theoretic treatment of the impact of interdependency on the decision to invest in protective measures and suggest ways to coordinate actions of those at risk, ranging from subsidization or taxation to induce tipping or cascading to rules and regulations, such as well-enforced building codes.

Should Mitigation Measures be Encouraged: The Samaritan's Dilemma

One of the arguments that have been advanced as to why individuals do not adopt protective measures prior to a disaster is that they assume liberal aid from the government will be forthcoming anyway, should they suffer losses from an earthquake, hurricane or flood. Federal disaster assistance may create a type of Samaritan's dilemma: providing assistance *ex post* (after hardship) reduces parties' incentives to manage risk *ex ante* (before hardship occurs)³⁸. If the Watermans expects to receive government assistance after a loss, it will have less economic incentive to invest in mitigation measures and purchase insurance prior to a hurricane. The increased loss due to the lack of protection by residents in hazard-prone areas amplifies the government's incentive to provide assistance after a disaster to victims.

The empirical evidence on the role of disaster relief suggests, however, that individuals or communities have **not** based their decisions on whether or not to invest in mitigation measures by focusing on the expectation of future disaster relief. Kunreuther et al (1978)³⁹ found that most homeowners in earthquake- and hurricane-prone areas did not expect to receive aid from the federal government following a disaster. Burby et al. (1991)⁴⁰ found that local governments that received disaster relief undertook more efforts to reduce losses from future disasters than those that did not. This behavior seems counter-intuitive and the reasons for it are not fully understood. It will be interesting to see whether Hurricane Katrina changes this view given the highly publicized commitment by the Bush administration to provide billions of dollars in disaster relief to victims.

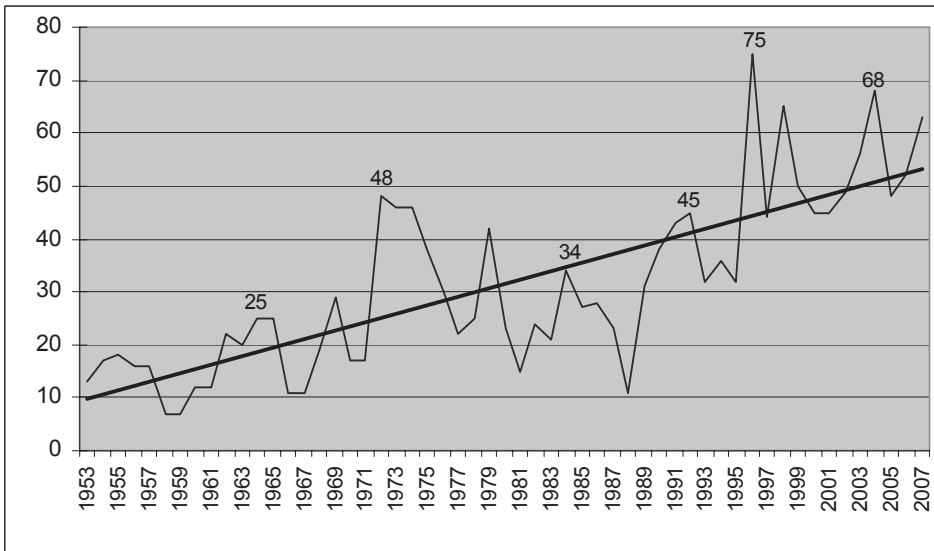
Whether or not individuals incorporate an expectation of disaster assistance in their pre-disaster planning process, a driving force with respect to the actual provision of government relief is the occurrence of disasters where the losses are large⁴¹. Under the current system of disaster assistance, the Governor of the State(s) can request that the President declare a "major disaster" and offer special assistance if the damage is severe enough. Although the President does not determine the amount of aid (the House and Senate do), he is responsible for a crucial step in the process. This obviously raises the question of what are the key drivers of such a decision and whether some states are more likely to benefit from such situation than others, and if so, when does this occur?

Recent research has shown that election years constituted a very active time for disaster assistance (all other things being equal). Three salient examples are the Alaska earthquake of March 1964 (a Presidential disaster year), Tropical Storm Agnes in June 1972, and Hurricane Andrew in September

1992. These three disasters all occurred during election years and led to special legislation by the US Congress in the form of liberal disaster assistance. For example, following the Alaska earthquake in 1964 where relatively few homes and businesses had earthquake resistant measures and insurance protection, the US Small Business Administration provided 1 per cent loans for rebuilding structures and refinancing mortgages to those who required funds through its disaster loan program. As pointed out above, the uninsured victims in Alaska were financially better off after the earthquake than their insured counterparts⁴².

Figure 1. US Disaster Presidential Declarations per Year

(Peak-values on the graph correspond to some presidential election years)



Sources: (Michel-Kerjan, in press) - Data from the US Department of Homeland Security

More recently, it has also been shown that a battleground state with 20 electoral votes has received more than twice as many Presidential disaster declarations than a state with only three electoral votes⁴³. Overall, the number of Presidential declarations has dramatically increased over the past 50 years: there had been 162 over the period 1955-1965, 282 over 1966-1975, up to 319 over the period 1986-1995 and 545 for 1996-2005⁴⁴. Figure 1 depicts the evolution of the number of these declarations over the past 55 years.

We also highlight some of the peak years, which quite often correspond to a presidential election year. In that sense, it is almost impossible to dissociate the economics of catastrophe management from politics⁴⁵. Research also shows

that a driving force with respect to the actual provision of government relief is the occurrence of disasters where the losses are large. All things being equal, a victim of natural disasters might get access to more disaster relief if the disaster affects a large number of people.

In the case of Hurricane Katrina, Governor Kathleen Blanco declared a State of Emergency on August 26th, 2005, and requested disaster relief funds from the federal government on the 28th. President Bush declared a State of Emergency on the 28th, an action that frees federal government funds and puts emergency response activities, debris removal, and individual assistance and housing programs under federal control⁴⁶. Under an emergency declaration, federal funds are capped at USD 5 million. On August 29th in response to Governor Blanco's request, the President declared a "major disaster," allotting more federal funds to aid in rescue and recovery. By September 8th, Congress had approved USD 52 billion in aid to victims of Hurricane Katrina. As of August 2007, the total federal relief allocated by Congress for the reconstruction of the areas devastated by the 2005 hurricane season is nearly USD 125 billion.

The Politician's Dilemma

The fact that politicians can benefit from their generous actions following a disaster raises basic questions as to the capacity of elected representatives at the local, state and federal levels to induce people to adopt protection measures before the next disaster. The difficulty in enforcing these mitigation measures has been characterized as the *politician's dilemma*⁴⁷.

Imagine an elected representative at the city or state level. Should s/he push for people and firms in this city or state to invest in cost-effective mitigation measures to prevent or limit the occurrence of a disaster? From a long-term perspective, the answer should be *yes*. But given short-term re-election considerations, the representative is likely to vote for measures that allocate taxpayers' money elsewhere that yield more political capital. It is another example where little consideration is given to supporting mitigation measures prior to a disaster (*ex ante*) because they believe that their constituencies are not worried about these events occurring, but there is likely to be a groundswell of support for generous assistance to victims from the public sector after a disaster (*ex post*) to aid their recovery. The one silver lining to this behavior is that following a natural disaster when residents and the media focus on the magnitude of the losses, politicians will respond by favoring stronger building codes and other loss reduction measures, but only when there is a consensus among her/his constituencies that this is a good thing to do.

3. Developing Innovative Mitigation Strategies through Public-Private Partnerships

Given the reluctance of individuals to adopt mitigation measures there may be a need for strategies that involve public-private partnerships. More specifically in this section we indicate how one can combine building codes with long-term insurance and mitigation loans as part of a disaster management plan.

Implementing Building Codes

We have already shown that if families like the Watermans have misperceptions of the probability of a future hurricane, short time horizons and budget constraints, they will have no interest in adopting cost-effective mitigation measures. Current federal disaster policy suggests that the public feels some degree of responsibility toward helping victims of natural disasters.

Despite the need to limit building in hazard-prone areas there has been a radical increase in construction in coastal areas subject to hurricanes with limited concern with the possibility of damage from future disaster. For example, after Hurricane Camille destroyed the Richelieu Apartment complex in Pass Christian Mississippi in 1969, a shopping center was built in the same location, housing a Winn Dixie and a Rite-Aid, among other retail businesses. Although the shopping center was leveled by Hurricane Katrina, real estate developers already have plans to rebuild on the site, most likely a condominium development this time⁴⁸.

Building codes are often not enforced in hazard-prone areas. Insurance experts, according to the Insurance Information Institute, have indicated that 25 per cent of the insured losses from Hurricane Andrew could have been prevented through better building code compliance and enforcement⁴⁹. Many communities have inadequate staffing and training to enforce these codes effectively. In Dade County, the area struck by Hurricane Andrew, there were only 60 building inspectors who were required to conduct multiple inspections on an average of 20 000 new buildings each year. This translates into an average of 35 inspections per day for each inspector, a near impossible task when driving time, report writing and other administrative tasks are taken into account.

Linking Mitigation with Insurance and Mortgages

In re-examining strategies for reducing losses from disasters in the future, one needs to strike a balance between satisfying the objectives of the individual

living in a hazard-prone area and the general public. Banks can play a key role in this regard if they require homeowners in hazard-prone areas to purchase insurance coverage against natural disasters and the premiums reflect the risk of living in the area.

Consider the residents of New Orleans, such as the Watermans family, who are residing in areas subject to flooding from hurricanes. If they have a federally insured mortgage, then banks require them to purchase flood insurance. Banks could also require that a third party inspector ensures that structures meet the building codes instituted by the city of New Orleans that homes rebuilt after Hurricane Katrina.

To make the adoption of these mitigation measures financially palatable from the property owner's perspective, banks holding the mortgage on the property could provide funds for this purpose through a home improvement loan with a payback period identical to the life of the mortgage. For example, the mitigation measure considered by the Watermans family cost USD 1,200. A 20-year loan for USD 1,200 at an annual interest rate of 10 per cent would result in payments of USD 116 per year. If the annual insurance was reduced by USD 400, the savings to the homeowner each year would be USD 284, the insured homeowner would have lower total payments by investing in mitigation⁵⁰.

A bank would have a financial incentive to provide this type of loan. By linking the expenditure in mitigation to the structure rather than to the property owner, the annual payments are lower and this would be a selling point to mortgagees. The bank will also feel that it is now better protected against a catastrophic loss to the property and the insurer knows that its potential loss from a major disaster is reduced. These mitigation loans would constitute a new financial product. Moreover, the general public will now be less likely to have large amounts of their tax dollars going for disaster relief. A win-win-win-win situation for all⁵¹!

There is an additional benefit to insurers from having banks ensuring that their mortgagees have met existing building codes. The costs of reinsurance that protects insurers against catastrophic losses should now decrease. If reinsurers know that they are less likely to make large payments to insurers because each piece of property in a region now has a lower chance of experiencing a large loss, then they will reduce their premiums to the reinsurer for the same reason that the insurer is reducing its premium to the property owner.

Suppose that an insurer had 1 000 identical insurance policies in New Orleans, each one of which would expect to make claims payments of

USD 50 000 following a hurricane if homes were not mitigated in the way that the Watermans were considering. The insurer's expected loss from such a disaster would be USD 50 million. To protect its surplus the insurer would want to have USD 25 million in coverage from a reinsurer. Given that the hypothetical hurricane has a 1 in 100 chance of hitting New Orleans, the expected loss to a reinsurer would be USD 250 000 and the premium charged to the insurer would reflect this. If the bank required that all 1 000 homes to meet the local building code and each homeowner's loss were reduced by USD 40 000 to USD 10 000, then the insurer's total loss would be USD 10 million should all 1 000 homes be affected and it would not require reinsurance. This savings would be passed on to the insurer in the form of a lower premium.

Seals of Approval

A complementary way to encourage the adoption of cost-effective mitigation measures is to require that banks and other lenders condition their mortgages. Sellers or buyers of new or existing homes would have to obtain a seal of approval from a recognized inspector that the structure meets or exceeds building code standards. This requirement either could be legislated or imposed by the existing housing government sponsored enterprises (GSEs) (i.e., Fannie Mae, Freddie Mac, and the 12 Federal Home Loan Banks). Existing homeowners may want to seek such a seal of approval as well, if they knew that insurers would provide a premium discount (akin to the discounts that insurers now make available for smoke detectors or burglar alarms) and if home improvement loans for this purpose were generally available.

A seal of approval should increase the property value of the home should the owner want to sell it, by informing the potential buyer that the house is built safely. There are other direct financial benefits from having such a seal. Under the *Fortified...for safer living* program of the Institute for Business & Home Safety, an independent inspector, trained by IBHS, verifies that disaster resistance features have been built into the home that exceed the minimum requirement of building codes, which in some states, will enable the property owner to receive homeowners' insurance credits. The success of such a program requires the support of the building industry and a cadre of qualified inspectors to provide accurate information as to whether existing codes and standards are being met or exceeded. Such a certification program can be very useful to insurers who may choose to provide coverage only to those structures that are given a certificate of disaster resistance.

Evidence from a July 1994 telephone survey of 1,241 residents in six hurricane-prone areas on the Atlantic and Gulf Coasts provides supporting

evidence for some type of seal of approval. Over 90 per cent of the respondents felt that local home builders should be required to follow building codes, and 85 per cent considered it very important that local building departments conduct inspections of new residential construction. We recommend the following procedure. The inspection required to establish a seal of approval must be undertaken by certified contractors. For new properties, the contractor must provide the buyer with this seal of approval. For existing properties, the buyer should pay for the inspection and satisfy the guidelines for a seal of approval. If the house does not satisfy the criteria, then banks and other mortgage lenders should roll into their mortgage loans the cost of such improvements⁵².

The Need for Long-Term Insurance Contracts

To our knowledge, homeowners' coverage has always been provided in the form of an annual contract renewable at the option of the insurer. In some cases legislation has restricted insurers from canceling policies or from charging premiums that reflect risk. For example, following the Northridge quake of 1994, California, in effect, imposed an exit fee on insurers that no longer wished to offer earthquake coverage, by requiring these firms to provide the initial capitalization for the newly created California Earthquake Authority. Similarly, Florida established a state-operated assigned risk pool—Citizens Property Insurance Corporation—as a stop-gap measure for those hurricane risks that the private insurers are unwilling to accept⁵³. Some insurers have recently restricted the sale of new homeowners policies in hurricane prone areas. Policyholders cannot help but worry that their existing coverage might be subject to unexpected cancellation or very significant premium increases, particularly if there is severe hurricane damage in the near future⁵⁴.

Short-term insurance policies create significant social costs. As discussed earlier, evidence from recent disasters reveals that many consumers fail to adequately protect their home or even insure at all, creating a welfare cost to themselves and a possible cost to all taxpayers in the form of government disaster assistance.

The absence of long-term insurance also results in direct private costs to both the insurer and the insured. The private value of the LTI over a period of N years is higher than the sum of N one-year insurance contracts if the risk remains constant over time, for two reasons: (1) LTI reduces the transaction costs to consumers should their annual homeowners policy not be renewed and to insurers should homeowners cancel their policy and (2) an LTI reduces the uncertainty to homeowners as to whether their premiums will be significantly increased following a severe disaster.

There is another rationale for developing LTI. LTI with risk-based premiums can also encourage individuals to invest in cost-effective mitigation measures. As we discussed, many homeowners do not invest in such measures because they are myopic and have budget constraints. They are unwilling to incur the high upfront cost associated with these investments relative to the small premium discount they would receive the following year that reflects the expected reduction in annual insured losses⁵⁵. An LTI policy can be coupled with the type of long-term home improvement loan tied to the mortgage we described above so that the annual payment for the bank loan will be less than the reduction in insurance premiums. In other words, investing in cost-effective mitigation measures will be financially attractive. The social welfare benefits of LTI coupled with long-term mitigation loans over N years can be significant in that there will be less damage to property, reduction in costs of protection against catastrophic losses by insurers, more secure mortgages and lower costs to the government for disaster assistance.

The use of insurance markets to motivate mitigation activities must be structured with care though. The worst case arises when full insurance is provided at a fixed premium, independent of whether or not mitigation precautions have been taken. The homeowner then has no financial incentive to invest in mitigation measures, since the benefits would only accrue to the insurer in the form of lower claims. In such a case the incentive to mitigate would actually be greater if there were no insurance market at all, since the benefits of mitigation would accrue to the homeowner by reducing the damage potential from future disasters. The most efficient solution, however, is risk-based premiums since it provides an *ex ante* mitigation incentive to qualify for lower premiums, while maintaining the *ex post* benefit of risk sharing through insurance⁵⁶.

Tax Incentives

One way for communities to encourage residents to pursue mitigation measures is to provide them with tax incentives. For example, if a homeowner reduces the chances of damage from a hurricane by installing a mitigation measure, then this taxpayer would get a rebate on state taxes to reflect the lower costs for disaster relief. Alternatively, property taxes could be reduced for the same reason. In practice, communities often create a monetary disincentive to invest in mitigation. A property owner who improves a home by making it safer is likely to have the property reassessed at a higher value and, hence, have to pay higher taxes. California has recognized this problem, and in 1990 voters passed Proposition 127, which exempts seismic rehabilitation improvements to buildings from reassessments that would increase property taxes.

The city of Berkeley has taken an additional step to encourage home buyers to retrofit newly purchased homes by instituting a transfer tax rebate. The city has a 1.5 per cent tax levied on property transfer transactions; up to one-third of this amount can be applied to seismic upgrades during the sale of property. Qualifying upgrades include foundation repairs or replacement, wall bracing in basements, shear wall installation, water heater anchoring, and securing of chimneys. Since 1993, these rebates have been applied to 6,300 houses, representing approximately USD 4.4 million in foregone revenues to the city⁵⁷.

The principal reason for using tax rebates to encourage mitigation is the broader benefit associated with these measures. If a house is not damaged because it is protected in some way, then the general community gains much larger savings than just the reduced damage to the house. For example, residents who would have to leave their unmitigated homes after a disaster, but who were now able to stay there because it was protected, would not have to be fed or housed elsewhere. These added benefits cannot be captured through insurance premium reductions, which normally cover damage only to the property. Taxes are associated with broader units of analysis, such as the community, state, or even federal level. To the extent that the savings in disaster costs accrue to these units of government, tax rebates are most appropriate.

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CONCLUSIONS

The past 15 years have witnessed a series of large-scale catastrophes that have inflicted historic economic and insured losses throughout the world. Half of the 20 most costly insured catastrophes since 1970 occurred after 2001. Except for the terrorist attacks of September 11, 2001, all of them were natural disasters. In Chapter 1 we discussed why the growing concentration of population and structures in high-risk areas, combined with the potential consequences of global warming, are likely to lead to even more devastating catastrophes in the coming months and years, unless proper risk reduction measures are implemented now.

Chapter 2 detailed the relevant steps in benefit-cost analysis and how this technique can be utilized for determining when well-enforced building codes for mitigating losses from natural disasters would be appropriate. A comparison of the current operation of several insurance programs for providing coverage against natural hazards in the United States and other countries (France, Great Britain and Japan) reveals important differences between countries. One common challenge is how to encourage residents and businesses to invest in loss-reduction measures and insurance in advance of a disaster so as to avoid the large-scale public assistance after a catastrophe occurs.

Most OECD countries have developed and implemented special insurance programs to provide financial protection against extreme events. It would be natural to include mitigation as an important feature of such programs through premium reductions and long-term loans. To date most insurance programs have focused on the financial component following a disaster, not on encouraging adoption of loss reduction measures in advance of the event. For programs which combine both elements, such as the US National Flood Insurance Program, policymakers are faced with the challenge of assuring that the required mitigation measures are really in place prior to the next disaster. Short-term considerations may lead political representatives **not** to enforce these measures.

Chapter 3 discussed why many homeowners have not voluntarily invested in cost-effective risk reduction measures in advance of a disaster. The principal reason is that many individuals believe that the event will not happen to them. In the case of New Orleans, many residents may have felt that they were fully

protected by flood control measures such as the levees that failed during Hurricane Katrina. This false sense of security led to increased development in hazard-prone areas without appropriate land-use regulations and well-enforced building codes. In addition, budget constraints and short time horizons may limit people's interest and ability to invest in hazard mitigation measures and to purchase insurance. As a result an unprecedented level of public assistance is likely to be provided to disaster victims and the affected communities. This natural disaster syndrome has been observed in many countries around the world.

The potential losses from natural disaster are likely to increase in the future unless there is a change in the political will. If we as a society are to commit ourselves to reducing future losses from natural disasters and limit government assistance after the event, then we have to engage the private and public sectors in a creative partnership. This requires well-enforced building codes and land-use regulations coupled with innovative programs such as long-term insurance policies for property protection. Economic incentives for encouraging mitigation need to be provided in the form of long-term mitigation loans.

The rationale for taking these measures before the next disaster is to reduce damage and avoid extreme insurance payments that could seriously challenge the insurance and reinsurance industry and the large-scale disaster relief that is likely to follow. In addition, if structures are well-designed and appropriate land-use regulations are in place, there will be a reduction in injuries, fatalities and the need to relocate large number of victims that could have enormous psychological and sociological implications both in the short and long-run.

Part III

**COPING WITH NON-CONVENTIONAL CRISES:
STRATEGIC LEADERSHIP IN A CHAOTIC WORLD**

Patrick Lagadec* and Xavier Guilhou**

This Part is aimed to clarify the general terrain on which the major crisis issues of today need to be considered and managed, to identify some strategic points of reference, and to suggest the dynamics that must be engaged to consolidate the capacities of our decision-making systems. It addresses the question of crisis management today, covering both its familiar, consensual, and validated areas and those areas of knowledge and know-how that are much more uncertain. The readers, then, are necessarily confronted with a document that combines highly contrasting realities: areas that are already well known to experts (but with which people on the front lines are all too often unfamiliar) and areas that have yet to be given any clear shape (for the literature on crises usually lags well behind events).

