



OECD CHEMICAL ACCIDENTS PROGRAMME

**A WORKSHOP ON NATECH RISK MANAGEMENT
(NATURAL-HAZARD TRIGGERED TECHNOLOGICAL ACCIDENTS)**

WORKSHOP OUTLINE

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INTRODUCTION

1. Disasters/catastrophes are sudden, calamitous events that bring great damage, loss or destruction, whether through natural or technological causes. They cause loss of life and property, and social and economic disruption. Disasters occur when hazards meet vulnerability. Natural events become natural hazards and cause natural disasters because of human involvement. A 'natural disaster' is the effect of a natural hazard – e.g. flood, storm, volcanic eruption, earthquake or landslide – that affects the environment and leads to financial, environmental and/or human losses. Recent years have seen a dramatic rise in the frequency and/or in the magnitude of catastrophes, both natural and man-made, and the trend is towards greater vulnerability and exposure, leading to larger losses. As a consequence, the human, economic and financial costs have increased in parallel, mostly because there are more and more people living in large urban areas, more industry and more infra-structure at risk.

2. Natural disasters can trigger secondary disasters such as toxic air releases, spill of hazardous materials, fires or explosions. These conjoint natural and technological disasters are termed "Natechs": **Natural-hazard triggered technological accidents**. "A Natech accident is a chemical accident caused by a natural hazard or a natural disaster. Chemical accidents include accidental oil and chemical spills, gas releases, and fires or explosions involving hazardous substances from fixed installations (e.g. petrochemical, pharmaceutical, pesticide, storage depot) and from oil and gas pipelines"¹.

3. Natural hazards affecting chemical facilities deserve particular attention. There is heightened concern of the danger posed by Natech accidents since they can cause the release of hazardous substances possibly resulting in severe environmental pollution, explosions and/or fires. Natural disasters and technological accidents have generally been studied as separate events. Thus, there is scarce information available on the interactions between natural disasters and simultaneous technological accidents. Awareness of the hazard posed by Natechs is growing, and a need for explicitly including them into chemical accident prevention, preparedness and response programmes is well recognised.

NATECHS IN THE OECD CHEMICAL ACCIDENTS PROGRAMME

OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response

4. The relevant chapters in the *OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response* (second edition, 2003) might need to be enhanced in order to consider the Natech risk more explicitly. Natech accidents are within the scope of the *Guiding Principles*:

- The *Guiding Principles* also apply to chemical accidents that occur as a result of the impact of natural hazards. As explained in the "Notes to Golden Rules", page 25 (emphasis added):

Accidents are defined to include unexpected events that could be triggered by, for example, technological or human error, deliberate acts (such as sabotage, terrorism, vandalism or theft) or natural disasters.

- The role of industry with respect to "know the hazards and risks at installations where there are hazardous substances" is described in the "Golden Rules", page 21 (emphasis added):

¹ *Natech risk reduction in OECD member countries: Results of a questionnaire survey* (2009) by Elisabeth Krausmann and Daniele Baranzini, JRC Scientific and Technical Reports, No. 54120, European Communities, 2009 (limited distribution).

Hazard identification and risk assessments should be undertaken from the earliest stages of design and construction, throughout operation and maintenance, and should address the possibilities of human or technological failures, as well as releases resulting from natural disasters or deliberate acts (such as terrorism, sabotage, vandalism or theft). Such assessments should be repeated periodically and whenever there are significant modifications to the installation.

- The role of industry with respect to hazard identification and risk assessment is detailed in Chapter 2, section 2.b.6 of the *Guiding Principles*, page 39 (emphasis added):

Accident scenarios considered as part of the risk assessment process should take into account the possibility of human and technological errors, as well as the possibility of natural disasters and/or deliberate acts (e.g., sabotage, terrorism, vandalism or theft) triggering a chemical accident.

