

# Towards an All-Hazards Approach to Emergency Preparedness and Response

## Lessons Learnt from Non-Nuclear Events

### Executive Summary



Radiological Protection

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NUCLEAR ENERGY AGENCY  
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Over the years, member countries from the OECD Nuclear Energy Agency (NEA) have developed effective emergency preparedness and response (EPR) arrangements for nuclear facilities and off-site response organisations. These arrangements have usually been tested through exercises involving the facility and off-site response organisations. EPR arrangements have thus been enhanced as necessary to include lessons learnt from nuclear emergency exercises, nuclear power plant accidents such as the accident at Fukushima Daiichi and changes to international guidance.

While nuclear power plant accidents are very rare, industrial non-nuclear events and natural disasters occur more frequently and can have a potentially large impact on populations and on widespread geographical areas. As a result of these events, populations may be required to take part in protective actions such as sheltering, evacuation and the restriction of food supplies. Research on these types of non-nuclear events and natural disasters has been extensive and has led to an understanding of factors that have supported the effectiveness of response activities, as well as those factors that may have degraded the response. This type of information can be used to enhance existing preparedness efforts for nuclear power plants, for other industrial facilities and for natural disasters in an “all-hazards” framework.

In recognition of the importance of an all-hazards approach to preparedness and response, the International Atomic Energy Agency (IAEA) General Safety Requirements (GSR No. 7), *Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA, 2015), encourage, to the extent practicable, the inclusion of the emergency management system in an all-hazards framework. The OECD Council similarly supports the integration of a nuclear emergency management system into a comprehensive, all-hazards and transboundary approach to country risk governance as a foundation for enhancing national resilience and responsiveness. Contributions to this report support the value of such an all-hazards approach to EPR.

## **Lessons learnt: Insights into emergency preparedness and response**

### **The chemical industry**

The nuclear and chemical industries share common elements in terms of how they seek to prevent, prepare for, respond to and recover from accidents. In the framework of the OECD Chemical Accidents Programme, five legal instruments, adopted by the OECD Council, have been developed to support member countries in the prevention of, preparedness for and response to chemical accidents, and in helping to shape policies concerning major accidents in member countries. Some of these instruments and tools can offer valuable input to enhance similar documents in the field of nuclear power generation. The following two key guidance documents are of particular interest. Both were developed by the OECD Chemical Accidents Programme.

The first document, “Guidance on Developing Safety Performance Indicators (SPIs): Guidance for Public Authorities and Communities” allows for an assessment of the performance of programmes for chemical accidents prevention, preparedness and response. Safety performance indicators aim to assist relevant stakeholders in establishing

programmes for assessing their own performance related to the prevention of, preparedness for and response to chemical accidents. They aim to help improve the ability of interested industrial enterprises, public authorities and community organisations to measure whether the many steps that are taken to reduce the likelihood of accidents, and improve preparedness and response capabilities, truly lead to safer communities and less risk to human health and the environment.

The second guidance document on “Corporate Governance for Process Safety: Guidance for Senior Leaders in High Hazard Industries” draws the attention of industry leadership to the need for high standards of corporate governance in relation to the management of high-hazard industries. This guidance document encourages every director, CEO and president of a major hazard company to check themselves against a set of self-assessment questions and evaluate their awareness and knowledge of the safety process.

### **Major accidents and emergency responses**

Recent experience, including major accidents not involving nuclear or radiological material in countries with extensive legal requirements and administrative frameworks, has demonstrated that legislation and regulations, while necessary, are not sufficient to ensure the prevention of accidents or adequate preparedness. It is therefore important for stakeholders to undertake additional initiatives and learn from the experience of others in different fields of work.

The comprehensive review of EPR carried out by the European Union’s Joint Research Centre (JRC) on accidents registered in the worldwide Major Accident Reporting System Database (eMars) identified some important lessons and has offered support to existing nuclear EPR programmes. Identification of possible accident scenarios is an important step in the development of EPR programmes. A common issue shared by both the nuclear and non-nuclear industries is that of identifying a wide range of accident scenarios, from design-basis to beyond-design-basis accidents. Consideration of such a broad range of accident scenarios would ensure that planning efforts are robust and would provide for adequate protection of public health and safety.

Training and emergency drills have also been identified as essential for successful emergency response both on-site and off-site. Training that is tested by exercises leads to appropriate actions in response to an emergency situation; knowing how to implement protective actions such as evacuation or sheltering can save lives. Exercises also test participants’ knowledge of assembly points/areas, power and water supplies, safe shutdown procedures for facilities, the location of emergency operation centres with incident commander and media information centres, medical facilities and first-aid areas, as well as how to use communication systems that are internal to the impacted facility and other means to ensure public communication. Exercises allow for interplay between emergency response workers, officials and facility staff in accordance with the seriousness of the scenario.

