

## PART I

### *Chapter 2*

# **Industrial, Technological and Other Catastrophes**

*by*  
Christian Lahnstein\*  
Munich Re

An international reinsurer must be credited with a certain degree of experience with catastrophes. But the question is, given the individual profile and diversity of the scenarios, how far can he meaningfully "process" such experience? This is scarcely possible using actuarial methods alone. It calls for methods that are probably more akin to those of an historian than those of an actuary, scientist, economist, legal or other kind of expert.

The first part of this chapter aims at categorising catastrophe scenarios while presenting comments on some of these categories.

The second part briefly shows how the same or similar catastrophe scenarios are differently handled in various insurance markets and legal systems.

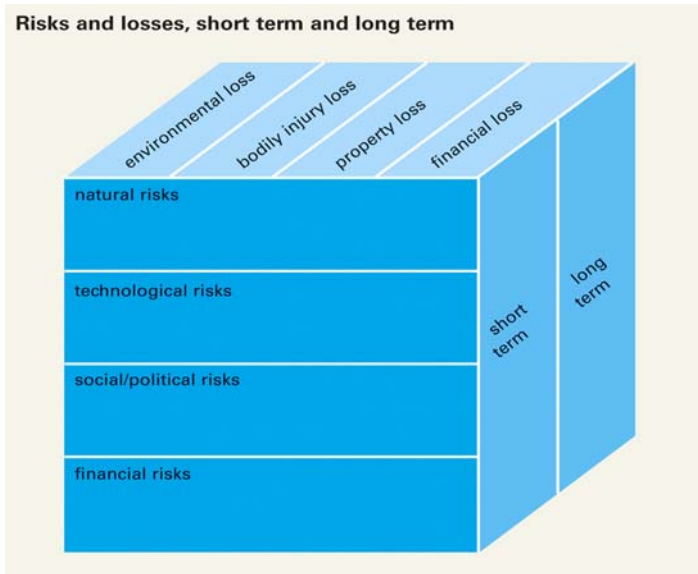
---

\* Legal Counsel, Claims Management and Consulting

## 1. Categorising catastrophes

A structured overview of catastrophes differentiates between short-term and long-term risks and losses.

**Figure 2.1**



Risks fall under four categories: natural hazards; technological risks including infrastructural risks such as mass losses arising from road, rail or air transport; social and political risks, and pure financial risks.

The losses can likewise be divided into four categories: environmental damage, personal injuries, property damage and purely economic losses.

A distinction can also be made between short-term and long-term scenarios: accidental pollution versus long-term soil and water pollution or climate change; technological short-term risks (industrial accidents like Bhopal 20 years ago) versus long-term risks (toxic torts like asbestos); political short-term risks like terrorism versus a new type of long-term risk affecting corporations: the trend to rework historical injustice under the aspect of tort law.

There are combinations and fluid transitions: accidents, events arising in the short term, can result in long-term damage, almost unlimited in the case of nuclear accidents, for example. A large number of individual accidents –

such as leaks in industrial plants – can be seen as the result of one continued risky operation. The causes of an industrial fire may be specific to that industry, but they may also be sabotage or terrorism.

Nevertheless such a differentiation appears to make sense. On the one hand, ecological and social/political aspects should each be looked at separately: the technological, ecological and social standards of corporate liability. On the other hand, typical structures should be perceived in large loss scenarios – each of which has a unique individual profile – and adequate claims management methods developed. Everywhere there is the unsolved problem that whilst questions of liability law and insurance cover become too complex for detailed application, it has not yet really been possible – in the reality of extrajudicial ad hoc payments or fund arrangements – to develop satisfactory alternative solutions. Finally, in long-term scenarios it is “abundantly clear that neither the judicial system nor the legislature will ever solve the problem of mass tort litigation until we find a way to resolve the futures problem”<sup>1</sup>, the problem of anticipating future claims when responsible parties insist on “global peace”<sup>2</sup>.

### ***1.1. The dubious ranking of catastrophes***

An earthquake in the Gobi Desert will not cause any damage, however strong it is: an event, not a loss event. On the other hand, the 1985 eruption of the Nevado del Ruiz volcano in Colombia, though relatively harmless on the basis of the Volcanic Explosivity Index, buried a town of 30,000. Nevertheless, the private insurance industry was affected much less by this than by the smashed roofs and dented cars caused by the July 1984 hailstorm in Munich. Ranking of catastrophes depending on the highly specific aspect of private property insurance involvement can be misleading.