5. To comply with these recommendations the operator needs information from authorities on the probability and intensity of natural hazards; he has to analyse the relevance of this information for his site, and integrate the results into his prevention and preparedness activities. In the development of internal emergency plans the operator should consider the external emergency plans associated with natural hazards. The OECD *Guiding Principles* that do not account for these particular challenges could be enhanced to address explicitly chemical accidents caused by natural hazards.

OECD Project on Natechs

6. The objectives of the OECD Natech Project are to: (i) investigate the specific elements of prevention of chemical releases as well as preparedness for and response to chemical releases resulting from the impact of natural hazards, which are not part of the national chemical accidents programmes; and (ii) make recommendations for good practices with respect to prevention of, preparedness for and response to Natech accidents.

7. Projections show that climate change is likely to influence the frequency and intensity of a range of natural hazards². Therefore policies on the control of Natechs must take into consideration the effects of a changing climate. The project will explore the aspects related to the effects of climate change on the frequency, intensity and geographical extent of natural hazards which can lead to chemical accidents.

OECD-EC Survey on Natech Risk Reduction

8. In 2009, an OECD-EC survey of Natechs was conducted to collect information on and assess: (i) the risk management policies at national and international levels relating to chemical accidents caused by natural hazards; and (ii) the current activities, research, publications, etc., on natural hazards, their impact on industrial installations and the related preparedness and mitigation measures. The survey report was prepared by the EC JRC, Institute for the Protection and Security of the Citizen (IPSC)¹.

9. The survey report analyses the responses received and proposes conclusions on the following topics: (i) Natech events data collection and retrieval; (ii) learning from Natechs; (iii) Natech awareness and risk reduction; and (iv) identifying needs and limitations in Natech risk reduction. It also presents overall conclusions concerning the need for improvement of existing regulations, the perception/awareness of Natech risk and the implementation of Natech risk reduction measures. Finally it makes recommendations for further work in developing a strategy to implement an existing framework for Natech risk reduction in order to make it (more) effective.

² Climate change 2007: Synthesis report. A report by the Intergovernmental Panel on Climate Change, Available at <http://www.ipcc.ch>

Natech risk reduction in the national chemical accidents programmes

General issues

10. The following general issues may be considered while analysing the main factors that impact the Natech risk reduction and implementation of targeted prevention and mitigation measures, and reviewing how Natechs are addressed in the national chemical accidents programmes:

1. How should Natech accidents and risk reduction be taken into account in the national chemical accidents programmes in order to guarantee effective Natech risk management?
2. How should resources invested in Natech risk reduction be used to achieve reasonable gains?
3. What are the roles and responsibilities of the key stakeholders – governments/public authorities, industry and communities/public – in the perception, assessment and management of Natech risk?
4. Perception and awareness of natech risk: How to improve awareness raising on Natechs and risk communication among all stakeholders, *i.e.* at all levels of the government, in industry, within communities and the public?
5. Training: (i) is there a need for training of chemical-prevention and natural-disaster management officials on Natech risk reduction? If yes, how to define this need? and (ii) what concrete actions should be undertaken to better prepare and train for the mitigation phase?
6. What are examples of efficient strategies adopted by governments to manage the human, economic and financial burden of Natech accidents?
7. Good practices: (i) how can all parties best prepare for the challenges posed by (major) Natech risks? (ii) how can countries share existing good practices for Natech risk reduction? and (iii) what successful experiences in dealing with Natech accidents are available?
8. Would natech risk maps / integrated risk map be useful to inform land use planning and emergency management decisions?
9. Climate change: (i) how will a changing climate affect the frequency and severity of chemical accidents? (ii) how can climate change adaptation plans effectively reduce the risk of chemical accidents/Natechs? (iii) what assistance and guidance is needed to help operators and authorities prevent Natechs in a changing climate? and (iv) what is expected from research into the impact of climate change on future Natech risks?
10. OECD Polluter-Pays-Principle: (i) how does the PPP apply to Natech accidents? (ii) what are foreseeable natural disasters? (iii) can a natural disaster ever be un-foreseeable? and (iv) should the responsibilities of the operators and authorities be elaborated?
11. Are there gaps/shortcomings in the international emergency assistance for Natechs?