Events reviewed from eMars have also highlighted the importance of selecting appropriate personal protection measures such as equipment for emergency responders, as well as that of increasing awareness of the hazards involved in the event. Emergency responders have died or been injured in major accidents, either during the intervention or after it takes place. In most cases, the root cause identified was a lack of knowledge about the types and hazards of the dangerous substances involved in the accident. Without this essential information, emergency response personnel were not able to make a decision on the level and type of personal protection to be used.

The review of events from eMars also identified another important consideration, namely that emergency planning can be successful only if it encompasses all three elements: preparedness, response and recovery. All these elements should be addressed early in the planning phase.

## *Preparing for the future*

Building on lessons learnt from crises that have taken place in OECD countries, the OECD High Level Risk Forum and the Directorate for Public Governance have gathered practical tools seeking to improve risk governance. One of the main conclusions of this work has been that governments must develop crisis-management capacities to cope with the complexity, novelty, ambiguity and uncertainty that characterise many modern crises. Emergency response plans are necessary tools for conventional crisis management. They are designed with reference to past events and work well for routine emergencies. Flexible approaches, however, are needed for rare and unpredictable events. The report presents an overview of the main outcomes of this work, which can contribute to efforts towards a comprehensive, all-hazards and transboundary approach to country risk governance and to ensuring more resilient societies. Some of the most relevant lessons learnt concern the areas described below.

### *Social media*

Social media in its many forms is revolutionising communication. Large groups of people can be reached almost instantly with messages to take protective actions, and these same people can be reached just as quickly with false information. Using social media effectively in crisis communication requires that appropriate resources be devoted to the management of social network messaging during the event. It is important to ensure that the information circulating in the various social media platforms is accurate because accurate information leads to public trust in officials. Such trust in leadership results in the public following the emergency directives issued by leadership. Lives are thus saved and people are removed from harm.

Social media has great promise in supporting two-way crisis communication. Governments, industries, response organisations and others must develop dedicated crisis communication strategies for the effective use of social media in crisis management. However, since some segments of the public may not be easily reachable through social media, inclusive crisis communication also requires the use of traditional communication channels.

### *Engaging with the private sector*

Engaging the private sector in crisis-management efforts is crucial, particularly when the scale and complexity of a crisis requires a “whole-of-society” approach. The private sector has many resources, including staff and equipment, which can be shared to support an effective emergency response. Governments should set up the right incentives for co-operation with the private sector in times of crisis.

### *Training leaders*

During a crisis, strategic-level decision makers are forced to act under challenging conditions and often with incomplete information. Leaders must be identified prior to the crisis, and they along with their teams, organisations and key partners must be sufficiently prepared to cope with the challenges presented by the crisis. Effective leadership training is a prerequisite for effective strategic crisis management.

### *The importance of exercises*

All contributions to this report underline the importance of exercises for testing and improving emergency management systems, a finding which supports the long-standing drill and exercise programmes in place at nuclear facilities. The report also presents recommendations on enhancements to aspects of traditional drills and exercises.

### **Emergency planning and response to a natural hazard-triggered technological accident (Natech)**

Natural hazards can lead to technological secondary effects or a so-called “natural hazard-triggered technological accident” (or a “Natech accident”). Natech accidents are frequent in the wake of natural disasters, and they have repeatedly had significant and long-term social, environmental and economic impacts. Awareness of Natech risks is increasing worldwide, but there is a continued lack of Natech risk assessment methodologies and little guidance exists on Natech risk management for industry and competent authorities. From an emergency management point of view, special planning is required to account for the potentially large impact of major natural events affecting populations and the building stock as well as industry and other infrastructures. To ensure sufficient preparedness in industry and an effective emergency response, several points are proposed for consideration:

- On-site emergency plans for accidents involving hazardous materials should take natural hazard risks into account.
- Off-site emergency response plans for hazardous industries in natural hazard-prone areas should consider the impact of hazardous material releases on populations and on rescue operations.
- The vulnerability of emergency response resources to natural events and hazardous material releases should be assessed.
- Medical services should be involved in the preparation of the external emergency plan.
- Emergency response plans, both at installation and community level, should be periodically reviewed and tested to make certain they consider the consequences of natural hazard impacts.

### **Public health lessons learnt**

The definition of health proposed by the World Health Organization (WHO) incorporates physical, mental and social well-being. Despite the enormous psychological and social cost of toxic disasters, until recently assessments have tended not to take into account this aspect in assessing the adverse effects of disasters. The public health perspective shows how each phase of a disaster and each player in disease onset (host, agent, environment) interact. Underneath these interactions are individual perceptions – by the sufferers, the health care providers, government agency officials and the media – and these perceptions drive the magnitude, persistence, evolution and even the risk and protective factors that are identified after major ecological catastrophes. It is important to understand the variables that promote health and protect against adverse mental health outcomes after disasters, or build resilience among the affected populations.

