

# UN/OECD seminar in follow-up to the 2020 Beirut port explosion:

*Lessons learned, experiences and good practices in managing risks  
of ammonium nitrate storage, handling and transport in port areas,  
preventing accidents and mitigating their consequences*

## – Summary and conclusions –

### 1. Background

#### 1.1. Beirut port explosion

The Beirut port explosion was a reminder of the devastating effects that industrial accidents can have on human beings and the environment. On 4 August 2020, a fire spread across a storage area of the Beirut port and caused a large amount of ammonium nitrate (AN) to explode. The explosion led to over 200 deaths, approximately 6,500 injuries and 300,000 people being displaced; it caused severe damage to critical infrastructure, including the port area and healthcare facilities during the COVID-19 pandemic. Major accidents involving AN or AN-based fertilizers are not new or uncommon. One century ago, the BASF plant explosion in Oppau, Germany caused the loss of 500 lives, 2,000 injuries and the near full destruction of the nearby town. Twenty years ago, the AZote Fertilisant (AZF) plant explosion in Toulouse, France caused 30 deaths, 2,500 injuries and billions of euros in damage. More recent major accidents include *inter alia*: the West Fertilizer Company explosion, United states (2013); the Tianjin port explosion, China (2015); the Angellala Creek truck explosion, Australia (2014); and the Bata explosions, Equatorial Guinea (2021).

#### 1.2. Objectives

The ultimate objective of the seminar was to share knowledge and improve the understanding of AN storage, handling and transport, as well as industrial accident prevention, preparedness and response, so as to prevent further accidents involving AN and AN-based fertilizers, or – should prevention not be possible – to mitigate related consequences through effective preparedness and response.

The seminar's more specific objectives were to:

- Share lessons learned from past accidents involving AN and AN-based fertilizers;
- Review international legal and policy instruments and tools for the prevention of, preparedness for and response to accidents involving hazardous substances, such as AN and AN-based fertilizers;
- Exchange experiences, lessons learned and good practices in managing the risks of hazardous substances, including AN and AN-based fertilizers, and in implementing related instruments; and
- Encourage cooperation amongst authorities, industry and other stakeholders at the national, regional, local and international levels.

### 1.3. Content and participation

The [UN/OECD seminar in follow-up to the 2020 Beirut port explosion](#) was held online on 14 December 2021. Information on the Beirut port explosion and other accidents involving AN or AN-based fertilizers was presented. The seminar covered lessons learned, experiences and good practices in managing risks of AN storage, handling and transport in port areas and beyond. It also addressed the prevention of related accidents and ways to mitigate their consequences should they occur. Speakers shared their knowledge on past accidents involving AN and AN-based fertilizers, related lessons learned and regulatory changes; international legal and policy instruments and recommendations addressing hazardous substances and related accident prevention, preparedness and response; and experiences and good practices in implementing them.

The seminar brought together representatives of various international organizations and national, regional and local government authorities, industry, academia and other stakeholders from across the globe. The over 500 participants came from a range of communities, including *inter alia* chemicals, customs/border, disaster risk reduction, emergency and humanitarian response, environmental protection, industrial safety, maritime, occupational safety and health and transport. While the seminar focused on AN and AN-based fertilizers, it was highlighted that many of the experiences, good practices and lessons learned are relevant for the understanding and management of the risks of hazardous substances more broadly.

The seminar had a wide range of participation. Participants represented the following 48 countries: Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, China, Costa Rica, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Latvia, Lebanon, Lithuania, Luxembourg, Malta, Mexico, Myanmar, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, South Africa, Spain, Suriname, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, United States of America, and Yemen. See the Annex for information on the national and local authorities that attended from each country.