Role and responsibilities of the various stakeholders in the Natech risk management/reduction

11. Based on the elements described in this document the following questions arise:

Governments / Public authorities

Enhancement of existing regulations/policies related to Natech (chemical) accidents:

1. How can a reasonable set of national rules/codes/regulations, guidelines or technical codes be defined in order to ensure effective Natech risk reduction?
2. How should land use planning policies be modified to (better) address Natech risk?
3. Do inspectors need specific guidance on the taking of Natech risk into consideration?

Implementation of Natech risk reduction measures:

4. What best practices for Natech risk reduction, including training of competent authorities, should be developed?
5. Which information on natural hazards should and can be provided for Natech risk reduction? What are the good practices in natural hazards and risks mapping?
6. What are the natural hazards warning systems requirements for the prevention of and preparedness for Natech chemical accidents?
7. How are Natech accidents taken into account in the emergency plans?
8. What kind of guidance relating to Natech risk assessment should be developed, and which particular topics/issues should it address?
9. What concrete actions should be undertaken to develop a strategy for implementing a framework for Natech risk reduction?

Industry

Natech risk assessment and management:

1. Does industry need to develop guidelines and specific technical codes addressing Natech risk? If so what should they be?
2. How far should operators go in including Natechs in conventional risk assessment and in the design and operation of plant? Are there examples of good practices in this area?
3. Should data and models on the dynamics of Natechs be developed?
4. Are there enough adequate methods for Natech risk assessment or should additional methods be developed for this purpose?
5. Does a lack of adequately trained personnel – e.g. with specific knowledge on Natechs – limit Natech risk reduction?
6. Should dedicated Natech emergency management plans be prepared to consider the possible lack of utilities, off-site responders, refuges and escape routes?

Communities / Public

1. Is there a need for guidance on Natech risk assessment for use at the community level?
2. is there any other Natech issue specific to communities/public?

OUTLINE OF AN OECD WORKSHOP ON NATECH RISK MANAGEMENT

Objective and Scope

12. The overall objective of the workshop is to investigate the specific elements of the prevention of, preparedness for and response to chemical accidents caused by a natural hazard or natural disaster – e.g. flood, storm, landslide, earthquake, volcanic eruption – and make recommendations for best practices related to Natechs.

13. The scope of the workshop will include any fixed chemical installation where hazardous substances are produced, processed, used, handled, stored, transported or disposed of, with potential risk for fire, toxic release, explosion, spill, etc. Other sectors of industrial activity will be considered with respect to transfer of knowledge and experience.

Preliminary programme

14. The workshop will consist of five sessions, each with a panel of speakers addressing the topic of the session from different perspectives; the issues listed above (see paragraphs 10-11) will be discussed within sessions which will likely address the following:

Opening Session: Welcome – Opening speech(es) – Presentation of Discussion Document

- Key lecture(s): Natech and the OECD *Guiding Principles* – Key issues arising from the Discussion Document
- Natech risk management in OECD member and non-member countries: Key finding of the EC-OECD survey on Natech

Session 1: Natural hazards: risk mapping and warning systems

Session 2: Natech risk management, including emergency planning – Good practices of industry and public authorities

Session 3: Considering climate change in Natech risk management

Session 4: Application of the Polluter-Pays-Principle to Natech accidents

Session 5: International cooperation on Natech risk management

Closing Session: Conclusions and Recommendations

Session 1: Natural hazards: risk mapping and warning systems

15. This session will address the authorities' duties which are fundamental for Natech risk management, including how to analyse natural hazards and risks, how to communicate about hazards and risks with the relevant people and how to set up an effective (early) warning system. The focus will be on natural hazard which can be geographically localised (e.g. floods, rock fall, avalanches). The discussion will concentrate on the different possibilities to illustrate various parameters relevant for hazard maps such as magnitudes (intensity or severity) or frequencies (probability of occurrence or return period) and on how to map resulting risks. These rather technical aspects will be complemented by organisational and communication aspects in relation to land use planning and (early) warning systems.