These factors will be a key challenge for disaster recovery and knowledge of such aspects can be used in the formulation of potentially successful interventions. New interventions should be careful to take cultural factors into account. They should maximise the ability of people to cope with stressful circumstances and to make sense out of what is happening to them. It is a well-known observation that disasters and periods of extreme collective strain can sometimes strengthen social cohesiveness and thus enhance the resilience of communities. Identifying the optimal type and quantity of supportive interventions will be one of the foremost priorities. This report presents an overview of lessons learnt for each phase of the disaster (i.e. preparedness, immediate response and long-term response), taking into account the different points of view of victims, professionals, authorities and the general public. The section of this report on public health lessons learnt is primarily based on the work of E.J. Bromet and J.M. Havenaar.

## **The experience of NEA member countries – incorporating lessons learnt from non-nuclear events into nuclear and radiological EPR**

The final chapter in this report recounts experiences in two NEA countries, the United States and Japan, both of which have enhanced nuclear emergency preparedness and response through the integration of lessons learnt from non-nuclear events.

While there has been only one radiological-related evacuation in the United States, an overview of evacuations in that country has shown that emergency evacuations of at least 1 000 people generally occur about every three weeks in the United States (NUREG/CR-6864). A review by the NRC on lessons learnt from large-scale evacuations (Hurricanes Katrina, Rita and Wilma) demonstrated that existing criteria, plans and procedures are already in place for nuclear power plants (NPPs) to address the issues that were experienced in the large-scale evacuations studied. These regulatory requirements and guidance are well established, and some of the applicable lessons learnt from the study were captured in the NRC 2011 Emergency Preparedness rule change. Others were captured in NRC/Federal Emergency Management Agency (FEMA) guidance documents.

As a result of its natural conditions, Japan is prone to virtually every type of natural disaster, including snowfalls, sediment disasters, volcanic eruptions and earthquakes. Disasters in Japan have triggered the introduction over time of disaster management systems and regulations integrating lessons learnt from those disasters and leading to a comprehensive disaster management system. Japan's legislation for disaster management systems, including the Disaster Countermeasures Basic Act, addresses all of the disaster phases of prevention, mitigation and preparedness, and emergency response, as well as recovery and reconstruction, with the roles and responsibilities among national and local governments clearly defined. It is also stipulated that the relevant entities of the public and private sectors are to co-operate in implementing various disaster countermeasures. The Disaster Countermeasures Basic Act has been regularly reviewed and amended since its first enactment, including with lessons learnt from the Great East Japan Earthquake. Provisions were thus added for the enhancement of measures concerning support activities carried out by local governments (2012), or of measures to ensure the safe and smooth evacuation of residents and to improve the protection of affected people (2013).

Overall, the report demonstrates a similarity in EPR planning across all sectors dealing with different hazards. It also identifies lessons learnt and good practices from a multidisciplinary perspective. Incorporation of these lessons learnt and good practices ultimately will build strong emergency response measures and national resiliency. The OECD and the IAEA have recognised the importance of a strong and unified response, and they have urged that, to the extent possible, radiological emergency preparedness be included in a greater, comprehensive, all-hazards emergency planning system. Contributions to this report support the value of such an all-hazards approach to EPR. The many examples outlined of lessons learnt from EPR in fields other than the nuclear sector can effectively be used by member countries, as appropriate, in enhancing their nuclear emergency management systems.

Because the NEA operates within the framework of the OECD, the agency's Working Party on Nuclear Emergency Matters (WPNEM) is well placed strategically to share information in this regard in order to foster an integrated all-hazards approach to EPR through co-ordination with relevant OECD bodies and other organisations. Indeed, the NEA Committee on Radiological Protection and Public Health (CRPPH) has underlined the value of this work and the efforts undertaken by the WPNEM towards an all-hazards approach to emergency preparedness and response, and it has encouraged the WPNEM to continue in this direction, noting that it is the first time that experts outside of the nuclear field have participated in an NEA report on EPR and underlining the value of such a comprehensive and multidisciplinary perspective.

## NEA PUBLICATIONS AND INFORMATION

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## Towards an All-Hazards Approach to Emergency Preparedness and Response: Lessons Learnt from Non-Nuclear Events

The field of emergency management is broad, complex and dynamic. In the post-Fukushima context, emergency preparedness and response (EPR) in the nuclear sector is more than ever being seen as part of a broader framework. The OECD has recommended that its members “establish and promote a comprehensive, all-hazards and transboundary approach to country risk governance to serve as the foundation for enhancing national resilience and responsiveness”. In order to achieve such an all-hazards approach to emergency management, a major step in the process will be to consider experiences from the emergency management of hazards emanating from a variety of sectors.

The NEA Working Party on Nuclear Emergency Matters (WPNEM) joined forces with the OECD Working Group on Chemical Accidents (WGCA), the OECD Public Governance and Territorial Development Directorate’s High-Level Risk Forum (HLRF) and the European Commission’s Joint Research Centre (JRC) to collaborate on this report, which demonstrates similarities between emergency planning and preparedness across sectors, and identifies lessons learnt and good practices in diverse areas for the benefit of the international community. A set of expert contributions, enriched with a broad range of national experiences, are presented in the report to take into account expertise gathered from the emergency management of hazards other than those emanating from the nuclear sector in an effort to support and foster an all-hazards approach to EPR.

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