We are well aware of the dual difficulty we are imposing here on the readers. They will have to venture into fields where the contours and the points of reference are still hazy and under discussion. They will also encounter a form of writing that is much less conventional than that normally found in reports. Moreover, when it comes to emergencies and crises, the established approach tends to focus on plans, fact sheets, and checklists, in order to classify and format realities often marked by confusion. But if, as here, we are to deal with crises on shifting and, in the end, chaotic terrain, we cannot rely on – indeed, we must eschew – such traditional fact sheets and simplified schemas. It is only by making this sacrifice, and not by contenting ourselves with developing ever more orderly classifications for pigeonholing risks, that we can begin to come to terms with the crises of our time.

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INTRODUCTION

Whenever the issue of new risks and emerging crises arises, the spectre of September 11 casts its shadow. But 9/11 is not the only issue. For instance, Katrina has altered the agenda of influential circles in Washington, which are now calling for an "all-hazards approach" less focused on the single problem of terrorism. More generally, we find ourselves today in a transitional period, marked by global discontinuities with respect to security and vulnerability on all fronts - environment, climate, demographics, public health, technology, social dynamics, economic tensions, geostrategy, violence. Whatever the field, we now see the curtain fall on an era whose mantra was "everything is under control" - the misleading guiding principle that dominated the approach to risk and crisis throughout the years 1980 to 2001. In other words, we have witnessed "the end of zero risk" (Lagadec-Guilhou, 2002), and we now need a new vision and new practices.

Two major, mutually reinforcing challenges compel us to rethink our guiding paradigms in depth. For one thing, events can now take on dimensions that are completely "off the charts" and out of proportion with what we used to consider reasonable to envision. On the other hand, our environments and our bases of reference are increasingly shaky and unstable and prey to violent de-structuring and restructuring. In other words, the universe of risks and crises is undergoing profound change. And our countries and our leaders are now called upon to adapt to these new battle lines.

We must tackle these questions head on, overwhelming and dovetailed as they are, and even if they may seem to us "unthinkable" (Lagadec, 2005). We must do so, not just to protect ourselves, but to more ambitiously imagine and pursue collective projects in this turbulent world, which combines the unfathomable and the threat of sudden collapse, but which also provides opportunities for rebounds that are equally "inconceivable". Rebound indeed, for what is at stake is not merely tragedy and impasse. We may think here of the Chinese character that famously stands for the concept: "danger" and "opportunity". Those who strive to take the future in hand also forge precious tools for opening promising new paths. Provided, of course, they are ready to

seize openings and opportunities offered by the sudden and the unexpected. Those opportunities present themselves only to those who are prepared.

Yet it is true that the underlying perception of the discontinuities that assail us from all sides tends to be one of loss and mourning. This is understandable, for historic breakdowns can indeed be overwhelming. The historian Barbara Tuchman (1962) put it beautifully when she described the funeral of Edward VII in 1910 against a backdrop of the demise of an entire world order:

“The muffled tongue of Big Ben tolled nine by the clock as the cortege left the palace, but on history’s clock it was sunset, and the sun of the old world was setting in a dying blaze of splendour never to be seen again” (p. 1)

“Lord Esher wrote in his diary after the funeral: “There never was such a break-up. All the old buoys which have marked the channel of our lives seem to have been swept away” (p. 14)

In fact, our current world and our perceptions of it are strikingly similar, when we consider the assaults that are steadily chipping away the foundations of our old world of the 20th century. We are at a point of historic discontinuity, which calls for much more than mere tinkering with and tightening up of security around the edges. The dominant impression is that of a world which is escaping all known frameworks, a world we can no longer manage, and for which our plans dissolve into nothingness, the frenzy of real-time, media zapping and political disarray. It is not, as some might have believed these last years, simply a question of equipping ourselves with a crisis management toolkit and checklist and thereby getting through the occasional incident or rough patch.

Of course, we are not starting from scratch. When it comes to technological security, in particular, we have not been sitting idly by these last 30 years. After Seveso (1976), Three Mile Island (1979), and Bhopal (1984), risks were recognized to be "major" (Lagadec, 1981a, 1981b), in the sense that they escaped the confines of industrial compounds, scientific categorizations, and frameworks of governance. The crises that made their way onto the agenda demanded new paradigms and new practices; indeed much was done during the 1980s to adapt our responses to the risks and the crises that came at the end of the “Thirty Glorious Years”, 1945-1974 (for example the post-Seveso legislation in Europe in the domain of technological risks). Yet whether we speak of natural risks, technological risks or the threat of terrorism (the distinction is in any case increasingly difficult to draw), we are facing realities

today that are more complex and more pressing than the accidents of the late 20th century.

Similarly, there has been very significant progress in the field of insurance and reinsurance, and specific mechanisms have been set up to cover major natural risks, industrial catastrophes, and terrorist threats, with a more recent extension onto the financial markets¹. But we must not forget the warning long issued by Munich Re, which is still highly pertinent today (1980):

"Foresight and preventive measures against damages are only too often overtaken and exceeded by evermore considerable hazards (...). Insurance was instituted as the result of human reasoning. To a large extent, it allows us to repair the material consequences of human failures. But it faces logical limitations as soon as mankind no longer has the capacity to deal with the problems of its existence in a reasonable way."

In these fields, progress is undeniable, although it still needs to take root. Yet this is not enough. A new and quantum leap - intellectual, operational, and in terms of governance - is needed on all fronts, and on an even wider scale. The risks and crises of 2006 are no longer those of the 1980s. After the World Trade Center attacks, the 2004 Tsunami, Hurricane Katrina, and the spectre of a flu pandemic that is said potentially to threaten the world economy (Cooper, 2005), it is now our turn to experience the feeling - unspoken, tenacious and widely shared - that our own "buoys" are terribly inadequate. We must recognize that the gap between the world of risk in the 1980s - when we started to forge the benchmarks in effect today - and the current risk landscape is just as wide as between the end of the Great War of 1914 and World War II.

This paper attempts to describe and assess this chaotic world of ours. Those who prepare for the "wrong" war, and resort to erroneous visions or strategies, will encounter nothing but disillusionment and fiasco, however excellent the tactics, organization, models, tools, and mathematical calculations that have served us to date as responses and strategic horizons.

Responses

Yesterday's threats (factories that suffered localized accidents, ordinary or "class-3" hurricanes) have certainly not disappeared. Therefore, we still need to marshal our existing capacities for risk control (Nicolet, Carnino, Wanner,

¹ These issues are dealt in the other Parts of this publication.

1989) and crisis management (ten Berge, 1990; Lagadec, 1991; Fink, 1986; Heath, 1990) with which the professionals are thoroughly familiar. And we must be wary, for expertise can vanish in just a few years. Yet while cultivating this expertise, and beyond it, we must also look at the challenges and upheavals now emerging in the field of security, and more generally across the entire panorama of our development and our global (dis)equilibrium. The line that typically marked the furthest horizon of previous studies and models of risk and crisis management needs to become our starting line, both for analysis and for action.

Since September 11, 2001, a great deal of thought has been given to the notion of major risks in complex societies (IRGC, 2005). The issue of protecting and insuring critical infrastructure against terrorism or major disasters has given rise to countless expert papers and international meetings. “Business continuity” is now the focus of many conferences and initiatives. The OECD has contributed greatly to this progress, as much through its studies and its expert meetings as through the forthright statements of its Secretary-General.

The immediate task is to understand these changes in the order of *problems* (Quarantelli, 1996; Dror, Lagadec, Porfiriev, Quarantelli, 2001), and to make the necessary changes in the order of *response* (Lagadec-Guilhou, 2002; Godard-Henry-Lagadec-Michel-Kerjan, 2002; OECD, 2003; World Economic Forum, 2006). We need a clear awareness of the discontinuities we are witnessing. Even more, and going far beyond simple diagnostics, we need the determination, the indispensable creativity to explore, to test, to validate approaches to what must be a fundamentally reinvented concept of governance.

The subject is immensely broad, and we are well aware of the limits of the analysis that we can offer in this part of the publication. Our ambition will focus on suggesting a number of paths of questioning and of work on three key points:

The fundamental issues. What is this universe of non-conventional crises, what are the new foundations of our collective security? This is less a question of adding up categories of risks and crises than of identifying the basic lines of diagnosis for answering the crucial question posed by any analyst: “what is this about?” Beyond conventional threat typologies, we must now think in terms of the breakdowns and discontinuities, both imposing and complex, that deeply mark non-conventional risks and crises. Two phenomena are intrinsically linked in this regard: the propensity of emerging risks to generate chaos, and the “liquefaction” of our basic foundations.

Operational responses. To deal with today's emerging crises, we need to develop entirely new skills. Certainly, those acquired in the past decades are

still valid footholds worthy of mention; but in addition, the new frontiers relating to security and vulnerability demand new responses. The goal is not to review all the literature, scientific or operational, which in any case is often more tactical than strategic, but rather to trace some "lifelines" that are essential for governments, international institutions or private operators grappling with the risks and crises of our time.

Strategic initiatives. As the OECD Secretary-General put it so forcefully in 2005, "The problem is less in defining what the challenges are - this is quite well known by people in the field - but rather translating our understanding of those challenges into political action. [...]. This requires a comprehensive and co-ordinated approach. A piecemeal response will not work." (Johnston, 2005, pp 3, 16). These remarks hit the nail on the head: we have been too much inclined in recent years to compile diagnostics, classifiers, and tactical checklists. Yet at times of great historical challenge, these basic elements are far from enough - and may even turn out to be part of the problem. The imperative is to put ourselves truly in position, in a determined frame of mind, to meet the current challenges in all their complexity. For a start, we must not allow ourselves to be overwhelmed by fear, for then we will merely stumble from one fiasco to the next, held hostage to outdated visions. But beyond that, if we are not to abandon governance to circumstances, we need to plan ahead so that we can pool our energies, lay down yardsticks, and unleash self-reinforcing dynamics. This requires determination: the way to counter discontinuities is through "creative ruptures" (Lagadec, 2000). This also requires new know-how. Already, some guideposts, or at least some points of departure can be suggested. But it is less a matter of new scripts and arsenals of apparently sophisticated tools, than the mobilization of wills and the capacity to apply our intelligence in new ways, for dealing with ever more turbulent times (Lagadec, 2006b).

As the reader will now understand, this paper is less a summary of the findings and the tools already at hand, in the tradition of the years 1980-2000, than a strategic point of departure. In each of the three chapters, we shall attempt to identify a few essential guideposts for policymakers who want to reassess their vision and action in the light of the challenges to be met.

Since we are in a time of transition, we will attempt to encompass at the same time the best of past achievements, and intuitions about the challenges now emerging. In other words, we shall try both to recall what we know about more "conventional" crises and how to manage them (knowledge and know-how that we must retain or urgently re-acquire), and to explore new forms of crises and new sets of responses to them.

Chapter 1

THE NEW WORLD OF RISKS AND CRISES

The break between the end of the 20th century and the beginning of the 21st-century has been violent and disconcerting. Our world used to be relatively stable. Certainly, it could and did undergo serious breakdowns and crises: but those were charted, localized, manageable, and reparable within established frameworks. Now we are in the grip of events which lie beyond "normal" categorizations. We find ourselves thrown into a world that is losing its bearings, its balancing mechanisms and its internal borders. We are moving from the accidental - specific breakdowns within generally stable terrains - to the chaotic: a landscape that is profoundly and permanently de-structured, a matrix of security problems responding to laws that we do not understand. A world where crisis becomes the central operating mode, and which is generated by events, processes, and combinations that are increasingly off the scale. Two essential types of difficulties come together to produce today's crises:

- *Shocks no longer fit their customary frames of reference: we are witnessing difficulties that in terms of scale, complexity, and speed "burst the seams" of our understanding and our vision.*
- *These shocks are arising against a backdrop of contexts and moorings that are also shifting with increasing speed, which only compounds our loss of bearings, management capacity, and the collapse of confidence.*

Hence, there can be no "technical" solution, however sophisticated, to these emerging crises. We must first assess the issues and then invent appropriate responses.

In writing about crisis management, it is customary to establish categories of events, and then offer codified responses, usually case-specific. Today, decision-makers need a radically different approach. The main challenge is not so much the particular technical content of crises, but rather our capacity to understand the inherent - and largely uncharted difficulties - we have to face. Difficulties which arise on two fronts, and which are mutually reinforcing:

- ***Crisis dynamics increasingly tend to be “extreme” in all respects:*** they are now characterized by highly destabilizing qualitative difficulties, which extend far beyond our intellectual, cultural and managerial codes of reference.
- ***Our bases of reference are collapsing:*** this exposes us to a sudden and fundamental loss of bearings, and can provoke destructive domino effects, even in the case of local, limited or merely suspected disturbances.

This first chapter explores, without claiming to be exhaustive, a few essential points relating to these two trends.

Before proceeding with our analysis, a word of clarification is in order. Our scientific, managerial and governance culture has made all of us, regardless of our specific national traditions, the heirs to a well-established “crisis management” *domain*, one that, like a tidy French garden, was defined by its internal borders, composed of compartmentalized lots, and managed in accordance with established rules, all within a globally stabilized context, resting on a solid and robust foundation. This is the intellectual setting in which we developed our tools of risk analysis and crisis management.

Certainly we acknowledged that breakdowns could and did have severe consequences, as well as collateral fallout, but we still believed that emergent situations would remain measurable, stable, and charted. This allowed for an approach to risk that was quite in harmony with conventional scientific and operating rules: measurement, reproduction, verification, and optimization. Consider what Peter Bernstein had to say in his cult book on risk, *Against the Gods*: “The best decisions are based on quantification and numbers determined by the patterns of the past” (Bernstein, 1998, p. 6). Or the definitive statement of Alvin Weinberg: “Science deals with regularities in our experience. Art deals with singularities” (Weinberg, 1985). It is this vision that underlies our approach to risk and crisis: any breakdown is merely singular, and crisis resolution simply aims to return to “normal” equilibrium. Hence, “business continuity”, “risk assessment”, and “crisis management” involve nothing more than applying recognized tactical expertise to awkward, but short-lived, events:

proper checklists and good operational training ensure that things promptly return to normal. If necessary, some very powerful props can be called into play, in terms of logistics and financing, in which case-solid tactical know-how can often be relied upon to ensure efficiency in "damage control" or "recovery".

Yet, lo and behold, these fine foundations have now been undermined, torn apart, rendered unintelligible, or have even vanished. What is the "probability" of an off-the-scale terrorist attack? The probability of a viral mutation? How can the finest-looking crisis plan be put into effect in a country that has no government? How can insurance companies deal with a pandemic like that of 1918? Towards the end of his book, Bernstein admits that "discontinuities, irregularities and volatility seem to be proliferating rather than diminishing". (Bernstein, 1998, page 329). Foundations, frontiers, regularities no longer respond to our models. What appears now on our radar screens is incoherent, contradictory, and volatile.

Our cultures, our psychological foundations, our institutions and our tools were all designed to work in a stable, modelled, measurable universe; they were sensibly rooted in averages, in "reasonable" levels of severity. Our forecasting and catch-up capacities would deal with aberrant emergencies *at the margins* of the system. It is little surprising, then, that we struggle when confronted with situations that deprive us of our basic moorings, and push us to the brink of chaos - or even over the brink - where our most fundamental frames of reference become ineffective, or even irrelevant.

This shift from the conventional to the unconventional – i.e. the "unthinkable", as long as we remain locked into our old ways of thinking about management and governance – constitutes the essential challenge in the crises of our time. The problem is no longer to make allowance *on the margin* for extreme events (Pickford, 2001), but to *focus* our thinking well beyond the bounds of the conventional, for the obvious reason that those bounds have lost most of their former relevance anyway. This is the point on which what follows is premised. We'll begin by addressing some of the crucially (de)structuring factors on the two fronts indicated above: namely, the fact that emergent events are increasingly "barbarian" in nature (by which we mean that they do not "play by the rules") and that our foundations are crumbling.

1. Bursting our frames of reference

The last quarter-century has seen remarkable progress in risk control and crisis management. Much has changed since appalling deficiencies were brought to light by the first great catastrophes in the United Kingdom in the 1970s (Flixborough, a chemical factory obliterated in 1974), when withering

criticism was levelled at the then-prevalent "telephone directory method" of risk control. This relied on classifications, overly case-specific, technical responses, which engendered a systematic propensity to act too late. France underwent the same evolution (as exemplified by the 1976 law on "dangerous" facilities), followed by the EC (the Seveso directive) in the early 1980s. This shift in turn gave rise to statistical, probabilistic, sociological approaches, "risk management", and the entire arsenal of crisis management - plans, tools, organizations, communication and so on. We developed systemic approaches, stressing managerial dynamics rather than specific features of individual components or processes. We adopted the notion of "in-depth defence", calling for consolidation along different lines of protection, the coordination of which would provide comprehensive security.

But we now must go beyond that. It is time for another shift in our approach, for the development of a new response "grammar". The need is already clear when it comes to questions such as public health, computer security, and power blackouts. The world of risk, the world of crises, have changed, and we must change with them.

By going beyond sector-specific analyses, we can identify the *generic* dimensions that determine these new crisis dynamics.

The scale of the phenomena. This is the most obvious factor - when a Katrina-style hurricane can devastate an area as big as Great Britain, when a storm like that of December 1999 in Europe can down as many trees as had all previous storms in the preceding two centuries combined, when a blackout can hit a whole continent... But we have to go well beyond this "obvious" dimension.

From the local to the global. In the 1980s, crisis management began to take into account the "neighbouring residents" of a factory or power plant in its calculations. But in today's crises, this "neighbouring zone" often expands exponentially to include the entire world - such was the lesson of Chernobyl (1986). In addition, the "Achilles' heels" of our systems are no longer specific, localized failures *per se*, but the fact that worldwide turbulences can tap into and magnify the potential of dormant, particular risks. This was the lesson of the December 1999 storms in Europe (which provoked the flash flooding of the nuclear power station at Blayais in France), and it is a threat inherent to all the great planetary "hurricanes", whether we are speaking of the climate, the environment, public health or terrorism. Every point of the planet can be hit by an imported crisis that originated far away, in space and in time.

The network. The intricacy of the vital infrastructure on which we are increasingly dependent at the national and international levels can act as a resonance chamber that will magnify a local breakdown to unprecedented proportions, or spark local problems for which the source and the solution are beyond local control. In the wake of September 11, the security of critical infrastructures (energy, water, transportation, information systems, banking systems, public health systems) came under close scrutiny, both in terms of protection (Auerswald, Brancomb, LaPorte, Michel-Kerjan, 2006) and insurance against a major disaster (Michel-Kerjan, 2003; Kunreuther-Michel-Kerjan, 2004). Indeed, a commission set up by President Clinton had already broached this issue in 1997-98:

“Our national defence, economic prosperity, and quality of life have long depended on the essential services that underpin our society. These critical infrastructures – energy, banking and finance, transportation, vital human service, and telecommunications – must be viewed in the Information Age. The rapid proliferation and integration of telecommunication and computer systems have connected infrastructures to one another in a complex network of interdependence. This interlinkage has created a new dimension of vulnerability, which, when combined with an emerging constellation of threats, poses unprecedented national risk.” (President’s Commission on Critical Infrastructure Protection, 1998)

Speed. The SARS episode in 2003 showed the need to think of our vulnerabilities in the context of highly compressed time units. The combination of the virus and the jet airliner changed the rules: in just a few hours, the virus jumped from Hong Kong to Toronto via the United States (the geography dictated by airfares does not conform any longer to that of the planisphere): a single, symptom-free carrier was enough to shake the capital of Ontario (which lost 15 000 jobs). Similarly, on 14 August 2003, a huge power cut plunged the north-eastern part of North America into darkness in a matter of 20 seconds. Today, an electronic glitch could shut down our information systems worldwide within a minute (Cukier, 2005). And of course the slightest hint of a spiral effect can instantly spark a worldwide media frenzy. When we realize that it takes a good 10 days to get our systems up and running in case of a freak event (Katrina, heat wave, tsunami), this time discrepancy is a cause for concern.

Ignorance. We now often find ourselves moving from uncertainty, a dimension to which we are well accustomed, to ignorance. Not only do experts now find themselves at the very limits of the current state of knowledge, but their theories and plans are simply not working. An expert will in many cases have great trouble in comprehending the threat and offering a prognosis; his

stock of prior observations, his laws of probability are no longer relevant. He may not even know whether there is a problem at all. He may suspect a phenomenon, but he can no longer exclude it. Similar uncertainties plunge decision-making systems into disarray. This became brutally clear during the Y2K transition, or with the "mad cow" affair (Phillips, 2001), where stakeholders were plunged into a maelstrom of contradictory information, between concerns that there might be "millions" of victims, official pronouncements that the disease was harmless, and the eventual, reassuring scientific assessments in hindsight, which allowed many to regain their bearings by simply shrugging off the whole episode as "panic over nothing". In August 2003, some officials thought it best to shrug their shoulders again over "a bit of summer heat", until, over a period of 10 days, the toll mounted to a staggering 15 000 deaths in France and 20 000 in Italy (Lagadec, 2005). This same lack of benchmarks can be seen with all the major issues, whether they relate to the climate, to nanotechnology, to genetic engineering, or to terrorism. The problem is no longer (as in our "positivist" recent past) to identify what we "still" don't know, or what lies at the limit of our knowledge - but more modestly; to try to discern what parcel of our available knowledge really is robust enough to resist the rash of questioning from all sides that modern crises elicit, and guide us through them when all else fails.