### ***1.2. Catastrophes and liability***

In catastrophe scenarios, questions of liability already play a part where natural hazards or political risks are to the fore. Flooding can also be caused as a result of zoning plans being faulty or not properly monitored. The causes of an earthquake cannot be attributed to anyone, but foreseeable or avoidable consequences of construction defects or poor disaster management can. In acts of terrorism, there is liability of “enabling” parties such as negligent security where liability of the perpetrators may be impossible to enforce. In technological catastrophes, liability becomes the core question. In any case, there is a dialectical relation between the risk-sharing functions of insurance and the risk-concentrating “polluter pays” functions of liability law.

### ***1.3. Latent catastrophes and liability***

In what are initially less obvious large loss situations, public pressure builds up in a process we may call "name, blame and claim". Such apportionment of blame may relate not only to exceptional but also to everyday situations, to familiar and long-accepted risks associated with production, consumption and transport. This is often what first creates acute public awareness of a large loss, transforming one of the various latent or accepted grievances into a scandal. In the United States it became strikingly clear how industry and the unions, health authorities and workers' compensation insurers had ignored or hushed up the problem of asbestos for decades until it was picked up in the 1970s as a result of more strictly defined product liability and solved by the bankruptcy of the manufacturers<sup>3</sup>.

### ***1.4. Catastrophes and "event" definitions in insurance and reinsurance***

In insurance and reinsurance, terms like "event" or "loss event", "accumulation loss" and "serial loss" form the subject of abstract, ambiguous contract clauses used to limit, in both contractual relationships, deductibles and retentions on the one hand and sums insured or reinsured on the other. Far-reaching consequences are attached to "soft" preconditions that can be interpreted in different ways.

### ***1.5. Catastrophe as a construct***

The term "catastrophe" is therefore a construct – not only an object of observation but also a concept of observation, or glasses that are put on to identify a specific need for action. The same facts may be assessed for different purposes on the basis of different criteria by ecologists or medics, regional or central administrations, social security and tort law experts, property and liability insurers, primary insurers and reinsurers.

### ***1.6. Catastrophes and mass media***

Mass media contribute to what is perceived as a catastrophe. This includes the interest in scandal, in attributing fault to persons, companies and institutions in an often moralising way, even if a most difficult evaluation of the consequences is involved; fitting things into a certain pattern or putting them under a certain heading so that, when the facts are complex, one particular aspect is emphasized and one of several possible interpretations made; the snowball effect of risk perception when the media reflect each other, when commentaries are commented on, and when statements of opinion are themselves scandalized<sup>4</sup>. In this way, pressure to

take political action is exerted before there has been any opportunity to clarify the issue in factual terms. Then again, through this political action it may be possible to isolate the problem and to demonstrate initiative and efficiency in a state of emergency, instead of struggling with fundamental, commonplace, structural problems.

### ***1.7. Short-term industrial catastrophes***

Hazardous production facilities have always been sited outside urban areas, only to be regularly absorbed again as the cities expand. The older the plant, the more central its location. A centrifugal trend can be observed here, with old manufacturing facilities being continually shut down and relocated further on the periphery. More and more capital cities are now losing their role as the dominant industrial location, as the example of Mexico clearly shows: the capital's share of national industrial production has halved over the last 20 years<sup>5</sup>.

This category includes the biggest civil technological disaster in recent decades, namely the escape of methyl isocyanate (MIC) from Union Carbide's plant in Bhopal (India). Here, in the early hours of 3rd December 1984, a toxic cloud blanketed a city in which most were sleeping and others were still awake in the railway station, teahouses and open-air cinemas, at wedding celebrations and a poetry festival. The case, which was not completely documented, is instructive in all too many respects. To start with, there was an incorrect estimate of the demand from Indian agriculture: an oversized production plant which after a brief period of euphoria was neglected. Unlike with drugs and pesticides, the health risks of an industrial chemical like MIC are not generally investigated as a priority. It was clear, though, that MIC quickly reacts with water, which meant that people's faces and breathing could have been protected with wet cloths. The company did not draw attention to this fact either preventively or when the crisis occurred. For the latter, the loudspeakers of the city's many minarets would have provided a suitable infrastructure. Whilst obvious prevention measures were not taken, a therapy remains unknown to this day. The number of victims was estimated at 12 000 to 16 000 dead and 200 000 injured. Experience gained from treatment was scarcely published. The US concern, which came off well with a settlement package of US\$ 470 million (of which US\$ 200 million was insured), was taken over in 1991 by the world largest chemical group, Dow. Indian legislation has reacted with laws on industrial accidents, information requirements and compulsory liability insurance. Dow was not involved in the accident; but new questions arise, new generations of victims appear, and Union Carbide had disappeared: the open borderlines between legal liability and moral or factual accountability.