Representatives of the following 15 international or intergovernmental organizations attended: CIS Inter-State Council on Industrial Safety, European Union (including the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO), Directorate-General for the Environment (DG Environment), and Major Accident Hazards Bureau of the Joint Research Centre (JRC)), as well as the European Investment Bank (EIB), Food and Agriculture Organization (FAO), Intergovernmental Organization for International Carriage by Rail (OTIF), International Labour Organization (ILO), International Maritime Organization (IMO), North Atlantic Treaty Organization (NATO) (Munitions Safety Information Analysis Center), Organisation for Economic Co-operation and Development (OECD), Organization for the Prohibition of Chemical Weapons (OPCW), United Nations Disaster Risk Reduction (UNDRR), United Nations Economic Commission for Europe (UNECE), United Nations Environment Programme/Office for the Coordination of Humanitarian Affairs Joint Environment Unit (OCHA/OCHA JEU), United Nations International Computing Centre (UNICC) and United Nations Institute for Training and Research (UNITAR).

In addition, many non-governmental entities attended the seminar. This includes 5 NGOs and 102 industry associations or companies. Academics from more than 32 universities or national research institutes also attended, including from Canada, Costa Rica, Belarus, Finland, France, Germany, Jamaica, Japan, Lebanon, Netherlands, Norway, Republic of China, Republic of Moldova, Russian Federation, South Africa, Suriname, Switzerland, United Kingdom of Great Britain and Northern Ireland and United States of America. See the Annex for more information.

#### **1.4. Sessions**

The seminar was co-moderated by the Chair of the Convention on the Transboundary Effects of Industrial Accidents' (Industrial Accidents Convention's) Bureau (Directorate for Civil Protection, Norway), who is also a member of the Bureau of the OECD Working Party on Chemical Accidents, and the Convention's Vice-Chair (Austria), who was also the Chair of the seminar's Advisory Group.

It opened with welcoming remarks from the UNECE Deputy Executive Secretary and the Chair of the seminar's Advisory Group. Both highlighted that industrial accidents involving AN, like the one at the Beirut port and elsewhere, have caused too many deaths and too much destruction and could have been prevented. They emphasized the need to do the utmost to prevent these accidents and to mitigate their effects should they occur. To that effect, they expressed the importance of a multi-stakeholder approach to prevention, including coordination and cooperation within and across countries, and that the existing international legal and policy instruments that apply to hazardous substances, including AN and AN-based fertilizers, need to be implemented and complied with. This was followed by a statement from Lebanon (see Section 4(c) below).

The first session then included expert presentations on AN and AN-based fertilizers (Federal Institute for Materials Research and Testing (BAM), Germany), accidents involving AN and lessons learned (Major Accident Hazard Bureau, European Commission Joint Research Centre (JRC)). They emphasized that a main cause of AN explosions is fire and of AN smoking is decomposition. In reviewing 23 past accidents across the globe, contributing factors to the accidents and key lessons learned were provided (see Section 4(c) below).

The second session consisted of representatives of international organizations (UNECE, IMO, ILO and UNEP/OCHA Joint Environment Unit) providing information on international legal and policy instruments and recommendations addressing hazardous substances, including AN and AN-based fertilizers, and industrial/chemical accident prevention, preparedness and response. The presentation by UNECE showcased also other existing instruments and activities under the auspices of the EU, OECD, UNDRR, United Nations Environment Programme (UNEP) and World Health Organization (WHO).

The third session covered a range of good practices and lessons learned from various authorities of the following countries: Brazil (Brazilian Institute for the Environment and Renewable Natural Resources (Ibama)), Estonia (Estonian Rescue Board), France (Ministry of Ecological Transition), Lithuania (SE Klaipėda State Seaport Authority), South Africa (South African Police Service) and the United States (Occupational Safety and Health Administration), as well as a joint presentation on industry practices (AEISG, Fertilizers Europe, IME and SAFEX).

Finally, the fourth session included a panel discussion, moderated by the Chair of the OECD Working Party on Chemical Accidents (Health and Safety Executive, United Kingdom of Great Britain and Northern Ireland). The panel included representatives of the European Commission (Directorate General Environment), France (Ministry of Ecological Transition), Canada (Transport Canada), the Russian Federation (EMERCOM) and industry (Fertilizers Europe). It covered how regional and national regulations on managing the risks of AN and AN-based fertilizers were updated taking into account past accidents, and how they are implemented in practice.