Session 2: Natech risk management, including emergency planning – Good practices of industry and public authorities

16. This session will examine strategies, approaches and good practice for Natech risk management. This includes the consideration of Natechs in "conventional" industrial risk management and existing regulations, technical codes and guidelines as well as the development of dedicated approaches. In addition, the raising of awareness on Natechs, clarifying roles and responsibilities, consideration of Natechs in land-use- and emergency-planning, as well as a need for specific training on Natech risk will be discussed. The final aim of the session is the identification of success stories as well as research gaps and shortcomings in strategies, regulations, codes, guidance, and practices. Presentations may include recommendations for further improvement of prevention, preparedness and response related to Natechs. The OECD *Guiding Principles* shall be taken into consideration in this context.

Session 3: Considering climate change in Natech risk management

17. This session will explore: (i) what is known about the effects of climate change on the frequency, intensity and geographical extent of natural hazards which can lead to chemical accidents; (ii) which strategies for adaptation to climate change exist and how far they take changes to chemical safety into consideration; and (iii) how climate change adaptation can be integrated into policies on Natech prevention, preparedness and response. Results of former OECD-projects on adaptation policies shall be taken into consideration (see Annex).

Session 4: Application of the Polluter-Pays-Principle to Natech accidents

18. This session will aim at clarifying the responsibilities of the operators and authorities with respect to Natech accidents. In this regard the OECD Recommendation on the application of the PPP to accidental pollution should be considered; it contains an Appendix on "Guiding Principles relating to Accidental Pollution" (see Annex). The issue of liability of operators in case of accidental pollution resulting from the impact of natural hazards on chemical installations and the application of PPP to Natech accidents are important topics that deserve additional discussion in order to provide public and private stakeholders with more guidance on these issues.

Session 5: International cooperation on Natech risk management

19. This session will take an in-depth look into challenges at the international level concerning the tools, practices and governance frameworks supporting the provision of multilateral assistance to Natechs. It will also provide an overview of a number of ongoing initiatives undertaken to address these challenges. Finally, the session will discuss the various roles that regional and international organisations, as well as private sector and local authorities can play in the emergency response system.

Discussion Document

20. A discussion document will be distributed to all participants at least one month in advance of the workshop. It will provide an overview of the Natech topic, identify areas where there appears to be a general consensus and areas where there remains differing opinions or approaches, and suggest issues for discussion.

21. The discussion document is expected to 'set the scene' with a clear and exhaustive description of the Natech subject, to be possibly 'provocative' if relevant or just 'stimulating' in order to foster discussions among participants. It will be developed based on the present paper and the two interim reports of the OECD Natech project prepared for the (2009) 19th and (2010) 20th WGCA Meetings respectively. It is

recommended that the document is aimed to be about 10-15 pages; however the page limit should not be a constraint if it is not appropriate for the Natech subject.

Speakers' presentations

22. A number of speakers are expected to make presentations on relevant topics at each thematic session, in accordance with the objectives of the workshop. Presentations should be, as far as possible, representative of all stakeholders' views, given 3-5 presentations at each workshop session. The aim of presentations is to: (i) provide an overview of the countries' approaches to Natech risk management; and (ii) identify subjects for discussion and issues to be solved. The purpose of these presentations is also to stimulate discussions among workshop participants. In each session, the speakers' presentations will be followed by a general discussion where conclusions and recommendations will be drawn up. All participants are expected to actively participate in discussions.

23. The speakers are asked to give short presentations – approximately 15 minutes – highlighting key points from their papers, and then participating in a discussion open to all participants. They should focus their contributions on the most important issues related to their session. The presentation is not meant to be exhaustive; rather it is to highlight areas where there is general agreement on best practice and to identify issues for discussion among participants in order to generate a wide exchange of experience.