The category also includes nuclear power stations. Many lie close to large cities and a few in the surrounding areas of metropolises like Paris, Tokyo, New York or Los Angeles. What becomes particularly clear here is, on the one hand, the limits of disaster plans: evacuation cannot be carried out either as a practice drill or in an emergency. On the other hand, the underinsurance of the obligatory nuclear pools is notorious, their capacity barely exceeding that of the open liability insurance market for other major industrial risks. This is all the more disturbing in view of the fact that September 11 brought to light risks that had evidently been given little previous consideration.

In normal traffic risks, by contrast, unlimited cover is usual in some motor liability insurance markets. This practice is under debate given the risk of catastrophes like the one at Selby in the UK in February 2001, with liability of around €80 million, the transportation of dangerous goods, fires in tunnels (the cost of the accident in the Mont Blanc Tunnel in 1999 is put at some €100 million) and, possibly, motor liability risks in connection with terrorism.

### ***1.8. Long-term technological risks***

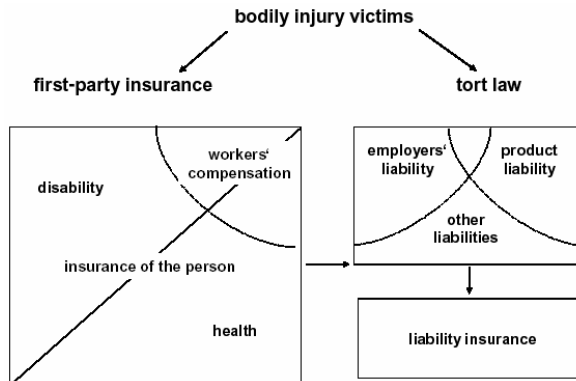
Because of the risks of change when dealing with the consequences of technology and the side-effects of products, this is probably the most complex category of large loss scenarios. Risks of change arise from new technologies like genetic engineering, from new hazardous substances or, more precisely, from new application of long-used substances: the latex problem of the 1990s as a result of the sudden massive demand for disposable gloves to prevent AIDS the discovery of dioxin, notorious through the use of herbicides in Vietnam and the Seveso accident in 1976, in many industrial processes, thanks to more accurate detection methods in the 1980s. Extensively used substances become problems because of their persistence (like CHCs and PCBs in the 1980s, and currently MTBE in the USA), typically first of all in specialist circles, then among the general public, which in turn makes new research budgets possible and results in pressure to take political action. A similar situation exists with respect to pharmaceuticals, when in the sea of side effects and interactions certain relationships are spotlighted and attributed to certain manufacturers. Historical but by no means closed cases involve the damaging effect of pesticides on agricultural workers and the environment. The biggest liability loss ever – personal injury claims due to asbestos – also falls into this category. On the other hand, the comparably high cost of removing asbestos from buildings worldwide has so far had only a marginal effect on the insurance industry, whereas the cost of remedial work on middle- and lower-class dwellings in the US in connection with lead paints and now the problem of toxic mould has placed burden on US homeowners and liability insurers. These examples only hint at the great number of relevant scenarios.

### 1.9. Long-term social and political risks

A new type of liability should not be ignored: the trend to rework historical injustice from earlier or more recent times with respect to liability law: the "sudden appearance of restitution cases all over the world"<sup>6</sup>, consequences of war and colonialism, slavery and discrimination. History becomes a field for political struggle; immunities under public international law which protect not only states but also individuals and enterprises are increasingly being breached by criminal and civil liabilities. An interesting example here are the negotiations to compensate an estimated one million "agent orange" victims in Vietnam. In Germany, the forced-labour lawsuits against German industry gave rise to debates about the different roles of social law and liability law<sup>7</sup>. Criticism has been directed at the foundation system solution<sup>8</sup> for failing to clarify the aspect of legal responsibility, i.e. the opportunity has not been seized to work out principles for the 21st century that make companies responsible vis-à-vis individual injured parties for exploiting state-enabled injustice. Reference is made to the approaches to civil-law liability in the case of human rights violations under US law in the 1980s and 1990s<sup>9</sup>.