## **2. Mandate and organization**

The decision to organize the seminar was taken following a proposal by the European Union at the eleventh meeting of the Conference of the Parties to the UNECE Industrial Accidents Convention (Geneva and online, 7-9 December 2020). The UNECE secretariat, in cooperation with the Convention's Bureau, developed a proposal for the seminar and subsequently agreed to establish an

Organizing Committee involving other international organizations and an Advisory Group for the preparation of the seminar.

The Organizing Committee included UNECE (secretariats to the Industrial Accidents Convention and to the Sub-Committees of Experts on the Transport of Dangerous Goods (TDG) and on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)), in cooperation with the OECD, ILO, IMO, UNEP/OCHA Joint Environment Unit and UNDRR Regional Office for Arab States. Each of these organizations has international instruments, recommendations and/or mechanisms relevant to: the storage, handling and transport of hazardous substances, including AN and AN-based fertilizers; related accident prevention, preparedness and response; or disaster risk reduction more generally. The Committee met twice and prepared a concept note, preceding survey, agenda and the present document. The seminar's organization was led by UNECE.

The Advisory Group was comprised of experts from 11 countries (Austria, Canada, Germany, France, Latvia, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland and the United States of America) and the European Union Joint Research Centre, nominated through the Bureaux to the Industrial Accidents Convention and OECD Working Party on Chemical Accidents and communicated through the Sub-Committees of Experts on TDG and GHS. It also included contributions from representatives of 4 industry associations (Australasian Explosives Industry Safety Group, Inc; Fertilizers Europe; Institute of Makers of Explosives; Responsible Packaging Management Association of Southern Africa) as observers. The group met twice to support the seminar organization and to provide guidance to the Organizing Committee.

The global seminar was held online on 14 December 2021 with Arabic, English, French, Russian and Spanish interpretation. It was made possible thanks to financial contributions from the French Ministry for Ecological Transition and German Federal Ministry of the Environment, Nature Conservation & Nuclear Safety.

### **3. Results of the survey**

In advance of the seminar, the Organizing Committee, under UNECE's leadership, with feedback from the Advisory Group, developed a joint UN/OECD survey covering: lessons learned from the Beirut port explosion and other accidents involving AN or AN-based fertilizers; the legal and regulatory framework for managing risks of AN; and challenges and suggestions in enhancing AN risk management. The survey, available in Arabic, English, French, Russian and Spanish, was distributed by UNECE (secretariats to the Industrial Accidents Convention, TDG and GHS), IMO, OECD, UNDRR Regional Office for Arab States, as well as the European Union Joint Research Centre.

101 responses were received from 43 countries of all UN regions and totalled to over 600 pages of data. UNECE synthesized the responses per question and then analysed them. The analysis found several key areas of concern regarding AN: classification, coordination amongst authorities, port management, safe storage and transport, land-use planning, inspections, public information and security.<sup>1</sup> Below are summaries of some of the significant findings:

- The Beirut port explosion prompted many governments to take actions within their countries, including heightened site inspections to ensure compliance with laws and regulations, reviews of laws and regulations and awareness raising through media and expert dialogues.

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<sup>1</sup> Throughout this document, 'security' refers to measures to protect a person, place or object or to mitigate impacts in the case of an intended event, such as a terror attack; whereas 'safety' entails preventing accidents or mitigating impacts in the case of an unintended accident or event.