Off-the-scale complexity. Our modes of acting are configured according to "normal" benchmarks of complexity, i.e. a *typical* emergent event can be neatly classified within a relatively defined and stable context (observing the *ceteris paribus* rule). Now, these benchmarks have been abruptly exceeded, and what was a given is no longer. This was the case with the class-5 (and then class-4) hurricane that hit New Orleans on August 29, 2005. Here we had a sudden phenomenon that involved an off-the-scale hurricane twice the size of the biggest ever witnessed, persistent flooding, a series of industrial disasters, outmoded evacuation schemes, widespread lethal pollution, destruction of 90 per cent of the essential utility networks (energy, communications, water etc.), unprecedented public safety concerns ("unprecedented" at least in the United States), concern over the possible loss of the port zone (essential to the continent's economy), uncertainty as to whether portions of the city could be saved – clearly speaking of a "hurricane" had become irrelevant and counterfactual to describe the set of challenges at hand. And this is becoming increasingly the norm: concepts, frameworks, scientific categorizations are exploding, and those who nevertheless cling to them are likely to be swept away.

The inconceivable. This is the most destabilizing element of all. America had expected missiles, but it was hit with box cutters. We thought global epidemics were a thing of the past, and, lo and behold, the spectre of a global

pandemics has returned. Indeed, when we look back at the flu pandemic of 1918 (Barry, 2004), we even have to acknowledge that societies of that time were probably a good deal more resilient than ours, trapped as we are by the widespread devotion to “lean process” and “just-in-time” principles that can transform a minor breakdown into a disaster almost instantly. In the wake of Katrina some have asked: what if the second hurricane, Rita, had hit Houston? What would it mean today to lose a major urban centre, a “hub city”? Moreover, as soon as the inconceivable happens, the simple plausibility of threats can unleash a nasty spiral - a few cases of bird flu, and poultry sales drop 20 per cent in just a few days across the continent, because of a sudden collective feeling that the old verities have been shattered.

A “class-5” media storm. As soon as an event is seen to exceed the norm and to suggest an imminent public disaster, the mass media will quickly swarm the scene, dominate coverage of the story, and thereby dictate collective representations of the emerging event. In so doing they tend to resort to “Hollywood-style” narrations, and desperately strive to sensationalize any given situation. Yesterday's question was whether (and how) our crisis managers - the exclusive recipients of warnings, analyses, and recommendations from the experts - would pass on information to the media with sufficient transparency and understanding. The challenge for them today is how to cope when all the tools of governance and “top-down” logics are promptly outflanked by these unbelievably powerful mass-media systems that are so adept at “staging” events, and even have their own “situation rooms”? What remains of the traditional leaders’ ability to “manage” events when virtually the only operating rules are those set by non-stop worldwide networks that sensationalize every story and reduce its complexity to a few seven-second sound bites? Moreover, the media dynamic feeds on itself and spins out of control: stakeholders end up adapting their actions, words, language and images to ensure that they are “camera ready” for the TV networks, which are only too happy to take the ready-made product. The Larsen effect - the acoustic feedback between microphone and amplifier that boosts any noise to the point of saturation - is in full swing. Everyone, including the journalist, becomes a spectator to this machine that produces news at once inaudible, emotional, and uprooting. Of course, the media have ways of checking their information, at least for “conventional” stories. But such gate-keepers fail, instantly and globally, in a large-scale crisis. While major TV network claim that they merely report on the decisions that are being taken, those are in fact dictated largely by popular sentiment, which in turn is shaped by the media coverage itself. And everyone, starting with the manager, tunes in to CNN - or other major networks, if a global “image war” happens to break out.

In other words, the “good old” crises of the 1980s and 1990s, with their confined stage and still relatively simple rules, are undergoing profound change.

2. The dislocation of our environments and benchmarks

As with hurricanes, which begin and grow by drawing energy from the oceans they pass over, the major crises of today thrive on, and tap into our key vulnerabilities, especially at the fault lines that scar our geographic, human and historical landscapes. Without attempting to be exhaustive, we can identify some of these fault lines that account for 21st century crisis dynamics. Let us sketch out briefly two main fields for analysis.

2.1. The sudden bursting of boundaries

Our world is assailed on many fronts by extravagant mutations that do not fit our normal frameworks of reference. Multiple and interdependent dynamics are completely reshaping the crises that we face today, in terms of their scope, their nature, their speed, and the conditions for dealing with them.

Demographics is surely the most critical factor. For a time we believed that modernization would flatten the demographic curve that had exploded during the 20th century, when the world population soared from 3 to 6 billion. Yet an examination of UN data does not support this hypothesis, which now turns out to be little more than wishful thinking: the next half-century will see more than 3 billion added to this figure, bringing it to 9.3 billion by 2050 (OECD, 2003). This trend produces a number of destabilizing factors, such as the concentration of these increases in poor countries, and the ageing of populations, even in developing countries. Moreover, the geographic dimension of this growth warrants detailed analysis. It is taking place for instance in the Indian Ocean and the Pacific zones, especially along the coasts and in the great deltas, those vital interfaces between rivers and sea. If one overlays these areas of demographic growth onto maps charting the major natural hazards (tsunamis, earthquakes, hurricanes, landslides) one sees a formidable potential for disasters that could easily provoke millions of instant casualties and which radically outstrips our benchmarks.

Urbanization and mass population movements result from this demographic explosion. It is estimated that 48 per cent of the world’s population today lives in cities. It was in the West that this unprecedented phenomenon first appeared: our urban population jumped from 20 per cent to nearly 80 per cent in less than three generations. But with the globalization of trade, this pattern is now extending to the entire planet. According to UN projections, urban dwellers will account for 60 per cent of the world population

in 2030. And while in Western societies, with their high purchasing power, people may fancy the notion of "rurbanization", alternating city life and modernity with the quest for ecology and authenticity, we must recognize that only a tiny portion of humanity can think in these terms. The rest of the planet has an entirely different perspective of the city: it is the point of convergence, the goal of mass migrations against the backdrop of demographic shifts that are radically transforming the urban landscape of many countries into huge megalopolises. In the grand scheme of things, Paris and London now come across as small towns. Thus latter-day China has more than 40 cities with populations exceeding 2 million, without counting giants like Shanghai, where the urban growth outlook defies the imagination. The city of Tianjin, east of Beijing, already has 12 million people, and its authorities are looking at growth that would double this number by 2030. Never in the history of mankind have there been such upheavals in the patterns of societal life. Today no one knows how to cope in terms of urban engineering, and our models have all been outpaced by the overall dynamics.

The fact is that "unthinkable" issues of urbanization now confront the world as a whole. There are already nearly 650 urban areas with a million people. This trend brings with it three major challenges: poverty, environment, and insecurity. Poverty is most heavily concentrated among women and children, the most vulnerable city dwellers. Exponential growth will have a tremendous impact in terms of health, hygiene and sanitation, and in particular the vital factor of drinking water. Nor can we overlook the issue of access to education, which is crucial to the stability and security of urban areas. Here again, the gulf between challenges and capacities is beyond belief.

The explosive potential of pressures on energy costs. In the context described above, the issue of transportation becomes a nightmare, primarily in Asia but even in the West. Our current means of transport are consuming - at the expense of massive pollution - more than 60 per cent of fossil fuel production, which is due to run out in 30 to 40 years (this is most notably the case with oil, the keystone of energy supplies). In the meantime, rising demand will inevitably spark a price explosion in fossil fuel and in transport logistics. These pressures will spark not only market disruptions but major crises at a geostrategic level. We are just at the beginning of great and profound movements that will be fed by the double impact of globalization and urbanization. The great mutation from the 20th century has to do with the degree of cultural intermingling among the populations concerned. We are far removed from the regional rural exodus that occurred in the old Europe: the movements now underway affect the entire planet and they are much more complex in their scope and their nature. Today, the question of "peak oil" management could bring the Western model to its knees. This is the major risk

for the coming years, if not the coming months: the dynamics of anticipation (with experts forecasting the collapse over time of particularly vulnerable sectors) could be just as destabilizing as actual physical ruptures.

The environmental issue. This involves a host of questions - water scarcity and pollution, soil loss through wind and water erosion, air pollution, sudden climate change - which can produce major intercontinental and worldwide imbalances. To this we must add the impact of technological developments that are largely unpredictable but that will be both specific and systemic in nature: electromagnetic radiation, bio- and nanotechnology, installations reaching the end of their life cycle, and wastes of all kinds. The fields to be considered are innumerable, and some of them will be completely foreign to our benchmarks and our experience. In short, every problem confronts us with an unknown world; combinations of problems produce hyper-complexity that leaves our scientific frameworks stripped bare. The global context produces specific problems, of public health in particular, that cannot be dealt with on a local or a one-off basis.

The systemic fragility of vital networks. We are the heirs to a world in which risk was installation-specific - the Seveso model, where "risk control" was the issue. Now we are faced with weaknesses inherent in the general architecture of our vital systems. Their structural interdependence is far beyond the level that we began to recognize in the 1980s, when we spoke of "tightly coupled" systems. What we now have is not only a coupling of critical systems, but a civilization based essentially on interlinkages that are generalized, dynamic, and largely invisible, even to the operators most directly concerned. As a clear example of such heightened vulnerability, "just-in-time" supply chains have been implemented to excess - for example, food stocks in shopping centres are enough for barely half a day. These are not just occasional aberrations that can be easily remedied. The global economy *depends* on this structural fragility, at least if we stick to the rules of today, in particular the financial rules (which have long relegated technical or systemic security issues to the background). The question of vulnerability, then, is really no longer a problem of risk at some sensitive point - a threat for which we have a whole arsenal of risk assessment - but a structural problem, one that is intimately linked to the very way our systems function.

This principle of general interdependence holds regardless of how we approach it, whether we are speaking of physical flows, as discussed above, or virtual flows - financial and banking servers, automatic teller machines, telecommunications, air traffic control systems - or the requirements of comfort (or survival, depending on the circumstances): power grids, air conditioning. The vital nature of these factors can be measured in an event like September 11,

Katrina (Lagadec, 2006a), or a heat wave. Furthermore, the principles underlying our global equilibrium can be turned against their original purpose: therefore, these factors have also become potential factors for mass destruction: "the network *is* the weapon", as was demonstrated (to a limited extent) in the case of postal services hit by the 2001 anthrax attacks and hoaxes.

Urbanization, population movements, sensitive economies, as well as collective refusals to accept risk - thus, every speck of white powder sparks a general shutdown - have become sources of weakness. Terrorist networks can exploit them, and this has been the central concern in the years since 2001. But this vulnerability can also bring major crises via natural disasters, as Katrina showed, or simply when we lose control of our own processes - as if we were Prometheus paying the price for mastering fire - as we began to see in Europe in 2001 with the anthrax scares.

As we can see already in these five dimensions, we are facing challenges that exceed our physical and intellectual capacities. This means that we must completely rethink our methods and above all our questioning in the face of such violent and extreme threshold events - all the more so, when we consider a second fault line, to which we now turn.

2.2. The ruptures in our fundamental assumptions

There is something more dangerous than the threat of crisis itself, and that is the fundamental weaknesses in the very design of our defence system. As Sun Tzu said in his *Art of War*, the best thing is to "attack the enemy's strategy". And the worst thing, in terms of security, is to tie ourselves up in the straitjacket of outmoded strategies, for then our failures will be systematic and generic. As that Chinese philosopher wrote, if the basic visions and the policies they induce are fundamentally inadequate, we will face "defeat in every battle". Worse, if our leaders perceive any efforts to reform their paradigms as an unacceptable challenge to their position, if therefore our methods for crisis management are constrained by taboos, "sacred cows" and blind spots, our fate is sealed. Our great weakness today is: not only to be "one war behind", but to refuse to rethink our take on the world.

In examining the major crises besetting us today, what is striking is the denial of reality, the refusal to ask (or take) questions, our mental blocks when challenged to think afresh, which go hand in hand with rigidly conformist training and preparations. If an exercise is to be held, for example, it is "inconceivable" that it should stray from the established and accepted scripts. Psychological tensions and the fear of losing control provoked by challenging exercises are such that it is very difficult, and often impossible, to adjust the

approach to risk analysis, to grasp the faint early warning signals of impending disaster, and to prepare for threats other than those of yesterday and the day before. These underlying attitudes betray themselves through knee-jerk responses. Let someone open up an unusual field of enquiry, and he will be sharply put down: "We're here to solve problems, not to ask questions!" Let someone try to introduce a hint of the unconventional into a crisis exercise, and the leaders will take offence: "Certainly not, you'll ruin the exercise!" These instinctive retorts betray a profound mental block. When such denials come that swiftly and systematically, it is clear that a very raw nerve has been touched and some fault lines identified that are no longer by any means marginal.

Historic fault lines. While attempts to make historical shortcuts are always dangerous, one cannot help drawing a parallel between today and the so-called Renaissance era of the 15th and 16th centuries in Europe. Once again, the power and universality of Western operating principles are brought into question, which provokes reactionary behaviours. The issue now is the breakdown of the balance of powers that sustains the security and the prosperity of the systems in which we live.

Geostrategic fault lines. Despite the continued presence of overarching institutions such as the UN Security Council, we are witnessing the emergence of a multitude of "geostrategic" centres, and the burgeoning of horizontal power networks (NGOs, virtual networks over the Internet, informal terrorist networks) that obey another logic and that are moreover ideally adapted to a chaotic world. We have lost most of our intellectual and even "physical" frameworks of reference in this unfathomable context. In the face of such changes, we tend to seek refuge in bland reassurances. We cling, for example, to a highly simplistic vision of a unipolar world, against those who would dream of a multipolar balance. We look no further than the familiar threats posed by "Westphalian" Nation-States, and we still interpret the collective motivations of peoples and groups in ways that fit our frameworks of rationality, while we resent all attempts to approach current evolutions through the concepts of "civilization crisis" or "identity crisis". This illusion brings great comfort for the moment, but it remains an illusion, and it paves the way for severe disillusionment when reality blows away the flimsy and makeshift windscreen that (barely) protected us for a time.

Such were the shocks of September 11: how could anyone imagine that individuals who on the surface had been successfully assimilated into American society, could attack both the economic and financial heart and the military nerve centre of the only remaining great world power - by hijacking airliners with simple box cutters? Yet many other, equally astonishing shocks are brewing, and it is time to explore them as so many major geostrategic fault

lines. As examples we may cite the re-emergence of central empires (most conspicuously, Iran), the emergence of new entrants, and the assertion of new identities (for instance among the Hispanic community in United States and Muslims in Europe). These are the new paradigms that will determine the risks and crises of the near future.

There are *fault lines as well in our basic models of governance*. Our approach to managing societies, even more so to managing crises and other emergencies, is now in question. The most recent large-scale crises (the tsunami, Katrina, the heat wave, Argentina) force us to be especially attentive. The advent of the information society provoked by the Internet, the inversion of communication channels, which are ever less "top-down", ever less the property of any power, but increasingly connected and attuned to real-time, are exploding our pyramidal, segmented and sequenced societies. The societies that are emerging are structuring themselves around networks and concepts of power that have nothing in common with the democratic practices that the advent of the modern industrial world produced. We are confronted with something else, a system that is not yet clearly defined but one where meaning is constructed quite differently. The breakdown of trust between civil society and the established powers can be traced to this transformation in the ways of action and of communication in the field. It is a groundswell that affects the whole world and that calls into question the resilience of the democratic model and its capacity for change. Joel de Rosnay (1995, 2006) takes this point further to declare that we are tottering away from the democratic model, towards a higher model, that of the "symbiotic". This rupture, as he sees it, will break us free of the bonds of power that have become obsolete in our way of life, that hinder the circulation and exchange of information in a world that has become infinitely more complex. It will give us greater capacity to collaborate and to be creative, through the networking of skills and talents, which will release us from current institutional constraints. If his analysis is correct, what we are witnessing is no less than a genuine revolution that will reshape from the bottom up the very workings of the world's societies.

Fault lines in our vital foundations. This breakdown is even more taboo than the previous ones, because of its extraordinary potential to spark anxiety. When all is said and done, we may come to see the very workability and sustainability of the foundations of our way of life called into question. No one can imagine that the authority, the security or the prosperity of the West could be suddenly overthrown. Yet the World Economic Forum in Davos (2006) put the question bluntly: if the financial, fiscal and economic wizardry on which our entire vision of power rests were to collapse because of a misread threat to the oil supply, or from an emerging power, or terrorist networks, how resilient would the Western system really prove itself to be? In fact, we dare not ask

what might be the systemic effect of a breakdown that would hit hard and simultaneously at a hyper-indebted United States and an imploding Europe (where key countries such as France, a member of the Security Council, and Germany are very fragile), or a terrorist attack on the Arabian Peninsula, which would create an oil price explosion, or an attack against Pakistan, which would pave the way for "inconceivable" scenarios.

With today's unprecedented shocks, we could easily lose large swaths of territory if our reading of reality and its challenges remains as narrow-minded as it tends to be. We must now make this notion of "the inconceivable" the centrepiece of our thinking on risks and crises. Indeed most of what we call "inconceivable" is not so because of the "natural", *a priori* limits of our understanding, but simply because our constraints, our models, and our yearning for comfort and avoidance have led us to put under this artificial category, as in a "no man's land", a number of issues nobody wishes to tackle. When our frameworks, or intellectual "boxes" collapse, "out of the box" solutions are required. Today's most commonly witnessed answer to "unthinkable" events, which combines denial and emotional overreaction, cannot make up for our lack of vision and the deficiencies of our policies.

The combination of these two fault lines - the hyper-complex dynamics of events and increasingly shaky societal foundations that can "liquefy" in an instant (as land reclaimed over swamps does during an earthquake)- are producing a world of risk that is totally foreign to us, one that is "barbarian". The issue is not this or that point of uncertainty, but rather the global and systemic descent into this unintelligible world of the chaotic - a world in which notions like discontinuity and the inconceivable become watchwords. Averages, statistical regularities, and the lessons of history are no longer pertinent points of reference. The atypical, the singular, the exceptional becomes the order of the day. And when the pace, the scope and the nature of the terrain thus depart so abruptly from the accepted blueprint, our visions, our initiatives and our tools rapidly fall apart.

We must rebuild them, and urgently.

Chapter 2

OPERATIONAL RESPONSES: BETWEEN KNOWLEDGE AND INVENTION

In the face of a threatening crisis, our intellectual and managerial tradition calls for us to prepare plans. Those plans set out actions and approaches that will be applied at each stage of the crisis. They are fine structures that involve a whole array of responses, in the style of a victory parade where everyone marches in step to an impeccable choreography. Unfortunately, reality rarely fits the plan's assumptions: warning signals are not recognized, managers disappear from the scene, tools do not work. The crisis unfolds on a battlefield fraught with difficulties, and not on a tidy avenue or square prepared for an orderly parade. As the experts continually point out, what matters is not so much the plan as the planning. If we do not heed this, we are bound for failure.

This chapter reviews what our grand systems are most sorely lacking in:

- *An “emergency culture”, an elementary crisis culture: these are known responses, and we must be aware of them.*
- *And henceforth: the capacity to deal with unconventional crises that demand reinvented responses.*

The debriefings and investigation reports of recent decades point up two kinds of basic inadequacies in our large organizations. Firstly, in many organizations, (apart from those specifically emergency oriented, such as police, fire brigade, etc.) there is an astonishing lack of capacity for emergency response. Secondly, we have failed to take on board the widely documented knowledge and know-how for conventional crisis management. It will be impossible to navigate the world of major crises now emerging without sound mastery of these domains.

Yet we must go even further, to the point where the most recent post-crisis analyses and preparedness efforts usually fall flat: we do not yet have the operational guideposts for dealing with the unconventional crises that are in fact our real source of vulnerability today.

This chapter has a dual purpose: to recall the knowledge we think we have acquired (but in fact have not, in whole or in part), and to begin to explore these new guideposts, which for the most part remain to be built.

1. Responses to be understood and mastered

1.1. *Emergency response capacities*

Major crises reveal, most often, that our systems, private and public, have not acquired the reflexes essential for dealing with emergency situations. It is true that the unconventional crises at issue here are far more complex than the accidents that our rescue squads are used to dealing with. Yet even for situations where the stakes are high, we need such a culture of rapid response to unforeseen situations, which is usually lacking among those more accustomed to case management than to rapid response to an immediate problem.

Experience shows the need for a number of key capabilities:

- ***Detect*** an emerging incident promptly. To be avoided from the outset: an irrepressible urge to dodge the issue; and visceral refusal to recognize any signal; a stress level so high as to be rendered incompetent; the illusion that a specialized unit has been alerted and will take care of the situation without the need for action on one's own part, etc.
- ***Give warning*** internally, to mobilize resources commensurate with the task at hand, without thinking that one can handle it alone.
- ***Intervene***, by rallying capabilities, information and tools immediately. Even in an emergency, meticulousness is essential. Just because

events are abnormal is no excuse for doing silly things and transforming an acute problem into overall confusion. And then there is time management: an emergency demands intervention now, not postponement to the beginning of next week.

- **Report**, to optimize the internal flow of information so that the response can be constantly adjusted.

These props are not enough for dealing with complex crises, and still less so with the great crises coming at us now, but they are necessary all the same. We must understand them, master them, and control them, and not become hostage to them.

In fact, these rules of emergency response were developed essentially for situations with clearly defined characteristics:

- A stable, charted, known world free of surprises that could upset all our management benchmarks, *ceteris paribus*.
- Strong, clear and unambiguous warning signals.
- A problem that can be resolved by technical specialists, working within customary operating frameworks.
- A need for information that does not go beyond a small number of persons and that can be communicated after the affair is settled.
- A simple command approach to management: a fireman or an emergency medic does not ask the victim's opinion before applying the usual treatment.
- Costs which can be readily handled by the insurance system, and which has no major problem in returning to normal.