## 2. One catastrophe, diverse approaches: the national patchwork compensation systems

On the one hand there is a whole range of catastrophe scenarios. On the other hand, the same scenario may affect many countries, but in different ways. Toxic torts are a good example. State and private prevention standards vary from country to country and also change over the course of time. The same applies to the social and political perception of risks, to the significance attached to them in the public debate. State and private compensation systems function differently. Thus, the same or similar catastrophes produce a puzzle made up of different insurance and liability situations in each country.



The compensation of asbestos victims, for example, differs from country to country: mainly covered by general disability and health insurers in the Netherlands, by workers' compensation insurers in Germany, by employers' liability insurers in UK and Ireland, by product liability insurers in USA.

With property insurance, the most striking difference compared to insurances of the person is that the background of state provision and state social security is largely absent. It is well known that in the 20<sup>th</sup> century, the world's governments tried, not always successfully, to establish Bismarck- or Beveridge-style models of pension, health and workers' compensation insurances. Certain historical models of using property insurance as social insurance were largely forgotten. Property insurance is, accordingly, the domain of private insurance.

Now it is precisely the risk of natural hazards, like earthquake or flood, and political risks, like terrorism, where the need for government involvement in compensating property damage is seen. Appropriate measures may be developed on an ad hoc basis, leading to one-off arrangements. Such ad hoc solutions may be welcome from the political point of view: to isolate a problem and to demonstrate initiative and efficiency in a state of emergency, instead of struggling with boring, commonplace structural problems. An example is the flood situation in Germany in Summer 2002, right in the middle of an election campaign. Or these systems are institutionalised, as in the various specific terrorism pools, mostly with mixed state and private involvement.

### **3. Some final considerations**

1. The wide range of catastrophe scenarios relativises the value of statistical statements.
2. A catastrophe may affect many countries (toxic torts) or occur in a similar way in various countries (accidents), but will be processed differently in the historically evolved and further evolving national patchwork systems. This also applies within the EU and there is no sign of harmonisation.
3. The combination of a) and b) means that each catastrophe is an unrepeatable historic event.
4. "Insurability knows no basic formula". Statements on insurability are statements on risk segmentation: who pays for what, a definition of specific markets.
5. Statements on insurability should either be cross-line and also include social security, or should explicitly name the line of business which they refer to.



## Notes

- 1 Mullenix, *Back to the futures: privatising future claims resolution*, University of Pennsylvania Law Review (Vol.148:1919, 2000).
- 2 Fn.1, 1922.
- 3 Brodeur, *Outrageous misconduct, The asbestos industry on trial* (1985). Rosenberg, *The dusting of America: a story of asbestos carnage, cover-up, and litigation*, [1986] Harvard Law Review 99, 1693.
- 4 Cf. Luhmann, *Die Realität der Massenmedien* (1996), pp. 53-81; Dunwoody/Peters, *The Mass Media and Risk Perception*, in: *Risk is a Construct: Perceptions of Risk Perception*, ed. by Bayerische Rück (1993), pp. 293-317.
- 5 Typical fire and explosion risks:
- A fireworks explosion at a large informal market in Lima's old town on 29 December 2001 caused 463 fatalities and destroyed four entire blocks:
  - A dynamite explosion at a barracks in a very densely populated area of Lagos (Nigeria) on 27 January 2002 resulted in over 500 fatalities. A similar accident in Cali (Colombia) in 1956 left over 2,000 dead.
  - An explosion on 21 September 2001 in the ammonium nitrate store of a fertilizer factory operated by the TotalFinaElf Group in Toulouse resulted in 100,000 claims, 27,000 damaged homes and 10,000 bodily injury losses, including 4,800 occupational accidents and 30 deaths. The overall loss, most of it insured, came to more than €2bn. Exactly 80 years earlier, on 21 September 1921, a similar ammonium nitrate explosion at a BASF plant caused the biggest civil accident in German industrial history – 561 dead and 1,952 injured, with windows apparently being shattered as much as 90 km away in Frankfurt.
  - Fire and explosions in petrochemical plants, like the explosion on 19 November 1984 in a storage facility for propane and butane situated within the municipal area of Mexico City, in which more than 500 people died and around 7,000 were injured. Most of the dead were found within 300 m of the plant. Since 1962, 40,000 people had moved into the originally uninhabited area surrounding the storage facility. Some dwellings were only 130 m away, whereas some vertical gas tanks were hurled up to 1,300 m through the air. A comparable accident at a Petrobras plant in São Paulo in 1985 also claimed more than 500 lives.
  - Fire at a plastic toy factory in Bangkok in 1991 in which more than 200 workers – mainly young women – were killed. This case also serves as an example for numerous industrial fires that occurred in the 1990s in the industrial areas of Southeast Asia.
- 6 Barkan, *The Guilt of Nations* (2000), p. IX.