- Most countries apply multiple international instruments and have national legislation and regulations that address hazardous substances, including AN; relevant rules were reported under customs, economic, environmental, occupational safety and health, port, security, trade and transport law, and under building and fire codes.
- Most countries do not have an explicit definition of ‘intermediate’ or ‘temporary’ storage; however, different rules and exclusions may apply to the storage of hazardous substances, including AN and AN-based fertilizers, depending on their properties and quantities, location and duration at a site. Some respondents identified the need to remove hazardous substances from ports as soon as practicable and deliver them to ports just before loading.
- Respondents provided information on AN risk management in port areas:
  - Some good practices included to limit quantities of AN and AN-based fertilizers per vessel, to have water and pumping facilities near loading docks, to ensure port workers are aware of risks and regulations and to conduct preventative checks and regular trainings.
  - Some lessons learned were the need to ensure sufficient information was provided for dangerous goods, for companies to have emergency response teams (i.e. not rely only on firefighters) and that different industries using AN and AN-based fertilizers have the specific technical knowledge required.
  - Some challenges entailed assessing why AN and AN-based fertilizers detonate in some situations but not others, managing AN residue from loading areas in ports or customs areas, building workers’ technical capacities and improving the labelling of containers holding hazardous substance.
- Most countries use international classification and labelling standards; at the same time, enhancing knowledge of the different types of AN mixtures and understanding their resistance to detonation is needed. Some respondents also emphasized the importance of safety data sheets in communicating information to others and the importance of inventory and traceability systems when storing and transporting hazardous substances.
- Most countries have requirements for training workers at sites with hazardous substances and some have requirements for detailed training at major hazards facilities. Moreover, some countries have rules requiring undertakings to appoint a certified safety advisor, who must ensure safety and compliance with laws and regulations.
- Various authorities are in charge of inspections at the national, sub-national and local levels; inspection criteria (e.g. testing, co-storing with other substances, safety distancing, security seals) and frequency need to be scrutinized, especially for storage sites containing mass amounts or multiple hazardous substances.
- Rules on land-use planning, siting and risk assessment commonly apply to the development of new hazardous installations,<sup>2</sup> modification of existing ones and/or when an installation is near a populated area. Recurring elements of these include zoning to keep distance from populated areas, ensuring safety and notification of the nearby public, protecting nearby environments, distancing from explosives and security assessments.
- While many countries have national legislation on informing the public of hazardous installations and ensuring their participation in decision-making, some respondents reported that the public is not always aware of the hazards, risks and emergency plans of sites with AN and AN-based fertilizers. Security should be considered in providing public information.

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<sup>2</sup> The term “hazardous installations” used in this report intends to cover “hazardous activities” holding hazardous substances within specific threshold quantities (annex I) under the UNECE Convention on the Transboundary Effects of Industrial Accidents and “establishments” holding dangerous substances within specific threshold quantities (annex I) under the EU Seveso Directive (2012/18/EU) on the control of major-accident hazards involving dangerous substances.

- In port areas, port authorities are often responsible for safety in the handling and transport of hazardous substances, including AN and AN-based fertilizers, and emergency preparedness. At manufacturing and storage sites, operators are responsible for ensuring safety of hazardous substances, including AN and AN-based fertilizers and for the preparation and activation of on-site contingency plans. Public authorities are responsible for off-site contingency plans, including with inputs from the operators, surrounding communities and in consultation with the public (aligned with the on-site plan). Coordination and cooperation among all involved authorities, operators and communities is thus essential. There are sometimes difficulties in communicating contingency plans to the nearby public and in fully resourcing and testing them with all subjected stakeholders.

These, among other findings, informed the seminar agenda to cover specific experiences, lessons learned, good practices and challenges in managing the risks of hazardous substances, including AN and AN-based fertilizers. A summarized overview of the analysis of each survey question was presented at the seminar.

## 4. Summary and conclusions

This section summarizes important information presented at the seminar and highlights the **conclusions** (bolded) drawn by the presenters, panellists and moderators, in response to the issues raised and discussed with the audience (including through the chat).

### ***a. International legal and policy instruments, industry guidance and good practice***

Many international and national legal and policy instruments, including recommendations, address the classification, testing, packaging, storage, handling and transport of hazardous substances, including AN and AN-based fertilizers, as well as industrial/chemical accident prevention, preparedness and response. Widely used international instruments that apply throughout the lifecycle of various hazardous substances, including AN and AN-based fertilizers, include *inter alia*:

- Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)
- UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)
- UN Manual of Tests and Criteria
- UN Recommendations on the Transport of Dangerous Goods, Model Regulations
- UNECE Convention on the Transboundary Effects of Industrial Accidents
- ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air<sup>3</sup>
- ILO Prevention of Major Industrial Accidents Convention (No. 174)
- ILO Chemicals Convention (No. 170)
- IMO International Maritime Dangerous Goods (IMDG) Code
- IMO International Maritime Solid Bulk Cargoes (IMSBC) Code
- IMO Recommendations on the Safe Transport of Dangerous Cargoes and Related activities in Port Areas
- OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response.