24. All speakers will be given a timeline for the development of their presentations which addresses:

- a date to provide an abstract/summary, giving the workshop organising committee time to review it to ensure that the speaker plans to address appropriate issues;
- a date for their full paper if any;
- a date to provide a short biography that can be used by the Chair for introductions; and
- a date to provide slides/PowerPoint presentations.

25. Speakers' papers will be available only in English. It is remembered that most of participants will not be native English speakers and, therefore, an effort should be made to use common terminology and relatively simple sentences.

Participants

26. The workshop will be open to representatives of: central government, including safety, civil protection, spatial planning and environment bodies; local authorities; non-governmental organisations (Environmental NGOs, etc.); international organisations (UNEP, UNECE, etc.); industry and academia.

Expected outcomes

27. The expected outcomes from a Natech Workshop are:

- Raising/increasing – or contribute to raise/increase – awareness of Natech accidents.
- Making recommendations for developing best practices with respect to the prevention of, preparedness for and response to Natech accidents.
- Making proposal for enhancement of the OECD *Guiding Principles for Chemical Accident Prevention, Preparedness and Response*, based on the workshop conclusions and recommendations.

- Improving international co-operation with respect to the prevention of, preparedness for and response to Natech accidents.
- Identifying gaps in research on Natechs.

ANNEX

WORK UNDERTAKEN AT THE OECD ON RISK, DISASTERS AND POLLUTION CONTROL

Emerging Risks in the 21st Century – Large-scale Disasters

1. OECD has carried out pilot studies addressing emerging systemic risks; a systemic risk is one that affects the systems on which society depends, health, transport, environment, telecommunications, etc. "*Emerging Risks in the 21st Century – An Agenda for Action*" was published in 2003. The book (i) examines the increasing incidence and impact of natural, technological and health-related hazards for a number of selected risk areas; (ii) reviews the main driving forces – demography, environment (earth's climate change, scarcity of water and reduction in biodiversity), technology (technological and regulatory changes, new technologies and emerging technologies) and socio-economic structures – which leads to the identification of cross-cutting issues; (iii) analyses these key issues in relation with the various phases of the risk management cycle – risk assessment, risk prevention, emergency management and recovery issues; and (iv) provides an action-oriented agenda for decision makers.

OECD publications on catastrophic risk and disaster management

2. Between 2002 and 2006 the OECD published several titles which address the economic, financial and insurance aspects of disasters across the disaster management cycle, *i.e.* mitigation, preparedness, response and recovery. A High-Level Advisory Board on financial management of large-scale catastrophes has developed strategic policy analysis, expert advice and good practices in areas including: identification of risks and vulnerabilities linked to disasters; promotion of risk awareness; enhancement of prevention and loss mitigation strategies; and development of guidance on the design of ex-ante catastrophe risk compensation solutions. OECD publications on catastrophic risk and disaster management are:

- *Large-scale disasters: lessons learned*
- *Keeping schools safe in earthquakes*
- *Catastrophe-linked securities and capital markets*
- *Policy handbook on natural hazard awareness and disaster risk reduction education*
- *Five publications in a series on "Policy Issues in Insurance": Financial management of large-scale catastrophes – Catastrophic risks and insurance – Terrorism risk insurance in OECD countries – Environmental risk and insurance – Insurance and expanding systemic risks*

OECD Recommendations of the Council related to the Polluter Pays Principle (PPP)

3. The three OECD Recommendations of the Council related to the Polluter Pays Principle (PPP)^{3,4,5}, issued in 1972, 1974 and 1989 respectively are probably the most important Council Acts the OECD has ever developed in the field of environmental policy.

³ OECD Recommendation (1972) on Guiding Principles Concerning International Economic Aspects of Environmental Policies [C(72)128]

4. The 1972 *Recommendation on Guiding Principles concerning International Economic Aspects of Environmental Policies* lays out the elements of the Polluter Pays Principle, and also pioneers the environmental links to other important concepts, such as 'harmonisation' and 'mutual acceptance'. The main idea contained in this Recommendation was that polluters themselves should bear the cost of implementing environmental protection measures that are decided by governments.