As soon as we move up the scale of severity, some important discrepancies appear vis-à-vis the natural field of application of emergency tools:

- In terms of technical complexity, there is a discrepancy of scale.
- In organizational terms, there is a discrepancy of complexity.
- In terms of governance, we move from a clearly defined field of operations to fields that are much more fluid and call for operations that are much less automatic and much more deliberate, with leadership structures that are more complex than for routine accidents.

We need new skills, then, on two fronts:

- The ability to deploy this emergency mindset: otherwise, bureaucrats will wait too long before intervening - and in all fields, especially in highly unstable situations, the fireman's rule applies: "one minute, a glass of water; 10 minutes, a truck; one hour, a whole fire station".
- The ability to control all these rapid response levers, without getting tied up in conceptual straitjackets that reflect the frequently heard complaints of people ill-prepared for events of strategic dimensions: "We're here to solve problems, not to ask questions", or "In a crisis there's no time to think".

However sophisticated the methods and tools recommended for handling the most complex crises, however difficult the situations for which we must prepare ourselves, the basic capacities cited above need to be (i) thoroughly acquired and (ii) sufficiently internalized so that even a mega-scale event will not overwhelm them.

This last point is very important: often, the surprise element and the sheer enormity of the situation will make people forget the mechanisms they had learned to wield in less intense events.

1.2. Crisis management capacities¹

A crisis is qualitatively different from an emergency. The problems coming at us from all sides do not fit within the normal bounds of conventional emergencies. In order to anticipate, react, handle and resolve critical problems, organizations must be able to understand this world of crisis, and its pitfalls, with which they are most often totally unfamiliar and they must have a response mentality that is suited to this unstable world. Non-conventional crises will of course demand a good deal more, but the elements presented below have increasingly come to be seen, since the 1980s and 1990s, as an essential basis to be understood and applied.

The first requirement for large organizations and for managers is to know their way around this world of crisis, which contrasts sharply with that of emergencies. They must be able to operate in this terrain, marked by ambiguity, uncertainty, instability, and accelerating rhythms - and above all, the threat of destabilization. The architecture of crisis management has four phases, each with its own demands.

1.2.1. The reflex phase: avoid being immediately discredited

Decoding, alerting, mobilizing. The longer we wait in a crisis, the stronger the dynamics in play will have become. We must know how and be able, then, to give advance warning and get mobilization started. This presupposes mechanisms of surveillance and mobilization, which need to be effective in two situations.

Obviously accidental phenomena. In recent decades, large organizations have adopted tools for prompt transmission of urgent information from the field in the wake of an accident: message formatting (the types of data to be transmitted are already formatted and all that is needed is to fill out pre-established forms), urgent information channels (to prevent data from being lost in the system), rules for triggering the crisis response. Of course, the existence of a plan on paper is not a sufficient guarantee: there must also be mechanisms in place, they must be operational, and everyone must know what to do with them. This presupposes an in-depth learning effort to understand the tools, the procedures, and the approach.

Creeping crises. These crises are by definition difficult to discern, due to their inherent stealth. Experience shows, however, that they can be identified by their symptoms: a strange sense of drift, an unusual degree of ambiguity within the organization; arguments advanced that are purely technical (calendars already full, authorizations already obtained, the point of no return is past) to block early moves; the prolonged and inexplicable absence of key personnel, in particular a manager who is both clearly identified and plays a clear role; widening gulfs between participants, between the situation developing and the values proclaimed; the impossibility of putting together a meeting on the latent problem, etc. None of these factors, taken separately, is enough to say that we are in a pre-crisis situation. But when several of these factors are at play, we should pay very careful attention. And if, along with some of the others, the last factor mentioned should appear - the refusal to recognize that there is a problematic situation - then there is a strong chance that we are in a risky situation and one that may already be far advanced. It is urgent then to reconsider the overall situation, the assumptions made, and the positions previously adopted.

Taking charge. We must ensure immediately that certain steps have been taken. It is through practice that we can learn to strike a proper balance between the inability to mobilize and the constant upheaval caused by untimely mobilization whenever an unusual signal is received.

Commit the emergency resources necessary. We must of course look hard at the most complex aspects of a crisis, but we can never neglect our essential duty to rescue people or to make the technical interventions needed to prevent the situation from getting out of hand.

Actively seek out information. We need to assemble factual information, to discern the uncertainties, to understand what we can know promptly and what we will know only later, to know what has not been affected, to begin to make out the nature of the problem (is it an isolated incident, or a generic phenomenon?). There is a basic rule here: the first information received is very often false, particularly if it is reassuring. And if by chance we receive disturbing information presented in a "reassuring" manner, this will likely mean the organization has already been compromised by the crisis.

Open a logbook. It is important to construct a memory of the event immediately. The written record will constitute a database useful to everyone, retaining information that might be lost when there is a handover of responsibility (since crises can last a long time, and the same person will not necessarily be in charge from beginning to end).

Put together a team, and isolate treatment of the crisis. There must be no void at the helm (with no one really in charge), but at the same time the "bridge" must not become too crowded with people (often starting with senior managers) who come to see what's happening (without really getting involved), who make statements about the situation without understanding it, who offer "reassuring" remarks, and who loudly comment on decisions without really taking any responsibility. We cannot have the entire organization dealing with the crisis - except for an event that affects the organization as a whole. Units that are not involved must be able to keep on with their normal work, and those that have to deal with the crisis should do so effectively.

Communicate. A crisis or pre-crisis situation demands both a strong presence and great transparency. The model to follow, at least in most cases, is the reverse of that described previously, which starts from the undoubted need to know with certainty and to be able to reassure before informing. Above all, when issuing a communication in which the informative element will at first be inevitably weak, three major "political" steps must be taken:

- Demonstrate that the situation is being taken seriously: the managers are indeed at the helm and have not jumped ship; they have launched actions; they are following procedures that do not depend on improvisation.

- Recognize the problem (or at least the fact that some believe there could be a problem): this will never be extracted from decision-makers.
- Recognize the stakeholders: this is the essential point. Decision makers are not required to perform miracles, but we expect them not to ignore the individuals and groups concerned.

This three-way demonstration of competence and openness in information and in the public procedures followed is the only effective way to prevent mounting anxiety. There is nothing that sows panic more readily than the suspicion that leaders are incapable of handling the situation and that they are bogged down in the governance models of another age.

Communication cannot of course be confined to the media. Some target audiences must receive special attention: in the first place there are the victims, who are entitled both to tactfulness and to competence; then there are the professions most directly concerned by the problem, for example physicians and pharmacists in the case of a public health problem, or the specific experts in the case of a technical difficulty.

The most important thing to bear in mind is that people are reassured not by insisting that "everything is under control" but by demonstrating that the situation is being taken seriously.

Of course, in some fields and in some circumstances, communication cannot be so frank. But this must be a strategically motivated choice, and not simply the result of incompetence or inertia.

1.2.2. The reflection phase: avoid being immediately discredited

In a crisis, it is not enough to commit resources. The problem at hand must be thoroughly examined, the people to work with must be identified, positions must be thought out on the thorniest questions, and the broad lines of response must be established. This reflection function, performed with the necessary intellectual detachment, must be launched as quickly as possible and must continue throughout the crisis. A crisis cannot be handled by mere instinct, nor by quasi-automatic procedures.

Start the questioning. The first requirement, once initial emergency steps have been taken, is to ask in-depth questions about the situation - at the very time when urgency and stress are likely to block any serious examination. It is especially important to avoid overly optimistic conclusions that would support

the most favourable hypotheses, the most comforting interpretations, and the most obvious interests. The key questions are these: What is really happening? What does this crisis mean, what does it reveal? What could emerge from it? What are the latent fault lines that could be reopened? What could feed the crisis, in the current context? How will the various stakeholders perceive the situation? What are the alternative developments that we can anticipate, what will happen tomorrow, in a week, in a month?

This kind of diagnosis is gruelling work, for too many elements will elude us, and too many of the suggested hypotheses will seem off-the-wall. It takes constant shuttling between indicators, models, hypotheses and observation, but it can gradually define a field of work (just as a surgeon prepares his operating field) and thereby avoid generalized to-and-fro and fragmented responses, or the exhausting attempt (with the attendant one step too late) to pursue all the variant versions of the crisis.

Map the players. A specific effort is needed to identify all the stakeholders who will be involved in the crisis: obvious players, peripheral players, surprise players; players who will quickly collapse, players who will charge from the edges right to the center; relations between players that will change, sometimes radically (yesterday's adversary can become the key to the solution today). If we stick with our pre-crisis prejudices, we will never catch up with the dynamic reality of the crisis: here as in all other areas, we must be bold in our questioning and resolute in looking for new approaches.

Start networking, get out of the bunker. To pursue such questioning successfully, to prepare a pertinent response, we must go beyond the normal circle of players. We must establish links with many outside entities. Even if some of them are in conflict, it is better if they can recognize and talk to each other, as promptly as possible. Experience shows the wisdom of forging or re-establishing these links before a crisis forces us to do so, for otherwise it will be done under the pressure of an extreme emergency, with absolute constraints, and people, organizations and cultures will no longer have the flexibility needed to adjust. But we must also recognize that such openness is not at all natural: on the contrary, in a crisis everything conspires to cut off an organization from most of its environment, and this can very quickly render any exit impossible.

Put together a management system. There are many players in positions of influence and responsibility. The rule of thumb for emergencies, so clear and comforting on paper - "a leader, a mission, and resources" - is not of much use. The principle to follow is, rather, to construct an ad hoc decision-making system, relying naturally on existing managers, but also enlisting in the most appropriate manner the major players who will have a key role in the situation,

as it is and as it threatens to become. Some groups may indeed prove themselves decisive in the situation, even if they were previously deemed a negligible quantity. This structure will have to be made explicit. To ensure that the appropriate players really take charge, to guarantee the functioning of the interfaces, the response system has to be clear and thoroughly understood.

An essential point: in a severe crisis, the authority of the decision-maker flows not from his ability to issue peremptory orders, but rather from his capacity to collect information, intelligence, powers and resources and redistribute them widely. This intelligence, both conceptual and operational, will give managers the indispensable adhesive force to mobilize large systems for useful ends, and to achieve the necessary coherence. This is not to say that we have stripped the managers of their prerogatives, far from it. One of their essential tasks is indeed to explain the rules of the game, which are indispensable for reducing the risk of break-up and splintering inherent in any crisis response. Those rules can be amended as the crisis proceeds, but they must always be as precise as possible, and clearly linked to fundamental goals: flexibility must not be confused with wavering.

In support: a strategic thinking unit. If a crisis of any complexity is to be managed successfully, the leaders must have the support of a group of analysts who can stand back and look at things dispassionately. The task of that group will be to anticipate possible developments in the situation, to keep all aspects of the crisis under active surveillance, watching in particular for mistakes "waiting to happen", and to think about new options for consideration.

This unit should be staffed with people who are used to "thinking outside the box", but who have a sound dose of good sense. It should be devoted exclusively to the strategic thinking exercise, which is a demanding one because it requires sifting the entire field of possibilities and venturing frequently into the supposedly "impossible", in order to be certain that one is not prisoner of an outmoded *weltanschauung*.

Finally, this unit must be in position at any moment to produce a situation summary or briefing sheet for management. Too often, a manager will be submerged in a mass of details and surrounded by evidence that no longer pertains. It is essential to deliver to him, when he calls for it, a strategic note based on the model provided below, and strategically more useful than the traditional "logbook", which can serve as a general reference source but is of no help for rapid managerial response.

Strategic briefing note

Date and time

- Essential facts.
- Technical scenarios: developments, possible domino effects, surprises.
- Stakeholders: participant map, surprises, recomposition of forces and relationships.
- Gaps, deviations and blunders: on the spot pinpointing and anticipating of all the major mistakes committed or about to be committed.
- Discontinuities: what has changed fundamentally in the context and what renders assumptions, rules, working and communication approaches obsolete.
- Progress made: it is very important to identify success stories that can breathe new strength and optimism into the system.
- Proposals for decisive action that can be used as levers to transform the situation, break through bottlenecks, and open hitherto unthinkable possibilities.

Identify fundamental positions. The essential values in crisis management are the acceptance of responsibility (for the safety of the community concerned), openness with information, solidarity in shouldering the economic and human consequences, and creativity in response to the problems encountered. These principles are increasingly being applied, and they stand in contrast to the reticence and secrecy that prevailed in the past. Yet these fundamental principles are not yet ingrained, and they can be quickly relegated to the background by the sense of urgency, the fear of debate, and the attractiveness of a purely technical solution. Yet adopt them we must: no serious crisis can be managed without defining and declaring the values and criteria that will serve as reference.

Those same requirements apply to the quality of the decision-making process. Decision-makers are not expected to come up with magic solutions, but they will be expected (immediately or subsequently) to take an approach that is not only technically sound but also explicit, transparent, and open to debate and validation both by experts and by society. Thus the principles followed will have to be clearly stated so that they can be understood and discussed, and perhaps refuted. The broad lines of the rationale to be followed should be clarified, and so should the “no-no's” that are to be observed.

The deeper the crisis is, the more open one must be to the prospect of reappraisal and questioning. If a crisis is “the moment of truth” (as in Greek theatre), then the way it is handled really calls for a “truth test”, for a meticulous review. There may be Rubicons to cross (lines that were hitherto deemed

uncrossable) that will demand both boldness and discretion, the acceptance of responsibility, and the search for legitimacy. This is surely the most delicate point in a crisis.

1.2.3. Throughout the crisis: maintain overall coherence

This third phase involves efforts to maintain consistency in action, when everything is tending to fragmentation. This must be done in the light of constant and fundamental reflection, to the very end of the crisis.

Managing a weakened system. The key point is not managing a set of operational tools but rather building a permanent strategic framework in which each player can act most effectively. This requires constant attention to the main flow of problems, without being distracted by the twists and turns the crisis may take. The following principles of action can help: ensure that the organization has effectively taken charge of the crisis (that it is effectively mobilized); define priorities and responsibilities; ensure high-quality internal and external communication; watch for weak points and fix them; anticipate developments in the crisis; take determined initiatives (instead of just "following the crisis hour by hour" as we often hear); keep in mind the post-crisis phase.

An ad hoc organization must be put in place to handle certain key functions: decision making (overall guidance), management (monitoring the situation and technical actions), communication (listening to information, issuing messages). To this we must add two support functions: detached observation (staged input of strategic intelligence at the highest level of responsibility); and logistical support for the crisis teams (the crisis usually presents a series of cascading difficulties), ranging from food issues to problems of local mobility, liaison).

Clearly defined task lists can be prepared for each person in these units. An essential point: arrange a site where this crisis organization can operate; assemble all the personnel required; know how to make the organization operate so that it does not shut itself off from events; provide guidance for these different groups with a constant view not only to immediate technical effectiveness and overall coherence, but also to anticipating and asking questions about potential surprises and mistakes.

Secure the required expertise. The issue of the potential input of expertise and its limits needs to be addressed up front. We must ask: what kind of diagnostics and answers are required, how fast, reliable and credible must they be, and which team of experts can provide them? In a crisis, the decision-maker

often has to act without expert input, or with only partial support from specialists.

While the experts are working, they should be allowed to do their job in peace, without pressure from the decision-makers to come up with immediate answers. While awaiting those answers, the decision-makers can ponder the likely outcomes, and the options that will be open, depending on the answers received.

Do not confuse roles. The expert is there to offer specific clarification: the decision will always entail multiple dimensions, and it is the leader who will have to put everything together.

Responding to the demands of communication

Media communication. This is the most visible aspect. The requirement is clear: to demonstrate the ability to provide high-quality information throughout the crisis, from beginning to end. The main guideposts for action are the following:

- Respect the fundamental requirements: external information is both a duty in a democratic society and an operational requirement in any crisis. To shirk this duty is to expose oneself, immediately or eventually, to repeat crises. And if the demands of decency are obviously being flouted, the crisis is likely to become definitively unmanageable.
- Know how to manage communication throughout the crisis: suitable presence and statements, from the onset of the crisis; competence, when the media come up with more pointed questions about prevention, responsibilities, and who is in charge; perseverance, to the very end of the crisis.
- Demonstrate the ability to meet the basic demands of crisis communication: not to "reassure", but "to inform"; provide frequent, accurate information that is as complete as possible; maintain consistency in consecutive messages (recognizing that some of the information may be wrong).
- Have available an organization and ad hoc tools to perform this mission: spokespersons prepared to deal with the media; well-marked press centres; respect for timetables (taking account of the imperatives of media deadlines); appropriate handling of different media (each with specific needs); communication tools: lists of correspondents, having data at hand for various possible scenarios; references and

background data (on the activity, organization, previous crises or problems, etc.).

- Even if "crisis fatigue" sets in, remember the main no-no's: don't lie, don't fall into stress-induced arrogance, keep a sense of responsibility and balanced judgment, and avoid conjecturing and drawing hasty conclusions; don't be "in tow" to the media, and don't abandon the decision-making role to them.
- Move from a defensive stance (falling back on set arguments) to a more positive one of explaining the difficulties in play, the responsibilities accepted, the trade-offs made, and the core values being guiding the operation.

Non-media communication. Victims and their families, government departments, elected officials, employees, clients, suppliers etc. require ongoing attention. To ensure good communication, identify the multiple audiences, priority target groups, and their specific needs.

Networks and specific procedures should be in place for reaching the domestic public swiftly and regularly: this is one of the most important points, which "media shock" may cause us to overlook. Resource personnel should be on hand for briefings on the situation just before or just after the press conference; make sure that dialogue structures are functioning.

With respect to victims and their families, the golden rules are these: provide prompt information (but watch out for the pitfalls of modern communication tools: one doesn't announce deaths by telephone); be tactful and don't let the victim or the family feel abandoned; offer help in overcoming the many difficulties that victims face. Here again, there are technical procedures of intervention to learn and apply, such as designating senior contact persons to whom victims can turn to iron out the inevitable bureaucratic problems, or setting up information and reception centres representing all the potential sources of help for victims, including psychological assistance and victims' associations.

A word of caution. "Crisis communication", a term invented in the late 1980s, will never be the master key to all problems. The success of communication in times of crisis depends in large measure on previous communication: it is no use to wheel out the "media war" guns at the last moment. While communication is an important aspect of crisis management, it is not the only need. We must not fall into the trap of regarding communication as the be-all and end-all of crisis management. Similarly, we must remember, once again, that crisis management is only feasible as part of a general effort at

risk prevention and exposure control. Otherwise, communication will be virtually impossible when a crisis strikes.

Manage the crisis right to its end. A crisis has its own dynamics. It begins most often with a peak or shock, then plateaus for a time (with a number of resurgences) and ends abruptly or, more frequently, drags on to a conclusion. In the shock phase, the means of response are weak; during the plateau phase, too many teams can impede efficient work; the terminal phase may be marked by weariness and, again, insufficient means. Here are some "Commandments" for dealing with this last phase of the crisis: stay mobilized until the problem is finally resolved (resisting the temptation to stand down at the first favourable signs), but don't keep the machinery in place longer than necessary (one must also know how to end the crisis); don't confuse the end of the media crisis with the end of the real problem. These difficulties underline again the fact that crisis management is a strategic business right through. If senior managers refuse to commit themselves, or do so at the wrong time, major difficulties are bound to arise.

1.2.4. The post-crisis: remain vigilant, and know how to make the necessary changes

Despite the weariness that sets in at the end of a crisis, one must cope with the post-crisis, its unexpected twists and turns (any weakened system can have multiple complications), and its longer-term fallout. One must know how to handle the healing process. One must measure the need to forget and the need to re-live the experience, in order to avoid dangerous internalization, to deal with guilt, to correct the failings revealed, and to prepare for the future. Post-crisis work should not be approached merely as assistance to a sorely tested organism: during the episode, individuals and teams will have shown their mettle, and we should build on that. Major initiatives can be taken, provided they have been clearly identified and studied in detail to avoid simple gadgetry.

Beyond the necessary work of healing, there are changes that must be made: a crisis brings out all the deep-down inadequacies that must not be left as they are. In operational terms, it can be useful to set up a special group in charge of these various post-crisis dimensions. During this final phase, "opportunities" will reveal themselves, and a management group should be able to seize them and thereby make further progress towards the best kind of healing there is - to make sense of events and to open doors despite the ordeals of the crisis.

2. Responses to be invented

2.1. A “grammar” for chaotic crises

Emerging crises, generated by an ever more turbulent and chaotic world, call for much more than the reflex capacity essential for dealing with emergencies, and more than the capacities for networking, for transparent and shared leadership, and for communication that are so essential to managing "conventional" crises. The great mutant crises of today are propelling managers into a de-structured and shifting terrain, where the watchwords are speed, counter-intuitiveness, ignorance, discontinuity, loss of bearings. We do not have a very solid base of knowledge and know-how in this terrain. But there are some guideposts to help us prepare, move forward and be inventive.

2.1.1. *Surveillance: a new culture of signal detection*

A simple emergency requires that the sectoral agency responsible have the capacity to react automatically to a clear and specific warning and to feed it promptly into the normal channels and frameworks for interpretation and processing. A “conventional” crisis calls for the capacity to process signals that may be disguised, subtle, or scattered. The agencies in charge then have the obligation to set up more elaborate receptors for detecting more complex phenomena, and systems and arrangements for assembling information, in order to ensure prompt reactivity. An extreme, off-the-scale crisis will demand something else: the ability to spot the signs of phenomena that cannot be represented by any known model. In that case, the alert cannot be given automatically (as in an emergency) or partially pre-formatted (as in a crisis), using pre-established principles.