- 7 Wolf, *Großschadenregulierung zwischen präventivem Rechtsgüterschutz und sozialrechtlichem Lösungsansatz, dargestellt am Beispiel der Zwangsarbeiterentschädigung* (Major loss settlement between preventive protection of legal interests and solutions based on social law; using as an example, compensation for victims of forced labour); in: Koch/Willingmann (eds.) *Modernes Schadensmanagement bei Großschäden*, 2002 (Modern loss management with major losses), 125-148. The contribution describes an exemplary liability case from the 1950s that is little known and barely discussed in the literature (Wollmann v. IG Farben). In many points it anticipates the current debate.
- 8 Cf. <http://www.stiftungsinitiative.de/>.
- 9 Based on the *Filártiga v. Peña-Irala* case, 630 F 2d 876 (2d Cr 1980); cf. Beth Stephens, *International human rights litigation in US courts* (1996); Terry, *Taking Filártiga on the Road*, in Craig Scott (ed), *Torture as Tort: Comparative Perspectives on the Development of Transnational Human Rights Litigation*, 109,115.

## *Annex 1*

### **List of Speakers and Presentations at the Conference\***

#### **Session 1 - Insurability of catastrophic risks**

- Economics of catastrophe risk insurance, *Christian Gollier (University of Toulouse)*.
- Insurability of terrorism risk: challenges and perspectives, *Howard Kunreuther and Erwann Michel-Kerjan (Wharton School, University of Pennsylvania)*.
- Industrial, technological and other catastrophes, *Christian Lahnstein (Munich Re)*.
- Recent trends in the catastrophe risk insurance/reinsurance market, *Patrick Murphy O'Connor (Benfield)*.
- Role of the reinsurance industry in the management of weather related risks, *Peter Zimmerli (Swiss Re)*.
- Issues and options in the management of terrorism risk through insurance, *Robert Reville (Rand Corporation)*.
- Current state of the coverage for war and terrorism risks - including NBC - in the aviation sector, *Eugene Hoeven (IATA)*
- Free market solutions for terrorism risks coverage, *Ben Garston (MAP Underwriting and Lloyd's Terrorism Panel)*.

---

\* Power point presentations summarising papers included in this publication as well as other presentations made at the conference are available on the OECD Insurance homepage: <http://www.oecd.org/daf/insurance>.

- Improving insurability and affordability: the role of insurance in hazard identification, risk assessment, risk prevention and mitigation for industrial/chemical accidents, *Satyananda Mishra, IAS, Disaster Management Institute, Bhopal - Government of Madhya Pradesh, India*).

## **Session 2 - Financial market solutions to manage catastrophic risks**

- International financing solutions to catastrophic risk exposures, *Torben Juul Andersen (Copenhagen Business School)*.
- The use of risk linked securities to manage catastrophic risks, including terrorism, *Christian Mumenthaler (Swiss Re)*.
- Current challenges in terrorism risk securitization, *Gordon Woo (RMS)*.
- Financing catastrophic risks in non-OECD countries: challenges and perspectives, *Reinhard Mechler (IIASA)*.
- Current market trends for catastrophe bonds and risk linked securities, *Christopher McGhee (MMC Securities, Guy Carpenter)*.
- The potential for new risk transfer instruments to cover terrorism risks, *Michele David (The Bond Market Association)*.
- Rating agency's perspective on catastrophe bonds and risk linked securities, *Rodrigo Araya (Moody's)*.