Numerous guidance documents have been developed and training materials are available to support countries in the implementation of the above-mentioned instruments.

Moreover, a number of industry guidance and good practices are also available:

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<sup>3</sup> Please note that only certain types of AN can be transported by air; others are forbidden.

- Fertilizers Europe runs a product stewardship programme to establish and enhance safety, security, health and environment performance, including with mandatory implementation for all member companies and audits by independent third parties.
- AEISG is developing a code of practice on the storage and handling of solid AN
- SAFEX produced a guide of good practices on the storage of solids technical grade AN
- IME has developed guidance on the safe handling of solid AN
- NFPA's Code 400 has a chapter dedicated to AN

The following conclusions were drawn during the seminar

- **While numerous international legal and policy instruments regulate** the classification, testing, packaging, storage, handling and transport of hazardous substances, including AN and AN-based fertilizers, as well as industrial/chemical accident prevention, preparedness and response, their **implementation needs to be strengthened. Countries can use of the numerous guidelines and good practices**, developed by international organizations and industry, that are available to support this. In addition, they can seek assistance from international organizations and industry associations in strengthening their implementation and applying related principles.
- **Implementation can be challenging for countries and industries, including due to: low institutional and financial capacities; lack of coordination across authorities; insufficient understanding of legal and policy instruments and their linkages; lack of implementation and eventual non-compliance; lack of coherence in policy-making; and lack of adequate training of workers (in storage sites and port areas, and in handling and transporting hazardous substances, such as AN, etc.), first responders and staff working for national, regional and local authorities.**
- **Such challenges can be addressed through the following means, among others:**
  - Raising awareness at all levels of governance with national, regional and local institutions and with industry, operators and workers
  - Ensuring inspections are conducted at regular intervals and follow-up inspections are conducted as needed
  - Ensuring operators and workers are trained and equipped
  - Putting in place monitoring and reporting mechanisms
  - Building capacity for countries to reach full implementation
- **It is essential to ensure a multi-hazard approach to disaster risk reduction (i.e. natural and man-made hazards, as well as chemical, biological, technological, environmental hazard risks) and to mainstream technological disaster risk management, among others for hazardous substances involving AN and AN-based fertilizers, into national, local and sectoral plans and strategies in an institutionalized manner. This can be supported through legislation and strong governance and with the involvement of all stakeholders. International organizations, such as UNDRR and UNECE can support related efforts.**

#### ***b. Characteristics of AN and AN-based fertilizers***

The scientific community has produced much knowledge on AN and AN-based fertilizers, including their characteristics, types and intrinsic hazards and risks. Experts presented such knowledge during the seminar. This was complemented by presentations on laws, policies and good practices in implementation for the safe management of AN and AN-based fertilizers, which should take into consideration this knowledge to be more effective. The conclusions which can be drawn from the seminar include:

- Differentiating between different types of AN and AN-based fertilizers (e.g. fertilizer versus technical grade, and percentage of nitrogen) is essential, because different types entail different hazards and risks and therefore require different safety measures. It is particularly relevant to differentiate between high-density AN, such as fertilizers, and low-density AN, such as explosives. While both products essentially contain AN, their physical forms are very different, producing different effects.
- Testing, classification and labelling should be conducted in accordance with applicable internationally agreed on recommendations, transposed by many countries through their national legislation, in particular the Globally Harmonized System on the Classification and Labelling of Chemicals (GHS) and the Model Regulations on the Transport of Dangerous Goods (TDG). These are regularly updated to take new information into account and to provide a worldwide harmonized approach, thus ensuring the same level of safety for all, when implemented.
- Testing, classification and labelling practices require sufficient resourcing and for those conducting tests to have proper training and tools.
- Hazardous substances, including AN and AN-based fertilizers, should be inventoried at storage sites and in port areas so authorities, inspectors, operators, workers and responders know what is stored where and how multiple hazardous substance could interact or react (e.g. to fires and heat).
- Educating and training those who handle and transport AN and AN-based fertilizers (e.g. staff of authorities, workers) and respond to related accidents (e.g. firefighters) on the characteristics and types of AN and AN-based fertilizers and their hazards and risks is essential (see 4(g) below). Too many firefighters – in addition to too many members of the public – have lost their lives in previous accidents involving AN, including in Beirut (2020), Tianjin, China (2015) and West Fertilizer, United States (2013), going in to extinguish a fire – not aware of the imminent explosion – sufficient knowledge is available to avoid such tragedies in the future.

### ***c. Lessons learned from Beirut and previous accidents***

The Beirut port explosion highlighted once again the importance of applying and complying with the international legal and policy instruments, existing guidance and good practices, and to apply widely available knowledge. Several countries reported on lessons learned from past accidents: A representative of the National Disaster Risk Management authority of Lebanon stated that the Beirut port explosion has lessons learned not only for Lebanon, but for the world at large on good governance, handling hazardous materials, prevention, preparedness and response. More specifically, he highlighted the following points:

- **Good governance is essential.** Lebanon is in the final phase of completing its National DRR strategy, to be adopted and subsequently implemented, seeking to save lives, assets and development gains.
- **Having good preparedness and response plans in place pays off when a disaster strikes.** In addition to efforts by national authorities, the roles of local level authorities and city administrations here are essential. Disasters always start at the local level; it is **important to have local level prevention, preparedness and response systems and plans in place and to test them.**
- Having experts present in response and humanitarian efforts is important for safety, as some of the debris from the explosion was found to be hazardous and harmful to volunteers working immediately after.

- Keeping track of all response actions is essential, in cooperation with all actors (national, including army forces and international assistance), including through a response framework and regular situation reports.
- Having realistic disaster drills and underground hospital functions is essential; hospitals in Beirut became overwhelmed after the explosion.
- International support and assistance can alleviate national efforts – the support rendered from the EU, UNEP/OCHA Joint Environment Unit and UNDP, following the Beirut port explosion, was essential.
- Mutual lessons learning and experience-sharing are important, supporting efforts to enhance safety, develop and implement related legal and policy instruments and plans.

The JRC presented its analysis from reviewing 23 past accidents involving AN or AN-based fertilizers. It referred to contributing factors of three of these accidents, some of which were not taken into consideration to prevent later accidents. The JRC also outlined the below key lessons learned from the accidents analysed, including *inter alia*:

- Proper storage and handling practices are needed to avoid contamination
- Avoid placing ignition sources near fertilizer piles
- Ensure appropriate preparedness measures (e.g. effective fire detection and extinguishing practices)
- Hazard and risk assessments and inspection practices should include all AN products and not to overlook 'off-specs' products
- Awareness of risks and hazards associated with ammonium nitrate among operators may be more widespread than originally thought
- More knowledge is needed to identify sub-standard products and associated hazards
- Ammonium nitrate should be considered in hazard assessment
- Separation of combustible materials from organic substances reduces potential conflagration and explosion
- In some cases, existing professional standards for preventing AN accidents can be confusing, contradictory and out-of-date
- Developments should be restricted around sites that handle or store AN
- Local authorities and responders should be aware of all AN storage and the risks
- Storing AN and AN-based fertilizers in bulk should not be allowed without proper fire prevention, protection and mitigation measures

Furthermore, national authorities from different regions discussed lessons learned and actions they took following the Beirut port explosion and other accidents, including:

- The Brazilian Institute for the Environment and Renewable Natural Resources (Ibama) established a task force on preventative actions in port areas and hazmat warehouses following the São Francisco do sul incidents and the Beirut port explosion.
- France created an independent trans-ministerial mission to assess existing schemes and provisions for the transport and handling of AN and AN-based fertilizers in maritime ports and to develop recommendations related to these issues following the Beirut port explosion. France also adopted a new law for technological risk prevention following the Toulouse accident.
- Several agencies of the United States prepared guidelines and programmes on the safety and security of AN from the lessons learned from the West fertilizer plant explosion in Texas.
- Many national authorities heightened inspections at sites with hazardous substances, including AN and AN-based fertilizers, and follow-up inspections to ensure compliance following the Beirut port explosion.

#### ***d. Risk assessments; land-use planning and siting***

Many governments have put in place requirements for risk assessments to be carried out to understand how an industrial facility, such as a port or a storage site for AN, poses risks to the public and the environment. Some of the good practices and lessons learned covered in the seminar showed the importance of conducting risk assessments and of considering the results during procedures for land-use planning and siting. The following conclusions were drawn from the seminar:

- **Conducting risk assessments is essential for determining the effects and related risks of hazardous substances, including AN and AN-based fertilizers, in the case of an accident.** They provide information on how people, places and the environment, including beyond national borders, could be exposed during an accident – taking into account the hazardous substances (and mixtures), their quantity and the surrounding conditions, as well as different accident scenarios.
- **National and local authorities, including land-use planners, need to take account of the results of risk assessments to make informed decisions on:**
  - **Measures to mitigate risk on-site during storage, handling and transport, including how much is allowed to be stored and under which conditions;**
  - **Land-use planning and siting, including how far storage, handling and transport sites need to be from people and places to ensure safety; and**
  - **Emergency management/contingency planning, including on- and off-site contingency plans.**
- France made a statement on its land-use planning legislation for high-risk industrial activities, which was developed following the Toulouse factory explosion (2001), emphasizing that it covers future and present urbanization. Its laws regulate future constructions and present situations where urbanization is close to industrial plants. Its rules allow for expropriation measures in high-risk areas and population protection measures in lower risk areas.
- **Information and knowledge on risk assessment methodologies should be regularly shared across countries. Land-use plans and siting decisions should take account of possible transboundary effects of accidents and seek to mitigate these, including for the population of affected neighbouring countries. Decisions on land-use planning and siting should be taken following consultation of the affected public.**

#### ***e. Inspections and follow-up inspections at hazardous sites***

Inspections provide a means to ensure rules and regulations are being implemented and complied with. Several presentations at the seminar, including from the authority of the Port of Klaipėda, Lithuania, and the South African Police Service, showed that **regular inspections can help ensure safety measures are applied**. Some examples of recurring criteria for inspections include checking, among others: safety distancing from other hazardous substances and explosives; temperature and ventilation control; placement outside the view of direct sunlight; packaging and labelling conditions; fire extinguishing devices; and emergency management plans. Following the Beirut port explosion, many countries heightened their inspection practices of sites with AN and AN-based fertilizers.

The following conclusions were drawn from the presentations and statements:

- **Countries should ensure high levels of inspections are developed and maintained for the safe and secure management of hazardous substances.**
- **Inspections of sites with hazardous substances provide an important means to ensure that rules and guidelines are being implemented and complied with.**
- **The criteria and frequency for inspections should depend upon, among other components: the type and quantity of the hazardous substance (or fertilizer) being stored, handled or**

transported; associated hazards and risks; conditions of the site and other chemicals or explosives present; and adjacency to residential, commercial or public space, as well as to the surrounding environment and national borders, in view of possible transboundary impacts.