At this third level, the "unconventional crisis", we need a very different kind of intelligence, understood no longer simply in its Latin meaning (the ability to learn and understand) but also in its modern English sense: "the capacity for information discrimination with a view to a decision-making". The first obstacle is obvious: we have to capture a phenomenon not previously identified. In surveillance we do not have a set of boxes to be filled in, nor any accurate indications of what we might detect. More than "weak signals", we need to look for signals that by their nature are virtually silent and especially elusive for the receptor systems we have available.

But surveillance also encounters a second obstacle, usually overlooked, and yet decisive in the dynamics of fiascos: this is the “delete key” that, when pressed, unleashes the phenomena we are still trying to identify. Explanation: as soon as they are detected, or even suspected, the signals we are looking for will

trigger the vague sensation of a major threat to the system, which in turn triggers an irrepressible and instantaneous need to delete and avoid. The signal carries within itself the ability to neutralize the receptors, and more: it will also block activation of the alert mechanism and the transmission chains, and indeed any idea or inclination for mobilization and reaction. That is why, in their post-crisis reports, investigators have consistently declared their "consternation" upon realizing, after the fact, how many players had been deaf and blind to the event in question. The report writers have not only the benefit of hindsight, as is commonly stressed: they are exempt from the effect of this mental and decisional block triggered by an unknown "shape".

If non-conventional surveillance is to be possible, it must be entrusted basically to persons and systems with the appropriate form of intelligence. We may distinguish three forms of intelligence, adapted to three different situations: emergencies, conventional crises, and extreme crises. Only the third is pertinent in the case of non-conventional signals:

- **"Procedural" intelligence²**. This form of intelligence is most useful for identifying, relaying, and classifying and filing well-identified and repetitive phenomena. Operators here are most comfortable with the surprise-free deductive approach. A signal will be perceived and transmitted if it corresponds to what the programme predicts. With this kind of intelligence, the operator can pick up the signal and take action if he has 80 per cent of the necessary information, and if the remaining 20 per cent raises no more than marginal questions. Otherwise he will wait or ask for additional information, and perhaps irrefutable proof as well, if the risk is high (the operator is paid to capture, process and classify data, not to take risks). The relationship to the real world is rather defensive: the system will accept from outside only homogeneous data series, which will be placed in the prearranged boxes. Obviously, the non-conventional is rather awkward for this type of intelligence. If it crops up, if it becomes pressing, it will trigger the classic traits of deafness, to the point where mechanisms will be put in place to keep things in the order they are supposed to be. Dino Buzzati described this point eloquently:

"I want the guards on watch duty to use normal means, and in particular not to use non-regulation optical instruments, which are often employed carelessly and can readily lead to error and false interpretations. Any soldier who possesses such instruments must report them to his company commander, who will confiscate and keep them." (Buzzati 1980, p. 195).

- **"Intuitive" intelligence.** This operator is working with 20 per cent of the necessary information, and has to rely on his intuition to fill in the possible scenarios. He is able to capture unconventional, non-homogeneous and unstructured information that does not fit into the normal formats and procedures. He accepts the principle that he must take stances and provide answers for which he has no proof. He works mainly in offensive and interactive operating modes and motion is his trigger for action.
- **"Creative" intelligence.** This is imperative for detecting signals that are not yet known and categorized. The modes employed are imaginative and innovative, free of codes and rules of the game. The operator works with a field of information outside the "real" as perceived by a "pragmatic" person. There is very little information available, and the operator must move about mentally in "no man's lands" where certainty is nonexistent, elements are constantly mutating, there are voids on all sides, and reality first appears as patchy. The operator who possesses this type of intelligence is quite at ease and even stimulated by what cannot be captured, and is highly handicapped when he has to work in a world of stable and repetitive data crunching, i.e. the world of procedural intelligence. But that is not what we expect of him for operating in an abnormal situation. A person who has developed this creative intelligence will actually be able to take himself "out of the box" and go beyond taboos; he will be able to see strange intersections among highly disparate and at first sight meaningless data; he feels comfortable and creative in a destabilized world, where the dice have not yet been rolled.

Detecting an off-the-charts phenomenon can be made much easier by an approach that is seldom used spontaneously, but which a creative person can readily adopt. This method starts with the following findings: while it is often difficult to detect the phenomenon itself, it is infinitely easier to recognize its "signature", which may often be perfectly clear and even exaggerated. As in biology, the best way is to look for the defence mechanisms that are triggered by an allergen. The non-conventional phenomenon we are looking for will act in the same way on the individuals and organizations concerned. For instance, the demands for "proof", assertions of "optimism", the compulsive need to "reassure", the need to "bunker down", reliance on technology, the pitfall of our beliefs and our *a priori*, double locking of all the doors, veto on questioning the agenda, etc. There are, then, ways of detection that can help greatly. But this assumes that we have accepted a shift of vision: what we must seek is, by definition, something that the system is by no means ready to perceive and to process. The objects of our search are not "in the spotlight", they are in our

"blind spots" and, more precisely, in places that are taboo (the best taboo being the one that is so well accepted and understood that it does not have to be stated).

This kind of non-standard surveillance involves quite a sharp break with practice. First of all, we will have to engage in some very bold questioning that will stray well off the charted path. Today, our organizations are caught up in increasingly procedural operating modes. Risk aversion, a surfeit of plans, constant certifications, guarantees of all kinds, only accentuate and confirm their addiction to established responses. What we must do now is to venture beyond these charted waters, into places for which there is as yet no information, and where the rules of assessment are not formatted in advance. Detecting unconventional risks means running risks, which will be all the bigger when the signals we must perceive, work with and transmit are "barbarian". This will pose acute difficulties for systems, and we must address them.

2.1.2. Leadership: committed involvement by the managers

In emergencies, the technical specialist is the essential operator: he will have backup from the entire organization, and the responsible manager is there to ensure that there are no particular implementation problems. Specific crises call for full engagement, and the first function of the crisis teams is to set the course, maintain coherence, and ensure liaison. For an unconventional crisis, the leader must play a much more crucial role, directly and personally. Questions of vision, of choice and of strategy come to the fore, in place of technical management tools. It is no longer a question of simply "running things".

When our bearings are lost, when meaning dissolves, and when the customary field of action disintegrates, as in non-conventional crises, nothing can be achieved without exemplary leadership from the pinnacle of the organization. When perspectives vanish they must be reinvented. When lines of action are destroyed, they must be re-created. When the customary networks of players are no longer the pertinent ones, they must be redesigned. Only in this way can we hope to restore identity, confidence, liaison, and a constructive collective will.

Leaders must be in a position from the outset to provide essential partners - which usually means the general public - with the following:

- Clarification without fudging the issue: phony "reassurances" will only undermine confidence.

- A broadening of the stakeholders' map, the questions, the rules. The instinctive reaction is to retreat into the recipes of the past; this is very normal, but it confirms a fatal mental block.
- The willingness and the capacity to look beyond the normal horizons, in spite of ambiguity and knowledge gaps: to counter the loss of direction and of operating frameworks with a plan, benchmarks, and a dynamic inventiveness.

This implies that the leaders must be heavily involved. They have to break through the conventional limits, which are no longer relevant; they have to slip across old boundaries and invent new collective responses. The leader cannot shirk this duty, which is in fact the core of his responsibility. When vital issues are at stake, nothing can be done without determined personal and direct involvement from the top. As Henry Kissinger put it, "The most important role of a leader is to take on his shoulder the burden of ambiguity inherent in difficult choices. That accomplished, his subordinates have criteria and can turn to implementation." (H. Kissinger, 1982, p. 531).

This constitutes a revolution in our culture of governance, which would rather leave it to the second ranks to anticipate risks and take charge in situations that are not yet clear. There is a tendency, in effect, to try to "protect" the leader, as long as everything is not "perfectly clear".

An especially striking example here is that of Rudolph Giuliani, the Mayor of New York City at the time of the September 11 events. It is easy to draw a contrast between what happened in New York at that time and what occurred in New Orleans in 2005 (even if the two situations were very different in many respects). His convictions and his personal commitment on the front line of that inconceivable event were the cornerstone of the city's resilience. His advice was unambiguous: *"Have beliefs and communicate them. See things for yourself. Set an example. Prepare relentlessly. Underpromise and overdeliver. Don't assume a damn thing"* (Giuliani, 2002).

This assumes that the leader himself is mentally prepared to take an approach to intelligence and action that is more creative than procedural - yet our habits at times of emergency and crisis are usually just the opposite. With very little information available and even less of it verified, the leader must have the conviction and the vision to lead the community out of its initial disorientation, and to avoid the two pitfalls that are always present in extreme crises: bureaucratic inertia (where each organization waits till the crisis fits its codes and rules), and the general loss of nerve (not only within the public, but along the entire chain of command). It is only by spreading confidence that we

can get through the ordeal, renew our energy, and come up with innovative plans and concrete roads to success.

The major challenge today is to choose and then prepare leaders so that the creative approach will prevail in the inevitable non-conventional crisis, whereas the entire organizational, administrative and institutional culture is in thrall to procedural thinking. In our cultures and in our selection processes, creative thinking is both punishing and punished. And this fundamental logic is not going to be turned around by devoting a few hours a year to "crisis management" seminars. This is a great challenge facing leaders and organizations today. Most often, we settle the question by ducking it. Unfortunately, we won't be able to duck it much longer.

2.1.3. Strategic intelligence: "Rapid Reflection Forces"

The importance of standing back and assessing the situation objectively is even more important in this world of discontinuity than it is in specific crises. The reason is clear enough: because the strategic landscape has mutated, the conventional tactics and interpretations no longer work and are even counterproductive. We must tear ourselves away from them, which demands a very active and determined effort, and then construct new frameworks for understanding and coping with reality.

In operational terms, this means that our leaders must have at hand people who are familiar with chaos and who are given to thinking openly and to networking in unreadable situations. This is essential for overcoming the most severely pathological reactions to these new forms of crisis: mental blocks (the constant refrain is "in a crisis, you don't have time to think"); the "bunker mentality", with everyone holing up in his own little corner; treating problems in purely technical ways without looking closely at the positions; and above all, rushing blindly to the most counterproductive options.

The initiatives now underway to establish "Rapid Reflection Forces", for example in EDF (Electricité de France), need to be pursued urgently. We cannot continue to rely on the reflection that takes place in interoffice calls and corridor chats or, more broadly, outside the dedicated crisis management mechanisms - which are generally based on reactive thinking and not at all on deep questioning.

Along with the more "tactical" crisis teams, focused entirely on immediate operational responses, plans and logistics, we also need solid teams that will promptly undertake four broad lines of questioning, which will be deepened as the ordeal progresses:

- *What's happening?* By definition, we cannot immediately grasp all the essential issues at stake in a crisis that is entirely new, unclear and chaotic. The intelligence front involves a constant battle to anticipate, detect and clarify surprises, domino effects, escalation dynamics, and the general mutations that can be triggered.
- *What are the major pitfalls?* When the pressure of events becomes extreme, when panic spreads, when the bearings are lost, the very normal tendency is to become mired in the most counterproductive ruts. This happens with every major crisis. We must, then, immediately think about the major errors to avoid.
- *What networks do we need?* By definition, extreme crises strike at the system in ways that are hard to anticipate, and that may differ depending on the people concerned (Katrina and heat waves being set examples). At the same time, the new issues will have to be handled with new players. New maps will be needed both for diagnosis and for action, and they will have to be adjusted or remodelled through the ordeal.
- *What constructive initiatives can we propose?* The most important thing is not to pore over statistical lists or to compile all the information possible, but rather to try to discern one or a few critical initiatives that could introduce "a new ballgame", help us escape our crisis-induced mental ruts, and launch virtuous circles.

The kind of thinking that is needed here is the diametric opposite of procedural thinking. We must discriminate the essential factors, both in order to understand the crisis and to get out of it. With these Rapid Reflection Forces, what is important is not to draw up lists of data and fill out a series of pre-formatted tables, or to get tied up in hours of teleconferencing that will be increasingly technical and focus on ever more detailed micromanagement. We are now far from the command-and-control techniques that are still promoted for handling crises at the top levels of our institutions.

In short, we must move beyond our habits in terms of decisional expertise, which is usually technical and scientific in nature and focused on micromanagement. We must introduce a breakthrough of methods at the desired levels - the business, the country, or group of countries - depending on the type of problem at hand. And this will be costly, because changing our guideposts is always an ordeal, even when they have consistently shown themselves to be inadequate.

2.1.4. Collective response and communication: the vital notion of empowerment

The years 1980-2000 were dominated by the idea of "Communication". We were told that to manage crises we had to give information to the players and to the public, as a democratic requirement. That in itself represented an important step forward. In fact, our tradition in times of emergency or catastrophe is rather that of "Command and Control", based on two sturdy pillars: the concentration of decision-making in a cloistered hierarchical structure, and the restriction of information held by that structure, in keeping with the military principles of the past.

But it was finally admitted that the key to success in multidimensional turbulence required other approaches. It called for bringing coherence to a great number of entities, on the basis of forward planning that was predetermined and bound by unquestionable operating rules. Such dynamics could not be achieved with an approach to governance that was restrictive, vertical, compartmentalized, and designed to minimize information.

We must now go much further. The idea of centralized management, even if open to large networks, is no longer in keeping with the demands of effective governance at a time of major discontinuity. In the face of situations that exceed the response capacities of a given government structure, when complexity overwhelms any specific organization, especially if it is vertically structured, when ignorance destabilizes organized expertise, when speed and hyperconnectivity explode the known rhythms and maps, when the loss of direction demands vital new foundations, we must look for other approaches. The new perspectives must combine several demands, starting with a fundamental rethinking of our governance paradigms.

Close networking among all stakeholders. This is needed to guarantee overall cohesion and the pooling of energies, indispensable to a swift and powerful response and to recovering from the inevitable mistaken paths and their unwanted effects. Creating capillarity in the system is seen as better than trying to erect illusory protective walls between each sector and each decision-making stage (as soon as a major crisis breaks out, all those walls become porous, and the best strategy is to use these flows, not to try to plug all the holes).

Involve all stakeholders at the core of the problem. It is essential to provide critical information and essential means to those who will have to cope with an abnormal situation on their own for some time; they must be brought decisively within the strategic loop; plans must be widely discussed with them, and their creativity and their initiative must be sought as inputs. The leadership,

the structure in charge cannot of course abdicate its management responsibilities. This holds in particular for the public. The shocks that will accompany the new world of risk will demand operating modes that can no longer be based on our visions of a state, organizations or businesses contributing "turnkey solutions" to groups of people who have been immobilized or anaesthetized by "crisis communication" through the media.

We must be very clear about the gulf to be bridged. It is groups of people themselves who must find answers to the challenges they will face (Dumas-Séguier, 1997). If their creativity is not mobilized, the essential changes will never take place. Our motto, "Everything is under control, the government is looking after you, don't do anything", needs to be radically overhauled. This approach has direct operational implications, for example when it comes to exercises: it is not enough to ask the people to be "bit players". Or when it comes to prevention, as was stressed in the report on the Quebec ice storm of 1998, which called for every citizen to have three days of supplies on hand at all times (Rapport Nicolet, 1999). Here again, confidence is vital: "He had more confidence in us than we had in ourselves", it was said of Rudolph Giuliani, and that is why his city did not collapse.

Building the dynamics of mutual trust. The purpose here must be to consolidate the collective dynamics through initiatives that have been invented together, and this presupposes that everyone is clear about the issues and the difficulties. In particular, the logic according to which "the government draws up the plans, it informs the operators, and they comply" must no longer prevail. Katrina marked what will likely be a turning point in this regard, signalling the end of an era.

Of course, the principle of partnership is so obvious that it has become a cliché, and something that everyone pays lip service to. But we need to ask whether we have the cultural underpinnings to weave these partnerships, which demand sharing, trust and the willingness to explore together (without having the State let down its guard on the control front). For the time being, we still have a long way to go, regardless of the country.

Yet it is precisely this "new ballgame" in matters of governance that offers hope of progress in terms of basic cohesion, intelligent analysis, swift execution, and manoeuvring room in case of error - demands that were impossible to meet in our previous frameworks.

These considerations also have important consequences for the way we handle communications. Here again, new rules of the game must be introduced. We know that in any unprepared organization, the tendency on all sides is to

“reassure” (and all the more firmly if there is no real certainty), and not to communicate any more once the problem appears to have escaped normal bounds. There is a great risk of falling into this trap during major crises which lay bare our ignorance and expose us to potential threats that are impossible to define or to decipher. The ideal breeding conditions will all be in place then for the pathology of information refusal. To counter this strong tendency, we must:

- Provide copious information, and do it early (not the minimum, and not when the chips are already down).
- Communicate about questions, not about certainties (which will come later).
- Communicate about processes, not about outcomes (the essential is the dynamics underway, the outcomes will only be known later).
- Be ready, of course, to communicate the certainties and the outcomes as soon as they are available, and even to report indicators and warning signals, if those signals are received before all the expected analytical results are in hand.

Quite apart from any recipe or checklist of behaviour, we must have acquired the strategic conviction that management and resolution of the crisis cannot be achieved without this shift in our fundamental approaches to involvement in communication. The problem is not to be "a bit more transparent" than before, but rather to have taken on board, in theory and in practice, the requirements of collective effort in a chaotic world - an environment that now demands dynamic linkages, fluidity and speed, shared information, and collective confidence.

We are far from the time when the decision maker could pretend to have the “right diagnostics” and could impose his views as official scientific expertise, as “truth”, held exclusively by the authorities. Such positivism is now outdated. Sir Robert May, an eminent scientist who has contributed to the mathematical modelling of complex systems and who is former Chief Scientific Adviser to the United Kingdom, made this point cogently at a European Union conference on Science and Governance: *In many important issues – both of safety and ethics ---science alone rarely gives unarguable answers. As Brecht wrote in his play The Life of Galileo: “The chief aim of science is not to open a door to infinite wisdom but to set a limit to infinite error”* (Sir Robert May, 2000)

We are also far from the time when a decision maker could claim to have the "right solutions", and therefore do without any involvement or information from other players. Kant’s words seem increasingly pertinent: *“To profess to*

solve all problems and to answer all questions would be impudent boasting, and would argue such extravagant self-conceit as at once to forfeit all confidence.” (Immanuel Kant, *The Critique of Pure Reason*).

Here we touch upon the very core of our conceptions of governance. A painful task awaits us: we are going to have to turn upside down our practices and, still more, our basic visions as they relate to information, expertise, networking among stakeholders, and citizen involvement. The situation demands forceful input from politicians, not as a way of preserving their power but as an exercise in reinventing the collective conduct of human affairs. At a time when major and increasingly recurrent shocks are obliging us to question the great challenges of our history and the way we address them, we are condemned to make some major changes in our approach to empowering stakeholders, and hence to reinvent the function of leadership.

Time is pressing us on this front also. Already the big TV news networks are creating their own "situation room" for following a major crisis. The centre of gravity is shifting rapidly from the public sector, where the closed model has run its course, to other players, among which the media stand front and centre. But this is only one aspect, even if it is important and the most visible. Very shortly now the private sector will also be adopting "national response plans" to avoid being held hostage to ideas they judge outdated. Similarly, the myriad of players - NGOs, international institutions, local associations, web surfers - will soon be organizing, in ways that will surprise us, to contribute their own modes of response to grave situations. Either our big organizations will learn to live with these upheavals and reinvent their place, or they will be swept away. As the Chinese proverb tells us, "the helmsman must navigate with the waves, or they will swallow him up".

A perusal of any of the major reports on large-scale crises can shed some interesting light on these questions. Here are some of their more essential findings:

- Withholding information destroys managers' credibility (the BSE inquiry commission, Philips, 2001):

1294. "Throughout the BSE story, the approach, to communication of risk was shaped by a consuming fear of provoking an irrational public scare. This applied not merely to the Government, but to advisory committees, to those responsible for the safety of medicines, to Chief Medical Officers and to the Meat and livestock Commission. All witnesses agreed that information should not be withheld from the public, but some spoke of the need to control the manner of its release. Mr Meldrum spoke of the desirability of releasing information in an

*orderly fashion*⁷ – of ensuring that the whole package of information was put together, taking care in the process not to "rock the boat".

1295. Mr Brian Dickinson, who was a member of MAFF's Food Safety Group, put the matter in this way: "Given the strength of public debate on the matter at the time one was aware of slightly leaning into the wind. You could not just stand upright and give a totally impartial, objective view of what was the situation. There was a stronger danger of being misinterpreted out way rather than, the other, and we tended to make more reassuring sounding statements than might ideally have been said".

1296. We felt that this was an accurate description of the general approach to risk communication. We have seen that it provoked increasing scepticism and, on 20 March 1996, the reaction that the Government had been deceiving the public.

1297. In discussing this topic with us, Sir Robert May, Chief Scientific Adviser expressed the following view: "You can see the temptation on occasion to wish to hold the facts close so that you can have internal discussion and the formation of a consensus so that a simple message can be taken out into the market place. My view is strongly that that temptation must be resisted, and that the full messy process whereby scientific understanding is arrived at with all its problems has to be spilled out into the open".

1298. This view received strong support from representatives of the consumer organizations. They emphasized the need for open scientific debate. Ms Sheila McKechnie, the Director of the Consumers' Association, emphasized the need to develop a culture of trust. She commented that: "There is nothing more nanny is than withholding information from people on the ground that they may react irrationally to that information".

1299. She made the point that organizations build up credibility by openness. She expressed the hope that the Food Standards Agency would achieve this.