5. The 1974 *Recommendation on the Implementation of the Polluter Pays Principle* clarifies the conditions under which 'aid' provided to polluters would be considered to be in violation of the PPP, and it reinforces the view that any aid related to pollution control costs should be strictly time-limited. One question that arises, however, is whether a polluter should pay for pollution damage (residual pollution) when he has taken all the measures introduced by public authorities.

6. The 1989 *Recommendation Concerning the Application of the Polluter Pays Principle to Accidental Pollution* extends the PPP logic to the case of accidental pollution at hazardous installations. It is stated that "the polluter should bear the expenses of carrying out the pollution prevention and control measures introduced by public authorities in member countries, to ensure that the environment is in an acceptable state". One exception is "if the accidental pollution is caused by an event for which the operator clearly cannot be considered liable under national law, such as a serious natural disaster that the operator cannot reasonably have foreseen". This statement would need to be developed in order to provide more guidance on these issues to public and private stakeholders.

Application of Polluter-Pays-Principle to Natech accidents

7. It is necessary to clarify the responsibilities of the operators and authorities with respect to Natech accidents. In this regard the OECD Recommendation on the application of the PPP to accidental pollution should be considered; it contains an Appendix on "Guiding Principles relating to Accidental Pollution" that says in point 7 (emphasis added):

8. If the accidental pollution is caused solely by an event for which the operator clearly cannot be considered liable under national law, such as a serious natural disaster that the operator cannot reasonably have foreseen, it is consistent with the Polluter-Pays Principle that public authorities do not charge the cost of control measures to the operator.

9. The issue of liability of operators in case of accidental pollution resulting from the impact of natural hazards on chemical installations and the application of PPP to natech accidents are important topics that deserve additional discussion in order to provide public and private stakeholders with more guidance on these issues.

OECD Draft Recommendation of the Council on Good Practices for Mitigating and Financing Catastrophic Risks

10. A Council Recommendation is currently being developed to offer general guidance to OECD members and non-members by providing an integrated, action-oriented framework for the identification of disaster risks, promotion of risk awareness, enhancement of prevention and loss mitigation strategies, and design of compensation arrangements [C(2010)143, draft 12 October 2010].

⁴ OECD Recommendation (1974) on the Implementation of the Polluter Pays Principle [C(74)223]

⁵ OECD Recommendation (1989) Concerning the Application of the Polluter Pays Principle to Accidental Pollution [C(89)88]

11. The good practices emphasize the importance of public and private sector collaboration in identifying and quantifying disaster risks, and in designing mitigation and financing mechanisms to cope with them. They are geared toward achieving the following main objectives:

- Risk assessment – Create a culture of risk assessment: Governments should undertake a public national disaster risk and vulnerability assessment. Mapped hazard data should be made publicly available and regularly updated.
- Risk perception – Promote risk awareness to aid risk prevention and loss mitigation: The OECD *Policy handbook on natural hazard awareness and disaster risk reduction education* provides guidance for the development of sound strategies in this field and constitutes a useful benchmark to assess the situation in a given country/region and identify possible improvements.
- Risk management – Design catastrophe risk compensation strategies to be ready before the occurrence of a major event: In doing so, the use of resources can be optimised and preparations for each phase of post disaster response from emergency rescue to long-term recovery can be facilitated. Insurance and other financial protection tools have an important role to play.

12. The good practices also include a set of ideas that could be developed further, such as the creation of an information-sharing platform that would provide data on large-scale catastrophes or the promotion of exchanges of information and experiences in order to showcase innovations in catastrophe risk assessment, management and financing in OECD member countries.