## **Session 3 - Role of governments and development of public-private partnerships for catastrophe risk management**

- Role of governments in natural catastrophe risk management and financing in OECD countries, *Paul K. Freeman (University of Denver)*.
- Catastrophe insurance programs in emerging countries: field experience, *Eugene Gurenko (World Bank, Financial Sector Operations and Policy Department)*.
- Potential role for governments in terrorism coverage, *Dwight Jaffee (Haas School of Business, UC Berkeley)*.
- Public-private partnerships to cover terrorism risks in OECD countries, *John Cooke (International Economic Relations Consultant, London)*.

- Role of the US government in the prevention and mitigation of terrorism risks, *Robert Liscouski (Infrastructure Protection Office, Department of Homeland Security, USA)*.
- Disaster risk management policy in Japan, *Kazuhiro Kawachimaru (NIPPONKOA Insurance Company Ltd)*.
- The Spanish experience in the management of extraordinary risks, including terrorism, *Ignacio Machetti (Consorcio de Compensación de Seguros)*.
- A stakeholder approach for developing a public-private partnership: the Hungarian case, *Reinhard Mechler (IIASA)*.
- Disaster risk management policy in China, *Yuanchang Zheng and Jianguo Mu (Department of Disaster and Social Relief, Ministry of Civil Affairs)*.
- The French experience in natural catastrophe risk management, *Suzanne Vallet (Caisse Centrale de Réassurance)*.
- Earthquake risk management policy in Indonesia, *Werner Bugl (PT Asuransi, MAIPARK Indonesia)*.
- Disaster risk management policy in Mexico, *Carlos Bayo Martinez (FONDEN)*.
- Disaster risk management policy in the Philippines, *Ronald I. Flores (Department of National Defense, Office of Civil Defense, National Disasters Coordinating Council)*.
- Disaster management in India, *D. Madan (Under Secretary, National Disaster Management Division, Ministry of Home Affairs, Government of India)*.
- Management of extraordinary risks, including terrorism, in India: achievements and perspectives, *C. S. Rao (Indian Insurance Regulatory and Development Authority)*.

# *Table of Contents*

## *Part I*

### **Insurability of Catastrophic Risks**

<i>Chapter 1</i>	<b>Some Aspects of the Economics of Catastrophe Risk Insurance</b> <i>by Christian Gollier, University of Toulouse</i> .....	13
<i>Chapter 2</i>	<b>Industrial, Technological and Other Catastrophes</b> <i>by Christian Lahnstein, Munich Re</i> .....	31
<i>Chapter 3</i>	<b>Recent Trends in the Catastrophic Risk Insurance / Reinsurance Market</b> <i>by Patrick Murphy O'Connor, Benfield</i> .....	41
<i>Chapter 4</i>	<b>Insurance of Atmospheric Perils – Challenges Ahead</b> <i>by Peter Zimmerli, Swiss Re</i> .....	51
<i>Chapter 5</i>	<b>National Security and Compensation Policy for Terrorism Losses</b> <i>by Lloyd Dixon and Robert Reville, RAND Center for Terrorism Risk Management Policy</i> .....	59
<i>Chapter 6</i>	<b>Current State of the Coverage for War and Terrorism Risks in the Aviation Sector</b> <i>by Eugene Hoenen, International Air Transport Association (IATA)</i> ....	73
<i>Chapter 7</i>	<b>Terrorism Insurance : An Overview of the Private Market</b> <i>by Ben Garston, MAP Underwriting at Lloyd's</i> .....	81

## *Part II*

### **Financial Markets Solutions to Manage Catastrophic Risks**

<i>Chapter 8</i>	<b>Current Challenges in the Securitization of Terrorism Risk</b> <i>by Gordon Woo, Risk Management Solutions Ltd</i> .....	91
------------------	--	----