1300. Everyone agreed that the Government had a problem with credibility. A number of Government Ministers told us that they had lost credibility with the public, so that it was necessary to get independent experts to lend credibility to public pronouncements about risk. Mrs Bottomley spoke of the need for the public to receive information free of "political overtones". She told us that she did all that she could to promote the Chief Medical Officer as an independent expert who could be trusted by the nation.

1301. Our experience over this lengthy Inquiry has led us to the firm conclusion that a policy of openness is the correct approach. When responding to public or media demand for advice, the Government must resist the temptation of attempting to appear to have all the answers in a situation of uncertainty. We believe that food -scares and vaccine scares thrive on a belief that the Government is withholding information. If doubts are openly expressed and publicly explored, the public are capable of responding rationally and are more likely to accept reassurance and advice if and when it comes. We note, by way of example, that SEAC and MAAF have made public the fact that an investigation is being carried out into the question of whether BSE has passed into sheep. We do not understand that this has led to a boycott of lamb.”

- The citizens must receive all the information necessary: (9-11, Commission Report, p. 318)

Once the South Tower was hit, civilians on upper floors wasted time ascending the stairs instead of searching for a clear path down, when stairwell A was at least partially passable. Although rooftop rescues had not been conclusively ruled out, civilians were not informed in fire drills that roof doors were locked, that rooftop areas were hazardous, and that no helicopter evacuation plan existed. In both towers, civilians who were able to reach the stairs and descend were also stymied by the deviations in the stairways and by smoke doors. This confusion delayed the evacuation of some and may have obstructed that of others. The Port Authority has acknowledged that in the future, tenants should be made aware of what conditions they will encounter during descent.

The NYPD 's 911 operators and FDNY dispatch were not adequately integrated into the emergency response. In several ways, the 911 system was not ready to cope with a major disaster. These operators and dispatchers were one of the only sources of information for individuals at and above the impact zone of the towers. The FDNY ordered both towers fully evacuated by 8 :57, but this guidance was not conveyed to 911 operators and FDNY dispatchers, who, for the next hour often continued to advise civilians not to self-evacuate, regardless of whether they were above or below the impact zones. Nor were 911 operators or FDNY dispatchers advised that the rooftop rescues had been ruled out. This failure may have been harmful to civilians on the upper floors of the South Tower who called 911 and were not told that their only evacuation hope was to attempt to descend, not to ascend. In planning for future disasters, it is important

to integrate those taking 911 calls into the emergency response team and to involve them in providing up-to-date information and assistance to the public.

- The citizens must be placed in a position of responsibility (9/11, p. 318):

One clear lesson of September 11 is that individual civilians need to take responsibility for maximizing the probability that they will survive, should a disaster strike.

- The citizen, the private sector employee, is not the enemy but a key player in the rescue system (9/11, p. 317):

The “first” first responders on 9/11, as in most catastrophes, were private sector civilians. Because 85 per cent of our nation’s critical infrastructure is controlled not by government but by the private sector, private-sector civilians are likely to be the first responders in any future catastrophes.

- Even in a mega-disaster, information is still a vital need (world flu pandemic, 1918):

In 1918 the lies of the officials and of the press never allowed the terror to condense into the concrete. The public could trust nothing and so they knew nothing. So a terror seeped into the society that prevented one woman from caring for her sister, that prevented volunteers from bringing food to families too ill to feed themselves and who starved to death because of it, that prevented trained nurses from responding to most urgent calls for their services. The fear, not the disease, threatened to break the society apart. [...] Those in authority must retain the public’s trust. The way to do it is to distort nothing, to put the best face on nothing, to try to manipulate no one. Lincoln said that first, and best. Leadership must make whatever horror exists concrete. Only then will people be able to break it apart ». (Barry 2004, p. 461)

2.1.5. Crisis recovery: embedding the recovery issue upstream

Until very recently, writers and experts divided a crisis into successive and clearly defined phases: the pre-crisis (the prevention and surveillance phase), the crisis itself (the acute phase of response and mitigation), and the post-crisis phase (reconstruction or recovery). This last phase came "afterward" not only in the chronological sense, but also in the setting of priorities.

The recovery dimension was deemed less important, because prevention, which was easier in a more stable and predictable world, would reduce the incidence of crises. When prevention failed, the crisis would be "managed", and any "residual" problems could be left to the last phase. Once the critical moment was over, other, lighter and less visible teams would take charge of "returning to normal". This postponement was workable, mainly because the general setting of predictability served as a stabilizer, and things could return to their normal equilibrium.

Today, this scheme has been profoundly disrupted. Prevention encounters increasing difficulties in its role as the first and central line of defence. The handling of the crisis leaves behind it problems of sometimes considerable scope and duration - one has only to think of Chernobyl. The acute phase may itself come to be seen as "anecdotal", or at least it has lost its monopoly on attention and investment of effort. A hurricane is usually over in a few days (alert, evacuation, return), but the reconstruction of New Orleans after Katrina will be a decade-long affair. Crisis recovery becomes a central dimension (Guilhou, 2005). It must be addressed as soon as crisis management begins, and even in preparedness efforts (for example in the architecture of information and communication systems). Unless the conditions of system recovery in a major crisis are carefully considered far in advance, the obstacles may well become insurmountable during the reconstruction phase that will have to be mounted after a severe event.

Leaders as well as operating personnel must be prepared to intervene decisively in areas that go far beyond simple "business recovery". The headaches facing the major utility operators in New Orleans today are perfect examples of the post-crisis problems that are bound to become more common: it is hard to move ahead with reconstruction if the big urban planning issues have not been decided; if the stakeholders in such choices are no longer around, but are not definitively gone (merely scattered around the continent); and if the authorities have trouble in coming to grips with the questions.

Moving beyond cases of this kind, we discover what is in fact a global problem: many parts of the planet are currently engaged in "crisis recovery", in the wake of natural disasters, technological disasters, wars, or combinations of all these elements. And the challenges are formidable on all fronts. While in the conventional phase of curative crisis treatment, stakeholders and their responsibilities are fairly clearly mapped out (although there will still be confusion, such as saturated and chaotic airports, in any severe event), the same cannot be said for this crisis recovery phase. Here we find that stakeholder interplay is much more confused, complex and uncoordinated. Everyone gets in on the act: NGOs (both the recognized, prestigious ones and the more

opportunistic), private businesses, government agencies, Civil and Military Cooperation operators. A frequent problem is that everyone defines his own tasks, in the absence of guidance and frameworks set by governments or international institutions. With no one really in charge, recovery operations are likely to be excessive and to run on much too long (with a high risk of infiltration by profiteers and even criminals). Clearly, this dimension of crisis recovery deserves very careful thinking, without waiting for further experience to accumulate, which will only result in yet greater costs in terms of human lives, economic disruption, and loss of credibility.

We shall look here at some working hypotheses that have already been validated by field experience. But a word of warning is in order: the essence lies in preparedness. If we do not have strong convictions, based on managerial cultures adapted to a highly uncertain world, a world that is radically open and complex, none of these recommendations can really be implemented. The third chapter of this paper will attempt to clarify some of the indispensable steps that must be taken for making systems, organizations and individuals capable of moving effectively down these new avenues.

Some lessons from the 1999 storms in France

"In fact, when the first alarming signs arrived, no one seems to have foreseen how the scenario would escalate. This must surely serve as an indicator, within the administrative organization in place, that the reaction function was given too much weight at the expense of strategic thinking about the dynamics in play. Clearly it would be better for thinking on these two fronts to run in parallel.

No specialized unit - of the kind that could take a detached view in the midst of emergency contingencies, and that is no doubt too seldom provided for in organization charts - was in place or activated to carry out this task.

The prospect of multiple bifurcations in the evolution of systemic crises calls in effect for approaches to dealing with problems that will in themselves take better account of the unforeseen, or can even prepare for the unforeseen as such, and will distance themselves from the response plans that are often too codified for open questioning.

Of course it is still important to have catalogues of resources and automatic checklists. But in the face of the abnormal, of circumstances that will never fit completely into a pre-established framework, it is even more essential for people to learn how to respond collectively, and how to work efficiently in teams and in networks.

Where realities are constantly shifting and highly uncertain, where communication problems are critical, where the means of information and of command are lacking and conventional modes of action are inappropriate, managers must have been trained in advance, as far as possible, to intervene in this kind of rupture situation.

Source: Prime Minister's Office, Évaluation des dispositifs de secours et d'intervention mis en œuvre à l'occasion des tempêtes des 26 et 28 décembre 1999, Interim Report of the Interministerial Mission, July 2002.

NOTES

1. The following sections draw heavily on previous publications of Patrick Lagadec (in *Apprendre à Gérer les crises*, 1993 and *Traité des nouveaux Risques*, Gallimard, 2002, with Olivier Godard, Claude Henry, Erwann Michel-Kerjan).
2. Cf. the notion of "procedural memory", which is what allows us, for example, to start up our car without thinking about it.

Chapter 3

STRATEGIC INITIATIVES

An understanding of the issues and a clear grasp of the cardinal rules of management are indispensable, but they are not sufficient. In these turbulent fields, where paralysis is so common, we must overcome two kinds of obstacles.

- *The cultural block, which prevents us from a really serious examination of the actual challenges: we remain caught up in risk analysis systems and models for managing exposure and crises that are no longer in phase with current and coming realities.*
- *The managerial block, which prevents us from taking indispensable initiatives for making stakeholders capable of action in these new fields.*

What we must do immediately is to give some strategic impetus to our systems, not only to overcome these blocks but to put ourselves in a position to be more creative, open and innovative. Our systems will then be able to cope with the challenges of our time, not through blind groping, but through intelligent, positive and determined action.

Previous chapters introduced some “grammar” to help manage crises and navigate major discontinuities without falling systematically into deadly downward spirals. But the lessons of experience are tough and tenacious: managers, organizations, and cultures that are not prepared for these destabilizing and increasingly "barbarian" worlds will not be able to follow lines that we now know to be indispensable. It is not enough to declare the principles to be followed, as one would mechanically apply a technical checklist. We regularly find that the best guideposts and the best-conceived plans are immediately cast aside when a dangerous situation emerges. We find fierce resistance, especially at the highest levels, to putting the question on the agenda, to getting prepared, and to setting targets for progress. In other words, crisis management skills are not something one can pick up as the event unfolds.

It has long been recognized, in all countries and in all organizations, that there are two key lines of action. Without a transformation of intellectual and managerial cultures, it is vain to expect significant progress. Without a sound and determined effort at strategic and operational preparedness, it is vain to expect better performance.

But the real transformation has to do with the sharp break we must make, in moving from unbelievable resistance and passiveness in these fields to an unflinching determination to reform our organizations. To cite Sun Tzu again, we must recognize that we are dealing here with "vital questions". And as he said, the person who is not tested in these issues, who does not recognize the challenges and the way to deal with them, “will be defeated in every battle”.

1. Overcoming cultural barriers

As long as “risk” is understood to mean a phenomenon of very low probability and of very limited severity - these two terms producing something that is "acceptable" and that needs only to be "explained" - risk managers will have no problem. They know how to make the calculations, and where to find sound advice for proper "communication" about the risks.

As long as "crisis" is understood to mean a somewhat delicate situation that demands particular resources, specific organizational rules, and suitable plans and checklists, crisis managers have no worries. They will ask for a list of possible risks and crises, and assign someone to draw up a response and a data sheet. If they have the time, they may even propose an annual exercise to ensure that all the prepared responses are in working order. Once it is fitted into this framework, and the appropriate responses identified, the crisis can be

considered to have been tamed and channelled, and it can be stamped “acceptable”

Yet it is quite another story when we try to get individuals and groups to work on new crises, on much more vital issues, for which by definition we do not have a full arsenal of desired responses. Let us be clear, it's a scary subject. The instinctive reaction will be to deny it. That reflex is deeply rooted and must be overcome.

1.1 Pavlovian denial

Anyone who ventures into this terrain for the first time is in for a surprise. Individuals and organizations usually react very negatively to any idea of preparedness, questioning, or information, particularly about this delicate terrain. We must be aware of these defence mechanisms and their power of paralysis. They revolve mainly around the following factors:

- The feeling that a manager cannot waste time on these matters: "If he is the manager, it's because he has the answers".
- The feeling that the subject is not serious: "If there is no codified response that can be readily modelled and can then be subcontracted to technical specialists, then the approach must not be scientific".
- Incomprehension: "A manager is there to give answers, not to ask questions".
- Anxiety: "A manager is not a risk taker: it's his job to apply tried and true procedures, not to invent new ones as he goes along".
- The feeling of illegitimacy: asking management teams to prepare for non-conventional situations is often seen as unacceptable, because it runs contrary to all the rules of the game through which these team members rose to the senior posts they now hold.

Decision-makers will be at least unconsciously aware of a discrepancy, and they may not be able to repress the urge to flee. As we have seen, a crisis demands above all a creative profile, not the more common one of a manager who is good at running machines and using standard techniques without inquiring too far into the purposes, the meanings, or the players to be involved. Such a profile is not generally a central requirement in recruitment and in promotion, and could even be grounds for rejection. Many managers thus have a vague feeling that these critical questions involve venturing into unknown, hostile and dangerous territory for which they do not have the required bearings, and which is therefore “to be avoided.”

Naturally, these difficulties can be overcome, but they do exist and are the uncontested rule in organizations that are not prepared. They are the most remarkable allies of crisis.

Resistance expresses itself in many ways: "we already have plans"; "they already impose useless exercises on us"; "we don't have the time"; "it will cost too much"; "it's not a priority"; "it's much too sensitive, you're going to open a Pandora's box"; "we can't get the managers involved, there's too much conflict at the top"; "surely you're not going to tell me I'm not doing my job right!"; "if a dicey situation comes up I know what to do: call the emergency unit".

All these defensive reflexes need to be transformed if we are to develop a collective capacity for asking questions about the uncertainties, a capacity to examine possible options and to accept the need for individual and collective preparedness.

1.2. Deeply rooted resistance

The problem here goes far beyond simple "resistance to change". It is much more visceral, and it is rooted in a combination of three lines of defence:

The intellectual block. Anything that is unprecedented, exceptional, non-linear is instinctively rejected. It is as if we were still the disciples of the naturalists of the 18th-century:

“Causes which result in effects which are rare, violent and sudden must not affect us, they are not part of the ordinary process of Nature. Our causes and reasons are the effects that occur each day, movements that follow one another, effects that are continually renewed and endlessly repeated.” (Buffon, 1749)

Uriel Rosenthal, one of the pioneers of crisis study, finds that this tradition persists and stymies our approach to crises:

“Scientists feel uncomfortable with phenomena that seem beyond the scope of the neatly crafted theories which have been developed on the basis of normal circumstances and events. Crises seem to be in total opposition to the very foundations of modern social science.” (Rosenthal, 1989, p. 5)

In these circumstances, non-conventional problems are likely to remain orphans, and anyone who takes an interest in them will have trouble being taken "seriously".

The managerial block. Ralph Stacey, a professor of strategic management, claims that:

“At least 90 per cent of the content of textbooks on strategic management concentrates on the relatively easy part of the management task, namely the running of the organizational machine in as surprise-free way as possible [...]. On the contrary, the real management task involves tackling exceptions quickly and without pressure, coping with and even using unpredictability, clashing counter-cultures. The real task is about managing instability, irregularity, difference and disorder.” (Stacey, 1996, p. 19-20).

The fact is that, when flung into these situations, managers are highly likely to become confused or paralyzed. And any invitation to prepare for the abnormal will be taken as a groundless, illegitimate and even provocative suggestion.

The psychological block. This, without doubt, is the most potent block. A crisis event can effectively strip the manager of all his sense of direction, all his frames of reference, and everything that justifies his social position (responsibility, respectability, power, identity), and expose him to the risk of floundering or of being driven to extremes. Clearly this is profoundly destabilizing and destructuring for somebody who is unprepared. In the words of Sun Tzu: “Is it not at this point that half a step in the wrong direction could put me thousands of miles away?”

A psychoanalytical analysis is in order here, given the powerful and often irrepressible emotions that surface among both individuals and groups in critical situations - even a planned exercise regularly evokes the same type of destabilizations. Experience suggests a careful reading of these lines from the psychoanalyst Nicole Fabre, writing about Descartes, if we want to understand the depth of this resistance:

“His thoughts are a whole. His work also. There is no crack through which it can be attacked. There are no voids. His belief is that there is no vacuum in nature. As such his controversy with vacuum, in particular with Pascal’s “quick-silver experiments” and his refusal to consider the existence of any vacuum, is so surprising in this man who referred to experiment whenever possible, to the extent that it is impossible not to see in this refusal the expression of his personality or his mode of reasoning. So much so, that I must speak of this refusal in terms of resistance. If Descartes resisted the notion of vacuum so completely, if the notion of emptiness was so inconceivable and

shocking to him, it must be that to him the notion of vacuum symbolized nothingness or chaos. It represents a risk of disorder. Descartes' use of rationality to reject this concept so vigorously, manifests his fear of nothingness (death?) and the fear of losing his hold on the solidity of a system which he values because it presents not the slightest chink.”(Fabre, 2004, p. 91)

These handicaps would not be such cause for concern if we were steadily pushing back the frontiers of uncertainty, and if ignorance were slowly receding. However, as we have seen above, this is not the case.

1.3. A cultural shift

When it comes to exposure and crises, our perspective must be literally up-ended. Issues that were previously regarded as “marginal” now stand centre stage and must be treated as such. The “known world” no longer exists, that comfortable world where we pursued our plans and activities against recognized measures of excellence, and where any discrete, marginal uncertainties were only worthy of attention if they were already covered by validated theories backed with robust statistical evidence, stripped of all excess.

Our perspective must not be simply that of limiting habitual resistance. We must now acquire the intellectual and cultural facility to move about creatively in a highly unstable and opaque world. It is true that for the time being we have no roadmap available, and so we must construct one.

Rupture. The concepts that we excluded from our intellectual working domain must now be accepted as new frontiers for urgent exploration: discontinuity, irreversibility, escalation to extremes, volatility, sudden reversals, crystallization, resonance. That domain must embrace all disciplines, and it must be transdisciplinary. These lines of thinking and action must no longer be taboo, and the response dynamics must no longer be those of the bunker, the Maginot line, or the gravity dam. The response must be on a par with today's challenges, and must therefore combine openness, speed, fluidity, complexity and connectivity, based on a solid foundation of conviction, determination, values and identity. It must have maximum flexibility for invention outside the frameworks of the past, yet - and here is an essential contradiction - this will require at the same time certain fixed points of conviction that can stand up to confusion and chaos. All of this raises a number of daunting questions.

2. Preparedness for both conventional and chaotic crises

Our systems need to be energized in two ways. First, they must be made capable of dealing at least with relatively circumscribed crises, for they already constitute the first level of difficulty that our systems are not always able to handle. The second is much more ambitious, but goes to the core of the impending challenge: to launch initiatives that will unleash dynamics whereby we can learn to cope on the terrain in which we will now be engaged - that of the chaotic.

2.1. Conventional crises: making up for lost time

We have known for the last decade what we have to do to prepare our managers, teams and networks for conventional crises. And we have known how to do it. Only one factor has been typically lacking - the willingness to engage in the process.

Some initiatives are already being taken to boost our know-how and thereby protect against the risk of systemic failure.

Getting the leadership to think about crisis issues. The first step is to place the problem of crises on decision-makers' agenda. The idea is to open the field to collective work on these issues, something that is rare. The most effective way is to have the leader meet with his inner circle in a strategic preparation seminar where they can role-play participant involvement, analyze concrete cases, provide operational reference points, and get used to the idea that this is a field of responsibility for the organization.

Feedback. The feedback or "lessons learned" process is the exact opposite of the oblivion syndrome. We don't close the books on a crisis once the costs are tallied and the bottom line drawn. On the contrary, we need to review the episode in a constructive spirit in order to identify and understand the sequences and linkages revealed in the way the affair was handled. The experience will be treated as an opportunity for collective progress, not as something to be filed away and forgotten (and still less as an occasion for finger-pointing). Moreover, engaging immediately in this type of reflection can help the healing process. At least it demonstrates an intent to be serious about the conduct of procedures: this is often essential when no one is able to come up with "miracle" solutions. Any feedback exercise is sensitive, of course, especially for those who are not prepared for it. The purpose is precisely to work, following the best learning principles, so that feedback gradually becomes possible, and increasingly substantive and useful for all.

Simulation exercises. A group that is not properly trained will find it very difficult to take charge in a crisis situation, and to innovate effectively in unprecedented circumstances. Continuous training is needed, then, not for dealing with well-codified events (the "fire drill" ritual) but rather for coping with destabilizing surprises. The approach should be that of simulation: it is irresponsible to rely solely on actual experience in collective training, especially if that experience is promptly excluded from the feedback session (the fear of prosecution flowing from these analyses is often an inhibiting factor). The simulations must be followed by rigorous debriefings, which are often neglected or rejected once the "course certificates" have been handed out. Yet they are essential for any kind of progress. Of course, steps must be taken to ensure that the exercise is conducted effectively and regularly: as in other fields, simply posting a notice may not be enough.

Specific skills upgrading. It is essential to provide special training for certain key figures: leaders who will have a key policy role as the crisis unfolds; crisis unit managers, who will have to guide extremely complex systems with great and often unknown perverse effects; spokespersons; experts; members of the "strategic reflection units" that were stressed earlier as so important. The general approach is to be content with "media training", but we must go far beyond that. There are in fact whole new areas of management that need to be explored and shared with those interested, and this cannot be done by devoting a few hours every five years to the task.

Learning from others. Because crises unfold within complex networks, it is important to extend the learning process to partners outside the organization concerned: meetings, feedback sessions, exercises, vulnerability analysis can no longer be conducted strictly in-house. The circle of stakeholders must be constantly expanded. This should be started as soon as the organization feels itself slightly less exposed, when fears have abated somewhat, and when internal confidence has been restored. And the organization must also have reached the threshold where it no longer believes it can manage a crisis alone.