WORK ON NATECHS UNDERTAKEN IN OTHER INTERNATIONAL ORGANISATIONS

UNECE Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters

13. A paragraph concerning natech accidents is included in the "*UNECE Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters* (2003)⁶ to the 1992 Convention on the protection and use of watercourses and international lakes and to the 1992 Convention on the transboundary effects of industrial accidents", in Article 4: Strict liability, point 2b (emphasis added):

1. *The operator shall be liable for the damage caused by an industrial accident.*
2. *No liability in accordance with this article shall attach to the operator, if he or she proves that, despite there being in place appropriate safety measures, the damage was:*
 - (a) *the result of an armed conflict, hostilities, civil war or insurrection;*
 - (b) *the result of a natural phenomenon of exceptional, inevitable, unforeseeable and irresistible character;*

14. The last sentence would require further elaboration to describe clearly the (level of) responsibility of operators with respect to prevention of, preparedness for and response to natech accidents measures.

Natech Risk Management at the European Community level

15. In Europe the systematic study of the interaction between natural and technological hazards is still in its early stages. Several legal acts directly or indirectly address natech risk reduction. However,

⁶ http://www.unece.org/env/civil-liability/documents/protocol_e.pdf

there is no specific legislation or guidelines that address the entire process of natech risk management⁷. To address this issue there are a number of activities among, and collaboration between the EC Joint Research Centre (JRC), the OECD and the UN International Strategy for Disaster Reduction (ISDR) that study natural and technological disasters and their socio-economic consequences.

Activities of the EC Joint Research Centre on Natech

16. The protection of the European citizens lies at the very heart of the mission of the Institute for the Protection and Security of the Citizen (IPSC) at the European Commission's Joint Research Centre. Among a variety of other activities the JRC supports the EU Member States and the European industry in the identification and reduction of natech risk.

17. In collaboration with international partners the JRC performs accident analyses to identify natech accident scenarios and develops methods and tools to assess and map natech risk. In addition, the JRC endeavors to identify best practices for Natech accident prevention and mitigation, and to suggest approaches for natech risk management. Recently the JRC has set up a dedicated natech accident database⁸ for the systematic collection and analysis of data on the causes and dynamics of natech events, as well as for the generation and dissemination of lessons learned.

The EC Seveso II Directive

18. The Seveso II Directive 98/82/EC establish the requirements for the prevention of and response to chemical accidents in the European Community, aiming at "*preventing major accidents which involve dangerous substances, and limit their consequences for man and the environment with a view to ensuring high levels of protection throughout the community in a consistent and effective manner*". The Directive does not have specific requirements for natech risk management; those are addressed either implicitly (because they are the same as for the "classical" chemical accidents) or indirectly. Article 5 on the general obligations of the operator stipulates that "*Member States shall ensure that the operator is obliged to take all measures necessary to prevent major accidents and to limit their consequences for man and the environment*". Article 6 indicates that the notification for new and existing establishments that the operator has to send to the Member State shall contain, among others, "*the immediate environment of the establishment (elements liable to cause a major accident or to aggravate the consequences thereof)*". Article 11 on emergency plans stipulates that "*Member States shall ensure that emergency plans are put into effect without delay by the operator and, if necessary by the competent authority designated for this purpose: (i) when a major accident occurs, or (ii) when an uncontrolled event occurs which by its nature could reasonably be expected to lead to a major accident*".

19. In order to assist the EU Member States with the implementation of the Seveso II Directive the EC has published guidelines on the preparation of a safety report that recommend analyzing the potential effects of natural hazards (e.g. floods, earthquakes, lightning, winds, landslides, etc.) and other external hazards⁹. While providing general guidance on certain aspects of the Seveso II Directive they do not suggest specific actions or methodologies to reduce the natech risk.

⁷ *State of the Art in Natech Risk Management* by AM Cruz, LJ Steinberg, AL Vetere Arellano, J-P Nordvik and F Pisano. Report EUR 21292, 2004, EC Joint Research Center and UN International Strategy for Disaster Reduction

⁸ <http://enatech.jrc.ec.europa.eu/>

⁹ *Guidance on the preparation of a safety report to meet the requirements of Directive 96/82/EC as amended by Directive 2003/105/EC (Seveso II)* by L Fabbri, M Struckl and M Wood (eds). Report EUR 22113 EN, 2005, European Communities