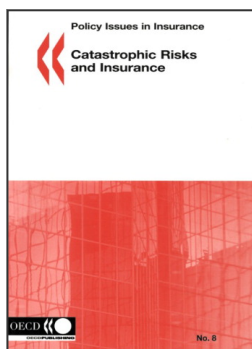
<i>Chapter 9</i>	<b>Financing Disaster Risks in Developing and Emerging Economy Countries</b> <i>by Reinhard Mechler, IIASA</i> .....	105
<i>Chapter 10</i>	<b>The Potential for New Derivatives Instruments to Cover Terrorism Risks</b> <i>by Michele David, the Bond Market Association</i> .....	163
<i>Chapter 11</i>	<b>Catastrophic Risk Securitization: Moody's Perspective</b> <i>by Rodrigo Araya, Moody's</i> .....	171
 <i>Part III</i> <b>Role of Government and Public-Private Partnerships for Catastrophic Risks Management</b>		
<i>Part III.A.</i>	<b>Analytical and Comparative Reports</b> .....	185
<i>Chapter 12</i>	<b>Comparative Analysis of Large Scale Catastrophe Compensation Schemes</b> <i>by Paul K. Freeman and Kathryn Scott, University of Denver</i> .....	187
<i>Chapter 13</i>	<b>Rapid Onset Natural Disasters: the Role of Risk Financing in Effective Catastrophe Risk Management</b> <i>by Eugene Gurenko and Rodney Lester, World Bank</i> .....	235
<i>Chapter 14</i>	<b>Designing a Disaster Insurance Pool Participatory and Expert Approaches in Hungary and Turkey</b> <i>by Joanne Linnerooth-Bayer, IIASA, Anna Vári, Hungarian Academy of Sciences and Reinhard Mechler, IIASA</i> .....	267
<i>Part III.B.</i>	<b>Country Surveys – OECD Countries</b> .....	291
<i>Chapter 15</i>	<b>The French Experience in the Management and Compensation of Large Scale Disasters</b> <i>by Suzanne Vallet, Caisse Centrale de Réassurance</i> .....	293

<i>Chapter 16</i>	<b>Disaster Risk Management in Japan</b> by Non-Life Insurance Rating Organization of Japan and K. Kawachimaru, NIPPONKOA Insurance Company Ltd* .....	303
<i>Chapter 17</i>	<b>Natural Disasters Fund (FONDEN)</b> by Carlos Bayo Martinez, FONDEN, Mexico .....	321
<i>Chapter 18</i>	<b>The Spanish Experience in the Management of Extraordinary Risks, Including Terrorism</b> by Ignacio Machetti, Consorcio de Compensación de Seguros .....	337
<i>Chapter 19</i>	<b>The Turkish Catastrophe Insurance Pool (TCIP) and Compulsory Earthquake Insurance Scheme</b> by S. Yazici, Permanent Delegation of Turkey to the OECD .....	349
<i>Part III.C.</i>	<b>Country Surveys – Emerging Economies</b> .....	365
<i>Chapter 20</i>	<b>Natural Disasters and Disaster Relief Policy in China</b> by Y. Zheng, Department of Disaster and Social Relief, J. Mu, National Disaster Reduction Center of China, Ministry of Civil Affairs .....	367
<i>Chapter 21</i>	<b>Disaster Management in India</b> by D. Madan, National Disaster Management Division, Ministry of Home Affairs, India .....	381
<i>Chapter 22</i>	<b>Management of Extraordinary Risks, Including Terrorism, in India Achievements and Perspectives</b> by C.S. Rao, Indian Insurance Regulatory and Development Authority .....	393
<i>Chapter 23</i>	<b>Earthquake Risk Management Policy in Indonesia</b> by Werner G. Bugl, Asuransi Maipark Indonesia .....	399
<i>Chapter 24</i>	<b>Disaster Risk Management Policy in the Philippines</b> by Ronald I. Flores, Department of National Defense, Office of Civil Defense, National Disasters Coordinating Council .....	411
<i>Annex 1</i>	List of Speakers and Presentations at the Conference .....	419

---

\* Background Note of Mr Kawachimaru's presentation (NIPPONKOA Insurance Company Ltd), based on *Governmental Earthquake Insurance System in Japan*, from *Earthquake Insurance in Japan*, written and published in March 2003 by Non-Life Insurance Rating Organization of Japan.





**From:**  
**Catastrophic Risks and Insurance**

**Access the complete publication at:**  
<https://doi.org/10.1787/9789264009950-en>

**Please cite this chapter as:**

Lahnstein, Christian (2006), "Industrial, Technological and Other Catastrophes", in OECD, *Catastrophic Risks and Insurance*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264009950-3-en>

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to [rights@oecd.org](mailto:rights@oecd.org). Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at [info@copyright.com](mailto:info@copyright.com) or the Centre français d'exploitation du droit de copie (CFC) at [contact@cfcopies.com](mailto:contact@cfcopies.com).