These approaches can contribute a great deal. Experience suggests some conditions for ensuring their success:

Personal involvement by leaders. It is in the nature of crises that they strike at the fundamental elements of the organization's existence. Nothing serious can be done without the demonstrated and steady involvement of the people at the very top. Every staff member will feel much more committed to the learning process if the "boss" is personally engaged. The minister, the president, the director must show that he himself is committed to this policy. He must, in particular, reassure all those who agree to innovate in poorly

understood fields; show appreciation for the most promising achievements and performers; have ad hoc means for tracking the issue; provide methodological support for those who agree to become involved. It is, then, a question of demonstrating real conviction, not just issuing formal statements.

An overall work programme. The organization should shy away from showy, one-off operations that will exhaust energy, good will and budgets. There should be a steady progression over time, gradually involving greater numbers of players: first the central core, and then, via concentric circles, an ever larger network. It is also important to play on all registers of learning: an institution that is not properly trained cannot handle multiple exercises or painful feedback sessions unless it has, at the same time, effective support in terms of methodology and know-how.

Process control. Managers must know at all times who is doing what, and they should keep a critical eye on the methods used and the results obtained. This presupposes feedback on the learning process itself. To be shunned are all those habitual exercises that serve no known purpose, and the types of debriefings (also common) that turn out to be protocol-obsessed meetings rather than opportunities for in-depth exchange between all partners. These demands call for establishment of a project management unit that is specifically alert to the methodological difficulties and has close links to the leadership.

2.2. Managing in a chaotic world: promoting "out-of-the-box" dynamics

The principles of intervention are the same as those discussed above for conventional crises, but the starting point is different: here we begin where the previous preparations left off. Work will focus on the following essential dimensions:

The inconceivable: the goal must be to mobilize ourselves around the dimension of the inconceivable, through open prior questioning, simulation and feedback. We will work with others in training to this dimension, and will throw the field wide open to thinking creatively without waiting until we have solid information and sound responses. The cardinal principle is this: not to foresee the unforeseeable but to train ourselves to cope with it.

In a simulation exercise, for example, simply asking a group to produce a scenario that is a priori "inconceivable" is itself very constructive and even liberating. We will very quickly discover the unspoken taboos of the group in question, which will at last become explicit. And in this way we may discover crises that are already brewing.

Training will focus on sharpening the capacity to spot unconventional crises. This means:

- Develop peripheral vision to watch for ruptures at the margins.
- Identify the "sleeping variables" that can abruptly erupt: what was once seen as normal suddenly becomes unacceptable, and what was considered totally impossible becomes the norm.
- Look for unconventional sources of information and make contact with people outside the usual circles: by definition, extreme events do not come through the normal channels, which means that we must have other sightlines and other reflexes.
- Have people pool their sensations, their intuitions and their surprises (and not only their sure data), and have mechanisms for compiling and sharing these intuitions (which are difficult to classify in the pre-established format): focus on converging intuitions rather than on scrupulously documented technical "proof".
- Look carefully at visions, identities, stances and linkages, to determine what is still pertinent, what is no longer pertinent, and what needs to be constructed.

Here is another concrete path, which illustrates the learning philosophy to be followed. If we want to sharpen the strategic perspicacity of a group in charge of "flu pandemic" planning, for example, we will find it very useful to go beyond conventional exercises based on a model of this kind: "We are going to give you a flu pandemic scenario; we are going to see if you know how to apply the national plan for coping with the problems which the facilitation group will provide you with during the day". Instead, we will apply something non-conventional, the "Red Team Approach":

"Suppose you were a secret agent for the 'forces of flu', trying to spark a pandemic. How would you attack the system? What would you do to get around the established lines of defence? And then, what would you do to induce paralysis, conflict, contradictions, and failures in the system and its defence tools? What traps would you set for its leaders? What would you do to strip them of their credibility and their legitimacy as quickly as possible?"

Experience shows that coming at the issue from this angle brings us more directly to the goal, and that participants in the exercise will suddenly become much more creative than under the old system, which was entirely focused on

measuring the gap between what the official plans call for and what the players do.

The ability to discriminate. In many organizations inured to emergencies and conventional crises, the key to their reaction strategy is to assemble all the information possible, and to fill in all the tables, which will be more elaborate the more complex is the situation. The higher the stakes, the more exhaustive this work must be. Yet the feeling of security that these "hot air machines" generate can quickly become a trap. What is needed is a completely opposite approach, one that places the ability to discriminate at the core of the intellectual and operational approach. What are the two or three essential facts, factors or dimensions that must be sought out, constructed, or implemented? As one big international organization told an expert who was being fielded to find an exit after a terrible genocide: "Get out there, but whatever you do don't write reports. Send us just one idea, if you can find it".

Training is needed to come to grips with this new, counterintuitive and rather disconcerting approach. When you have put together a 600-page plan, when you apply the plan, and when you ask everyone involved to fill out statistical tables in the midst of a crisis, failure is just around the corner. But at least all this effort will protect you - you can hide behind all this feverish activity and defend yourself with a mountain of documents in case of an ex-post audit. On the other hand, to be discriminating means you have to wrestle with reality and come up, not with averages, but with what is really crucial, i.e. to discern what can be done that will be effective. Our conventional exercises, when they are organized and carried out, never prepare us for such vital dynamics.

Invention is the mother of initiative. We know that large-scale crises cause organizations to retreat into the models of the past which, even if they have fully demonstrated their uselessness, at least offer the comfort of familiarity, even in failure. If there is to be a fiasco, at least it won't be too much of a surprise. And the method followed will itself provide a kind of "cover". This is a pitfall to be avoided.

We must accept the fact that, in mutating situations, only a mutating intellectual approach will show us fruitful openings.

The usual reflex is to wait until we can see our way clearly, to have a solid overall model before undertaking any novel or in any way risky operation. This view is no longer appropriate. The blinding speed of change and the certain danger of standing still force us to take risks and make bold moves, together with other players.

Progress will be achieved through specific acts by which we can learn, experiment, and open networks. When the battlefield is so vast and so complex, the appropriate rule of thumb is to move forward in stages that are well thought out, clearly defined, but bold. By following a specifically defined project that we can see through to success, we can learn things and, just as important, persuade ourselves that we can make progress, that action is not suicidal but, on the contrary, productive. The targeted nature of the initiatives is also crucial, because time is short and does not allow for elaborate plans.

There may be the occasion for feedback, simulations or public hearings. After the 2001 anthrax attacks in the United States, for example, and the thousands of false alarms in Europe, one of the authors suggested to postal operators that they host an international feedback session to consider some operational initiatives for the future. The president of the French postal service, *La Poste*, immediately agreed to the idea, and in 2002 key representatives of about thirty operators met in Paris to share their experiences and to set up an inter-network alert and information system (Lagadec-Rosenthal, 2003; Lagadec-Michel-Kerjan, 2006). Similarly, with EDF support, international debriefing missions were conducted on the Quebec ice storm (Lagadec, 1999, 2000); on the lessons from the 2003 SARS outbreak in Toronto, relating to a potential pandemic (Lagadec-Dab, 2005); and more recently on the lessons from Katrina for big network operators (P. Lagadec, E. Lagadec, X. Guilhou, 2006).

Education. Until these issues are covered during initial training it will be very difficult to insert them on the agenda for decision-makers. Because the subject is so foreign to their frame of reference, they will be too fearful of the risks to consider and construct creative solutions. The real question, though, is this: how must we equip our future managers and citizens so that they can find new bearings, new anchor points for conviction, new tools of action in a world fraught with crisis and discontinuity? (Frémont, 2004). And this, not in a stable world where the disruptions to be “managed” are rare and isolated, but in a world where the dynamics of risk, of crisis and of discontinuity become the very matrix of evolution (Bellet, 2004).

2.3. Concrete achievements: some operational examples

i). Seminars for leaders

How should we go about enlisting leaders and their inner circles in training for handling extreme events? This is a question that OECD countries might want to consider for consolidating leadership circles at a time when the risk of major crises is ever present.

Our institutions are accustomed to large-scale "command and control" exercises that are complex and time-consuming (and that deal only with logistics, coordination and communication problems), and often no one is very sure how to address the more unfathomable challenges that now face us at times of crisis.

The following pages propose some methodological guidelines that are quite practical and that the authors have used in the field, with the managers of large institutions, the executive committees of major companies, the officials of big cities, etc.

Prevention and management of non-conventional crises: operational initiatives

General framework

- In the turbulent and structurally unstable world that is coming to be, every large organization has the duty to prepare itself for situations of very high turbulence. These non-conventional situations, typified by systemic breakdowns and resonance phenomena, call for powerful and coherent mobilization, for strategic options, and for innovative fundamental stances that cannot be improvised. It is imperative, then, to ensure that leaders and their teams are fully prepared.
- Preparedness for managing these situations goes far beyond what was covered in the "crisis management" or "crisis communication" seminars of 10 or 20 years ago. It involves essentially preparing ourselves, individually and collectively, for situations that pose major surprises that are "inconceivable".
- Experience shows unambiguously that for optimal success in such training the seminars should have between 15 and 60 participants. Recognizing that leaders' agendas are crowded, the seminar is kept to a very short timeframe - an afternoon, an evening, a morning.
- The key objective of the seminar is to build a team or network of individuals who are thoroughly committed over the long haul to taking initiatives for progress in this difficult field. The stress is not on producing rules, checklists or recipes, but on questioning and on the capacity to engage in such questioning jointly, on direct and thorough involvement in simulations that will test the capacity for high-speed construction of response stances, of organizational modes adapted to the least expected situations. The crises of today nearly always depart from the anticipated scripts, and we must train ourselves to react strategically in such situations, which always take us by surprise, to

- the point where organizations are regularly paralyzed by the non-conventional nature of the situation.
- The seminar could employ a number of approaches:
 - Simulation exercises: this is essential when we want to prepare for surprises.
 - Case studies: this provides a useful perspective, and involves video films of remarkable pedagogical effect.
 - Demonstration of acquired knowledge both in diagnosing problems and the pitfalls to avoid and, naturally, in choosing the most appropriate response (once again with input from participants, video footage from exceptionally experienced leaders).
 - Finally, time should be devoted to operational approaches to building, over time, ever-stronger collective skills in these fields, which are undergoing sharp mutations.
 - The strategic operation must involve the most senior leader or leaders directly. This is what Rudolph Giuliani did in New York, and it allowed him to set and hold his course in the storm. We are now into the realm of politics in its true sense (the capacity to bring collective meaning and direction to difficult circumstances in which all the markers are lost), and not that of emergency techniques.
 - Generally speaking, organizations, institutions and managers appreciate the urgency of initiatives on these issues. They can be planned, even from the outset, with an international dimension.
 - In some cases, it will be advisable to interview the leaders before the seminar. In all cases, the operation is prepared in very close collaboration with the responsible manager within the institution or the team concerned.

The essential principles of operational intervention are these:

1. As soon as a non-conventional crisis emerges, examine the usefulness of a debriefing exercise with the institution's managers.
2. If the idea is confirmed, consider the best time to conduct the debriefing: neither too early (when the desired participants are entirely preoccupied in managing the situation) nor too late (when those persons may have forgotten about the event, or have already had too many requests).

3. Putting together the field work: identify the key persons to be met with; consider the best way of involving them in the initiative, from an information-sharing perspective and not simply that of an interview.
4. Conduct the debriefing exercise in the field: this information gathering must include an essential dimension of exchange, of support, of feedback from the investigation team. If possible, films will be made of the interviews and reports, as ideal teaching aids¹.
5. A written report for operational and strategic use. The intent is to identify new issues, new principles for guiding crisis management in our time.
6. Information seminars and strategic brainstorming sessions following the mission.

NOTE

1. Examples: Roy A. Williams (Director of Aviation): “Louis Armstrong New Orleans International Airport and Katrina: Working out of the book”, talking to Patrick Lagadec, firsthand accounts collected by the debriefing mission sponsored by EDF (Pierre Bérour, *Directeur du contrôle des risques*) on major vital networks and Katrina, 19-26 February 2006.

Rodney D. CHARD (Executive Vice President Whitney Holding Corporation ; Executive Vice President and Division Executive, Operations and Technology, Whitney National Bank in New Orleans) : “Whitney Bank and Katrina – Rebuilding technology infrastructure”, talking to Patrick Lagadec, firsthand accounts collected by the debriefing mission sponsored by EDF (Pierre Bérour, *Directeur du contrôle des risques*) on major vital networks and Katrina, 19-26 February 2006.

CONCLUSIONS

This is the major risk we face today: to keep trotting out the line that "everything is under control", "don't be pessimistic and so don't ask any questions", while demanding that the citizens give up the idea of "zero risk", while complaining constantly about the "unhealthy litigiousness" of our societies.

If we cannot mount strong, determined and open initiatives, we risk falling prey to the most punishing kind of bunker mentality. Threats and crises are not going to wait. And if we stumble from fiasco to fiasco, our energies and our confidence will collapse, reinforcing the fears of officials and the public alike and leading to a deadly downward spiral.

We must therefore learn to take new initiatives, through very concrete and practical approaches, and we have just indicated the operational routes that have already been found useful in the field. The first requirement, in most cases, is not to hold a press conference or issue a white paper but rather to engage effectively with stakeholders in precise initiatives for learning, for overcoming obstacles, for convincing, and for transforming denial into positive determination.

"Failure is not an option". On all fronts - intellectual, managerial, governance, conviction - we must now acquire the skills and the openness to address the new vulnerability issues. We must venture resolutely to these new frontiers, in order to understand them and to improve our skills, in terms of vision, philosophies and tools - in order to better master our destiny in these particularly turbulent times.

LARGE FINANCIAL INSTITUTIONS AND UNCONVENTIONAL CRISES

The issue

Major financial institutions play a critical role in the recovery process in the wake of a crisis. That role is even more important in what is becoming a chaotic environment: astronomical direct costs, cascading damages that are impossible to assess, beneficiaries that are impossible to reach, public institutions and essential operators that are profoundly destabilized.

Preparedness is the vital key

Inadequate preparedness aggravates considerably the risks and costs, and even the possibility, of recovering from a crisis.

Given the paralyzing nature of any extreme phenomenon, the financial institutions that must help are at great risk of finding themselves profoundly de-structured in a post-accident world, and too destabilized to make use of the funds entrusted to them. Thus, financial institutions are likely to be overwhelmed by the storm, to be required to “pay” ineffectively and, in the end, to be the ultimate scapegoat.

It is vital, then, for big financial and insurance institutions to develop and apply policies that are up to these challenges, so that they can play their role when needed and act as an essential lever in recognizing and managing the risk of unthinkable crises.

Two imperatives

Financial institutions must consider action on two crucial fronts:

1. Assuring their own preparedness for off-the-scale crises (in addition to what they already do in connection with conventional crises).

2. Close and sustained attention to the preparedness of all those who look to the financial organizations for support, in particular for insurance and reinsurance.

Simple operating rules

Internally, to insure real competence

Large financial institutions need to set up an in-house group, reporting to the highest level, with the tasks of:

- Strategic thinking and active surveillance on the problem of unconventional crises, using new concepts and tools such as those indicated in this section.
- In addition to the usual technical documentation, apply this strategic thinking to policymaking, with particular attention to the rules of engagement before, during and after highly destabilizing situations.
- Start work on developing the non-conventional operating tools for engagement that will be needed when entirely new problems emerge.

Externally, rules of audit for all requests for coverage

To make our big systems more resilient and more robust, and to restore relevance to their general financial support activity, which is so essential in cases of major disaster, large financial institutions must now tie their support and their insurance coverage to some cardinal requirements of a strategic nature that go well beyond the conventional rules of risk management.

Following are some of the questions that must become the initial benchmarks to ensure that the problem of off-the-scale risks and crises is really taken in hand at the highest level of the organization seeking coverage:

- When and how do the senior leadership and its teams participate in strategic preparation sessions, seminars and simulations on major risks of non-conventional crises?
- What specific instances of debriefing on extreme situation have there been in the last two years?
- Beyond crisis plans and conventional exercises (the quality of which must be assessed), what benchmarks appropriate to off-the-scale events are already available and specifically applied?

- How does the institution give effect to the lessons drawn from these efforts?
- Is the institution also working on preparedness with all its essential partners?
- In a dynamic and forward-looking manner, what are the principles and guidelines for the next two years in terms of acquiring knowledge and know-how?
- Is this programme officially in the hands of a specialist reporting to senior management?

It will be important to ensure that any item missing from this checklist of essential requirements is taken directly into account in assessing the institution in question.

Annex B

TWO EXAMPLES OF CRISES FROM THE YEARS 1980-2000¹

Case No. 1: The Sandoz fire and pollution of the Rhine, November 1986

During the night of November 1, 1986, a fire broke out in one of the Sandoz warehouses in Schweitzerhalle, not far from Basel, Switzerland. The warehouse contained 1351 tonnes of chemicals, intended mainly for agricultural use. Firefighters brought the blaze under control in the early hours of the morning. The warning issued to local people, to stay indoors and close the windows, was lifted around 7 a.m.. The incident was over and the "emergency" had been dealt with.

But a few days later, a crisis erupted: the Rhine had been polluted. At least some of the water used to put out the fire had drained back into the river. Laden with toxic chemicals, it struck at the very artery of Europe, tainting this "symbol of symbols" all the way to its mouth. "The death of the Rhine" made headlines in the European and international press. This was no longer an emergency, but a real crisis.

This was not a sudden plunge into crisis - and therein, perhaps, lay the trap. There was certainly a tremendous fire, but on November 1, 1986 everyone was congratulating the firefighters for the excellent job they had done. There were no victims. A press conference on November 4 evoked no awkward questions. Everyone was relieved.

While the incident seemed to have passed, the crisis took over the field by stealth. It revealed itself only four days later, after the emergency efforts had been called off. Yet it soon engulfed the entire theatre of operations. It was a further shock to the city of Basel, which had been aroused in the middle of the night and had put up with sirens (silent since the last war), a terrible odour that blanketed part of the city, and orders and counterorders to close schools, etc. It created a lingering fear that manifested itself in many ways: a cloud fell over the intimate relationship between the people and "their" chemical industry.

Within Sandoz, they were blinded by their initial success. The incident was over and it was now just a question of settling damages. Pollution? - "Come on, we're talking about eels!" So no one took the situation firmly in hand. When the field is abandoned in this way, through inaction or partial action, everything feeds the crisis. This was the case with the lists of chemicals that might have found their way into the Rhine with the water from the fire hoses, which the company made public. But those lists were not complete, and the company was soon accused of deliberately trying to conceal the most dangerous products.

When it seemed that everything was over, the world press arrived. The wildest rumours began to flourish, in ground that was particularly well prepared. The headlines read like a Wagnerian opera title: "Death of the Rhine". The government mobilized on a scale never before seen: the cantonal parliament was convened, the Grand Council of Basel held a minute of silence, the two federal houses of parliament met (which was unprecedented for this type of problem). The crisis was about to gain the upper hand. And as we know from experience the louder the questioning becomes the quicker the frames of reference disappear. Would the company be able to extricate itself from this surreal and indeed suicidal void?

Fortunately, the alarm was sounded, as is often the case, by someone who knew the system well but was something of an outsider. Edgar Fasel had just arrived at Sandoz, with the job of creating a new external relations department that was to become operational in early 1987. In the course of his previous career, with another industrial concern and with the Swiss government, he had already had to deal with serious crises.

Edgar Fasel: "On Friday the 14th, I realized that communication had broken down completely. I was very frank with the CEO, Mr. Moret: "what we're doing is completely stupid; everyone is running after everyone else; we're all at the end of our rope; we're aggressive, bad losers, bad players". He told me, "Yes, you're right, something's got to be done." He called a management meeting for Sunday afternoon. For my part, I brought together a team of some 20 people to inject some new blood into the affair. On the 21st, we called together the international press. The essential thing, as I saw it, was not the third list that we were going to give them, but the fact that the president would be there to run the meeting. In fact, it went very well - Mr. Moret was superb. For our part, we stressed that we have always told people that we knew. They could accuse us of not knowing everything all the time, but they couldn't call us liars.

The personnel and equipment infrastructure for handling information and external relations at Basel was very weak at the time of the fire. We set up a telephone hotline to respond to the press, with a team of eight, then twelve men and women. The rules were: don't leave any question unanswered, don't keep bothering the specialists, who have to get their work done, bring them out only for the press conferences, don't put every technical question to them (they are not communicators and that isn't what they were trained for). This phone service, which operated 24 hours a day, received some 200 calls a day for 30 days and coped with 130 requests for individual interviews, as well as the presence of 17 TV crews. The Japanese were interested in the problem, and of course the Americans never fail to show up.

But our lovely organization came too late. The problems kept multiplying: around November 20, a Zurich ecological institute announced that theoretically, "dioxin could have been released by the flames." That information spread like wildfire. When the experts finally produced their analysis - negative findings - the media had lost interest in the subject. That episode really killed us.

In short, no matter how properly and skilfully we conducted ourselves, the image remained fixed. The information professionals had decided we were liars, that we understood nothing, that we were grasping at straws, that we were not on top of anything. Local people vented their feelings - they were fed up with technology: Chernobyl, the Challenger, local debates over nuclear power, and now all this from the city's chemical industry. There was no real way to fix the situation.

All we could do was hunker down and wait until people were ready to listen to us and to believe us again. We made use of that time to refine our organization and prepare our messages.

Basically, in terms of information, we were setting out to make up for lost time - because Sandoz had got through its first century successfully, of course, but without any true communication culture."²

This reorientation prevented Sandoz from going under, clinging desperately to outmoded attitudes. It turned things around and emerged stronger from a situation that, however, stood in sharp contrast with Bhopal: the pollution of the Rhine was not as bad as had been feared, and there was no disaster. Above all, the company was able to take bold initiatives in the wake of the episode. First, in terms of prevention, it invested heavily in safety: crisis management is by no means a question of communication alone. Sandoz also

set up an independent scientific institute to monitor water quality in the Rhine. It established a fund of 40 million French francs (some USD 6 million) to support research for ecological cleanup of the Rhine, it called for tenders, and it sponsored 34 teams - the projects were selected by an independent committee of experts. From an isolated incident there emerged a global plan that the people involved took very seriously: this is the kind of transparent initiative that best promotes healing.

Also noteworthy was the analytical work and investigation that Edgar Fasel, in particular, undertook in an effort to share the lessons from this ordeal. We should take seriously his key point: "If a leader tackles a crisis as if he were the keeper of a fortress, he is lost." And we should heed his lucid argument and his full encouragement for drawing tough lessons: "There are very few accidents (significant progress has been made in the safety field) but when they occur, they are very serious. We have to knuckle down, knowing that the ground is constantly shifting. The conclusions we draw today would have seemed completely outrageous and unacceptable just five years ago: people would have said we were alarmists! The experience of recent years has not entirely swept away old-fashioned ideas, but at least it has shown that some conventional ideas are no longer entirely satisfactory."³

Case No.2. Johnson & Johnson and criminal tampering with Tylenol, autumn 1982

This is a textbook case: the rare capacity to decipher instantly a signal of very low intensity; the ability to sound the alarm and mobilize quickly; taking charge resolutely at all levels - operational, strategic, ethical - when there is a large-scale threat⁴.

On September 30, 1982, the director of public relations for the Johnson & Johnson group was informed by a member of his department of a strange phone call from a *Chicago Tribune* journalist. The journalist had asked basic questions about Tylenol (a very popular painkiller, with sales of USD 400 million a year), about Johnson & Johnson, and about its relationship with its subsidiary, McNeil Consumer Products Company (which distributed the product). The conversation left the employee with an uneasy feeling. The director called the reporter back and asked what was going on. He was told the reporter was investigating a Chicago doctor's suspicion that there was a link between Tylenol and a recent death.

The public relations director called his boss, the corporate vice-president for public relations, who in turn immediately called his superior, the president of J&J. The vice-president's first thought was that there had been some kind of

problem at a plant, and he hoped it was all a mistake. The president called his executives together. But all this handful of executives knew was that a rumour circulating in Chicago was linking a J&J product with death. *Death . . . when health was what Johnson & Johnson was all about!*

The president lost no time: he told the vice-president of the executive committee and the public relations director that a helicopter was standing by to fly them immediately to McNeil headquarters in Pennsylvania, not far from J&J headquarters in New Jersey.

The president wasted no words, and told his vice-president, "Take charge." Ninety minutes later the two men were in action.

The selection of the crisis manager was not a random choice: the vice-president knew Chicago, and was a former boss of McNeil. He immediately introduced the communication dimension into the team. They followed the basic requirement: gather the best possible information about the event. A crisis unit was set up, with seven people, and a clearly defined mission focused on two key questions: "How do we protect consumers?" and "How do we save the product?" The president stayed at the helm.

A remarkable reflex phase, extended immediately by decisive interventions:

- alert the public via the media
- alert the medical community
- take the product off the shelves in the Chicago area
- coordinate with government agencies
- pull all advertising for the product
- offer a reward of USD 100 000 for information on the perpetrators of the contamination
- inspect millions of Tylenol capsules in J&J offices and in regional offices of government agencies

Yet everyone was still in the dark: where did the problem lie? Failure or sabotage? The threat remained random and impossible to pin down. The people with whom action had to be coordinated, especially the FBI, were strangers to corporate culture. The company's image was about to be destroyed: "J&J, from cradle to grave". Staff were attacked, even in their private life: "Your father works for a firm that kills people!"

The light began to dawn shortly afterwards, with the discovery in Chicago stores of two more Tylenol capsules tainted with cyanide. These lots came from different sources, both in terms of their manufacture and their routing. So it was sabotage in the retail stores, and this was absolutely confirmed on October 2, when a ransom demand was received.

Faced with the unknown (which is always the most destabilizing), J&J was at least able to fall back on a very sound internal code that constituted a kind of anchor in the storm. This was the "credo" established forty years earlier by the son of the founder, who was president from 1938 to 1963. Its wording was particularly advanced for its time:

“Institutions, both public and private, exist because the people want them, believe in them, or at least are willing to tolerate them. The day has passed when business was a private matter – if it ever really was. In a business society, every act of business has social consequences and may arouse public interest. Every time business hires, builds, sells, or buys, it is acting for the...people as well as for itself, and it must be prepared to accept full responsibility for its acts.”
[Translator’s note: taken from the J&J web site]

The company had always made great efforts to give life to this credo. Meetings organized on the subject drew more than 4000 employees. The president himself chaired every meeting. In 1975, a redrafting of the credo was considered at the highest level, and it was modified slightly. The actions taken immediately after the onset of the crisis were guided by this credo: consumer safety and welfare were the first priorities, and everything else was secondary. The company's response was consistent with the first line of the credo: “We believe our first responsibility is to the doctors, nurses and patients, to mothers, and all others who use our products and services.”

J&J insisted that this anchor was of great help to everyone when important decisions had to be taken in uncharted territory. It was a light at the end of the tunnel, a fixed reference point, but also extremely useful in terms of legitimacy. It provided the basis for the immediate reflex to protect the public: "act quickly and responsibly". It also underlay the communication policy: "tell what we know, as soon as we know it". And it provided immediate guidance for dealing with the outside world: "ask the public to trust us".

The news that new lots had been deliberately poisoned and the discovery that the packaging was vulnerable led the company to take some far-reaching decisions:

- It withdrew the product everywhere.
- It destroyed the entire stock.
- It set up a phone line to listen to and answer public concerns.
- It trained employees to receive calls (of which there were 30 000 over the next month).

But the company did not stop at a general recall. Tylenol was a very popular product and a profitable one, and the company did everything in its power not to leave its fate to the extortionists. It was the packaging alone that was at fault: over the short term, the market would have to be steered to an alternative format for the product (in tablets rather than capsules), and over the medium term, the product would be reintroduced in better-protected capsules.

This policy was supported by strong action at communication and marketing:

- Advertising: the company placed full-page ads in major American newspapers on October 12, offering to exchange bottles of capsules for tablets.
- It established a direct phone line for consumers within the first week of the crisis. Some 136 000 calls were received with 11 days following announcement of the service; and 210 000 calls within three weeks (specialized firms were hired to handle these calls, to the relief of J&J).
- 60-second spots were aired in October and November featuring the medical director announcing that the bottles would soon be available again with new packaging.
- The company's top executives made statements over the major TV networks.
- Other employees were trained to respond to interviews.
- A four-minute video was prepared for TV, showing how the tamper-proof packaging was made.
- Every letter addressed to J&J received an answer: some 3000 inquiries were handled in the course of a month and a half.

Nor was the internal front overlooked. The president took action immediately to let everyone know that a comeback was possible, and to dispel any defeatism: "We're coming back", he proclaimed. There was also ample

evidence of solidarity: J&J stood by its subsidiary, providing financial support and finding work for temporarily laid-off employees.

Beyond that, to give greater effect to its social responsibility, the company worked with the government and with Congress to promote new product packaging standards. It scheduled visits to more than 160 members of Congress in Washington to lobby for new legislation that would make it a crime to tamper with consumer products.

The company's management of the entire crisis demonstrated its capacity for initiative, based on its founding values. It did so again when the product returned to the market on November 11: the bottles of Tylenol now on the shelves were tamper-proofed with triple seals. The company was thus the first to comply with the new standards prescribed by the FDA (Food and Drug Administration). Once again, J&J demonstrated its operational capacities:

- Another big communication campaign: more than 2250 members of the corporate sales force (including J&J subsidiaries) were mobilized to make presentations to the medical community (70 per cent of all users take Tylenol on the advice of a physician). One million such presentations were made before the end of 1982; 450 000 e-mail messages were sent out to doctors and distributors.
- Another large-scale marketing campaign: discount coupons worth USD 2.50 were distributed through newspapers and via a toll-free number where people could request them. Discounts of up to 25 per cent were offered to retailers in order to win back shelf space. And a new advertising campaign was prepared.

Worldwide media interest in the case was enormous, producing 80 000 press clippings, 2000 telephone calls, hundreds of hours of radio and television reports - "the most widely covered issue since the Vietnam war". And the company did not limit itself to providing basic information: answering some of the calls required extensive research, for example to provide details on delivery routings (for one investigative journalist pursuing a particular hypothesis), or examining this or that sabotage theory.

Matters came dangerously close to the precipice when a journalist asked about the presence of cyanide on company plants. The company responded, off-the-cuff, that it had none of that poison within its walls, and so the problem could not be an internal one. But then it was discovered, to the company's horror, that there was indeed some cyanide in one of the company's research labs. If the press were to get its hands on that information, it could destroy J&J's credibility completely, for it would have been caught lying. If the press were to

publish such information, the general climate would inevitably condemn the company: in fact, the cyanide in the laboratory had absolutely no connection to the case, but in the midst of a crisis, who would be able to counter that hasty public verdict? The journalist was contacted, the response was corrected, and he was asked to use discretion, on understandable grounds. A second journalist learned of the report, and then a third. On each occasion the company took the same care in dealing with these scrupulous investigators who, after realizing that there was no real story involved, agreed to the embargo. The information was released later, at a time when the risk that it would be misconstrued could be better controlled.

Equally careful attention was paid to internal communication and to communication with shareholders (who are kept informed about the handling of the crisis). As a senior company executive put it:

“Our most valuable constituents are the employees. We realized that from day one. In all, we produced four different videotaped special reports on the Tylenol crisis. We had an internal video network for our 165 companies and divisions, and we sent them cassettes. The tapes, lasting more than three hours, covered all important aspects of the evolving story and treated at length the president’s teleconferences and [his appearance on an American TV programme]. The president and the CEO co-signed a letter that went to every employee in the United States, explaining the crisis, what the company was doing, and the steps we were going to take. The employee response was impressive. The crisis knitted our employees together, and bonded them as never before in the company's history. Of course, you'd rather wish it hadn't happened at all. But because the company responded the way it did, the employees were very proud of the organization.” (Ten Berge, 1990, p. 25)

The crisis left seven people dead. 31 million bottles of Tylenol were recalled, at a cost of USD 100 million. Within a few months, the market was 98 per cent restored. This outcome can be explained by three fundamental strategic capacities:

1. The absolutely remarkable reflex capacity in the chain of command, despite the weakness of the initial signal; the ability to mobilize all the essential ranks, up to the president; the president's capacity to put the system in position for active response. All of this in 90 minutes.
2. The establishment of clear rules of response, deeply anchored in the company's core values: stop the deaths; discover the cause; help the victims; be transparent, and behave with humility.

3. Masterful conduct on all fronts: overall coherence, specific communications for each target audience, mobilization of all personnel, including retired workers, tracking public opinion, decisive intervention by the president, large-scale media campaign.

The conduct of this crisis can be summed up in three words: competence (both strategic and tactical), responsibility (both external and internal), and dignity. And to consolidate the overall dynamics, there was a real effort at learning, targeted at managers, the bulk of the staff (including retirees), and outside groups and institutions.

NOTES

1. Extracts from : Patrick Lagadec, *Apprendre à gérer les crises, Société vulnérable – Acteurs responsables*, Les Editions d'Organisation, 1994.
2. Taken from P. Lagadec, *States of Emergency*, 1988. Interview with Edgar Fasel, 127-131.
3. Interview with Edgar Fasel. See also "Sandoz s'engage pour un Rhin propre", Sandoz, brochure, summer 1988.
4. Steven Fink, op. cit. p. 204-206 ; Dieudonnée ten Berge, 1990, p. 25-26.

Annex C.

**AN EXAMPLE OF AN OFF-THE-SCALE CRISIS:
KATRINA, AUGUST 29-SEPTEMBER 2005¹**

Hurricane Katrina struck the Gulf of Mexico coastline on August 29, 2005. It is estimated to have caused 1,300 deaths: it was the costliest hurricane in terms of human lives since 1928 (when the Okeechobee hurricane killed 2,500 people), and the third worst in American history (Galveston, 1900, 8 000 deaths)². An essential point is that it presented two facets:

- A major hurricane.
- A hybrid disaster, that was both natural and technological, following the breach of the levees and the flooding of New Orleans, which caught nearly everyone off-guard³.

1. The hurricane, a familiar event

- The south eastern coast of the United States is accustomed to hurricanes (even though Louisiana is located on the outer rim of the core hurricane zone, and was thus not on the screen for initial awareness and preparations).
- The organization and tools for weather forecasting and hurricane warnings are remarkably effective.
- Civil Defence systems are also dependable, at least in Florida, and people know how to react.
- There had been extreme storms in the past, including category-5 hurricanes like Andrew (1992) and Camille (1969).
- Katrina was forecast several days in advance. It achieved category-5 status over the Gulf of Mexico, and was then downgraded to level 4 and then to level 3 by the time it hit the coast. Its path had been very closely predicted to within about 10 km.

2. Katrina broke many records

- *Unusual parameters.* Katrina was not a category-5 hurricane, but there are other parameters besides wind speed that must be taken into account, and these are not successfully reflected in the Saffir-Simpson scale. The size of the storm, which was more than twice as big as Andrew (400 km versus 200), the general configuration of the coastline, with Louisiana forming a bottleneck that helped raise water levels; the fact that the hurricane hit at high tide. Depending on the place, the water rose between 4 and 10 metres above normal, compared with an average rise of 5 metres in the case of Andrew. Moreover, Katrina was followed on September 24 by another hurricane, Rita, which added its destructive effects to those of its predecessor.
- *Widespread and severe impact.* The area affected is as big as Great Britain, or 50 per cent of France: the landscape lay devastated, and the most severely hit areas were totally wiped out. Between 250 000 and 300 000 houses⁴ were severely damaged or destroyed; 110 000 in New Orleans alone, of which 30 000 to 50 000 were irreparable. Tourist facilities built of concrete were flattened.
- *A multi-faceted phenomenon.* The most serious problem, especially for New Orleans, was not the wind itself but the persistent flooding that followed the breach of the levees (most of the city having been built in a basin below the level of Lake Pontchartrain and the Mississippi River). In New Orleans, nearly 110 000 dwellings, or 50 per cent of the city's housing stock, were covered by more than 1.2 m of water, some of them by more than 3 m. The flooded area amounted to seven or eight Manhattan Islands.
- *Losses and costs.* The overall cost of Katrina is estimated at USD 200 billion. It wreaked havoc of all kinds, exceeding any other catastrophe in world history in terms of economic losses. With respect to insured losses, the cost of Katrina amounts to some USD 40 billion, or double that of the “record” hurricane Andrew in 1992, more than six times that of hurricane Hugo (1989), and twice the cost of the terrorist attacks of September 11, 2001. In the three weeks following Katrina, Congress released more than USD 75 billion, as much as the combined total for the September 11 events, the four big hurricanes of 2004, and hurricane Andrew.
- *Social devastation.* 1.5 million people were evacuated from the region⁵, reducing the number of available workers by more than

930 000. Apart from the shrunken workforce, reconstruction is still being hampered by the colossal problem of debris⁶, the destruction of utility systems, the dissolution of social bonds, public health threats (severe water pollution from chemicals), the soaring cost of materials, and high transportation costs reflecting the spike in fuel prices. Before Katrina, the Parish of Orleans had 15 000 active businesses: only 1880 were back in operation as of February 8, 2006.

3. Major networks: massive destruction, chain effects

- *Destruction of offshore oil facilities.* Around 75 per cent of the offshore oil platforms (3050 out of 4000) were located in the path of Katrina and of Rita, the two successive hurricanes: 114 were destroyed (50 by Katrina), 69 were damaged, 19 were set adrift, and three sank. It was however the older and less productive ones that were most seriously affected, and in the end this limited the impact on production. Immediately after Katrina, 91 per cent of oil production and 83 per cent of gas output had ceased; three weeks later, the figures were only 55 per cent and 34 per cent, respectively. Yet at a time of heavy pressure on oil prices, and a volatile economy, the least disruptions can have very severe consequences.
- *Destruction of vital networks.* 80 per cent to 90 per cent of vital utilities and services were destroyed in less than three hours (electricity, water, pumping). Earlier hurricanes had caused power cuts for perhaps 250 000 people: the figure for Katrina was over four times as high, at 1.1 million, including 800 000 in Louisiana. Telephone service was almost nonexistent, with more than 3 million lines out of commission, and with damage on a scale that could not be immediately repaired (indeed repairs took a very long time because of the persistent flooding); many switching centres were inaccessible and often irreparable, since water is a mortal enemy of electric and electronic installations.
- *The “clotting” effect.* The loss of electric power makes all other networks inoperable; the collapse of communications impedes normal operation of all response mechanisms; the loss of fuel, combined with the destruction of much of the transportation network, also brings a host of obstacles, and to these must be added problems of security. The second hurricane, Rita, provided another shock, causing recovery work to be suspended and reconstruction materials to be withdrawn to safety.

4. An unstable setting

- *The natural setting.* Seven of the ten most costly hurricanes in the history of the United States occurred in the course of just over one year, between August 2004 and October 2005. Five of the eleven most devastating catastrophes in history hit the United States over the last four years: there were as many major hurricanes (categories 3, 4 and 5) between 2000 and 2005 as during the entire decade of the 1990s. The frequency of such events, then, seems to be spiralling, and they are no longer extremely rare incidents of the "once in a hundred years" type. In other words, naïve relativism - "there have always been disasters" and "modern man has simply lost his memory of them" - does not stand up to any analysis, and especially that of insurers and reinsurers.
- *The social setting.* Our societies are intersected by fault lines that make for heavily contrasting social contexts, which can give rise to fragmented, extreme, unstable reactions that are difficult to comprehend. These fractures had already been identified in New Orleans. Henry Quarantelli, founder of the Disaster Research Center, had stressed prior to 2005 that land use patterns in some places in the United States no longer met the normal conditions assumed by institutional frameworks. In case of a disaster, he added, this would open the way to reactions that would not fit the normal paradigms ("no leaving your post, no violence") in terms of disaster sociology.
- *The institutional and organizational setting.* The shock of terrorism has provoked a fixation on 9/11-type attacks⁷. In one fell swoop, the status, the resources and the teams of FEMA were swept swiftly into the maelstrom, demonstrating that in just a few years a government agency could lose much of its effective capabilities⁸. As Katrina showed, the price to be paid for this impoverishment becomes brutally obvious under the test of reality. More generally - and this problem is not confined to the United States - because of budgetary cutbacks, and an increasingly short-term focus, our societies have been losing the crisis management capacities they had in the 1990s. Finally and most importantly, the priority given to "checklist"-type approaches at the expense of strategic questioning, the refusal to tackle issues for which we do not have "sure" answers on file, (in the name of "operational pragmatism" that can hardly conceal the mediocrity of the visions and the means deployed) have provoked a fundamental backwardness in our approaches to risks and crises. Outmoded paradigms, and the lack of vision, of strategic thinking and of preparedness: our systems are

most often "one war behind" in terms of our major vulnerabilities. Because of this, it is not enough to complain about the shortcomings of the people on the front lines (even when they are obvious, as in the case of Katrina) or to call for simple organizational tinkering. Fundamental failures require fundamental changes.

Katrina thus represented an off-the-scale phenomenon and it struck in a context that, before the disaster, already betrayed many fundamental misalignments. These are now common features of the new world of crisis.

NOTES

1. Xavier Guilhou (XAG), Patrick Lagadec (Ecole Polytechnique), Erwan Lagadec (Harvard University) : "Les crises hors cadres et les grands réseaux vitaux – Katrina. Faits marquants, pistes de réflexion". Mission de retour d'expérience, La Nouvelle Orléans (Louisiana), Gulfport (Mississippi), 19-25 février 2006 ; Washington, DC, 13-15 mars 2006, EDF, Direction des Risques Groupe, avril 2006. See at www.patricklagadec.net
2. Most of these figures are derived from interviews and written sources such as Robert P. Hartwig, Senior Vice President & Chief Economist, Insurance Information Institute, New York, December 7, 2005. <http://www.disasterinformation.org/disaster2/facts/presentation/>
3. This despite the fact that this risk had been remarkably well documented and had been the object of a simulation exercise based on an almost identical scenario in 2004. There is a big gap between the hypotheses and their effective internalization in organizations.
4. This exceeds the destruction in Bosnia-Herzegovina or the Southeast Asia tsunami.
5. 1.5 million people were displaced, as many as in a major civil war.
6. The same type of major surprise found at the World Trade Center in September 2001.

7. Despite the warning of the experts. A non-conventional crisis preparedness official in New York City confided, in July 2004, that what he feared above all was not another terrorist attack but a category-3 hurricane over New York (interview video footage).

8. As if echoing this idea, Mike Walker, former Deputy Director of FEMA, was quoted as follows in the Washington Times of 13 September 2005: “Two years ago, in a lecture at the Naval Postgraduate School... I told students that FEMA was not capable of adequately responding to a major hurricane, let alone a catastrophic terrorist attack. My comments were based on an assessment that morale at FEMA was then the worst since the agency was created. The very people the nation depended on to help out during our time of greatest need were being demoralized by an indifferent, inexperienced leadership that neither understood emergency management nor had the skills to ensure the agency had the resources to meet its all-hazards mission.”

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