***f. Intermediate/temporary storage of AN and AN-based fertilizers, including in port areas***

Hazardous substances, including AN and AN-based fertilizers, are often placed in intermediate/temporary storage at different points in their lifecycle. While there is not an internationally agreed upon definition for or time-frame of what constitutes such storage, this often includes when hazardous substances are somewhere temporarily, such when being classified, labelled, transported, traded and/or when confiscated (e.g. in the Beirut port). The following conclusions were drawn from the seminar:

- **The locations for such transitory activities and for storing AN and AN-based fertilizers for limited periods of time may or may not be designed for this substance or these mixtures specifically. This may thus require different measures to ensure safety.**
- **Some countries have rules in place prescribing maximum time limits for AN and AN-based fertilizers to be temporarily stored in certain places (e.g. port areas) and/or different obligations when temporarily storing these for set amounts of time.**
- **Intermediate/temporary storage often requires various sets of actors to coordinate and cooperate in handing over or disposing of hazardous substances, including national authorities, customs and border patrol, port authorities, companies, ship crews, truck drivers, etc.**
- **Countries should take the above factors or issues into consideration when reviewing their regulations and inspection criteria, in order to ensure hazardous substances, including AN and AN-based fertilizers, are always safety managed and accounted for when in intermediate/temporary storage.**
- **Implementation of the IMO Revised Recommendations on the safe transport of dangerous cargoes and related activities in port areas provides a basis to safely keep dangerous cargoes, including those with AN and AN-based fertilizers, in port areas temporarily. The recommendations can be reviewed for measures on warehouses, terminal areas and infrastructure in ports, as well as minimum training requirements, security provisions, responsibilities of different actors and more.**
- **Intermediate/temporary storage needs further discussion and consideration, including on the various definitions and elements involved, interlinkages between relevant regulations, implications for various authorities and various approaches to its management.**

***g. Information-sharing and training on hazardous substances, including AN and AN-based fertilizers***

The various actors involved in managing the risks of hazardous substances, including AN and AN-based fertilizers, have different sets of knowledge, receive different types and amounts of information and complete different trainings in working with substances and mixtures. Information-sharing and training help to ensure all stakeholders are prepared to manage hazardous substances safely. The following conclusions were drawn from the seminar:

- **To ensure the safe storage, handling and transport of hazardous substances, including AN and AN-based fertilizers, national and local authorities, inspectors, firefighters, workers, truck drivers, responders, among other groups, need to be aware of: (1) the characteristics and type of the substance/mixture they are working with; (2) the associated hazards and**

risks; and (3) measures to be taken to prevent, prepare for and respond to possible accidents. They also need training to properly implement safety measures.

- The public needs to be informed of the existence of nearby hazardous substances, including AN and AN-based fertilizers, that are capable of causing accidents that could affect them, as well as the associated hazards and risks and what to do in case of an accident. Information-measures should also target the affected public in neighbouring countries.
- Some challenges are: (1) information is not always provided to all those who need it to properly do their job and ensure safety or to respond to accidents; (2) information is not always communicated in an understandable manner to different target groups; and (3) authorities and companies may not always place safety first.
- Such challenges could be addressed by fully scoping the target groups and ensuring information is effectively channelled to them. The said information is often highly technical, so tailoring it for target groups and presenting it clearly to them is essential. Different forms of communication could include drills/exercises, letters, manuals, trainings, websites, etc.
- Applying relevant international instruments, such as the ILO Conventions and Recommendations supports the engagement and training of workers.

#### ***h. Cooperation and coordination across authorities***

Many hazardous substances can be used for different purposes and in a variety of sectors. The use of AN and AN-based fertilizers ranges from agriculture, to the chemicals industry, to explosives, to mining and more. During the lifecycles of hazardous substances, including AN and AN-based fertilizers, various regulations apply that are overseen by different authorities covering, among other areas, industrial safety, customs, police, emergency response, disaster risk management, occupational safety and health, ports, transport and environmental protection. Different authorities often use different terminology, take different approaches and have different areas of expertise. The following conclusions have been drawn from the presentations and discussions:

- It is essential to implement and enforce all applicable regulations and to enforce these through inspections, audits, etc. (see Section 4(e) above). Safety needs to be given the utmost priority, with the objective of preventing accidents from happening.
- It is essential that authorities coordinate and cooperate with industry and operators to ensure the safe storage, handling and transport of hazardous substances in port areas and beyond. It is also imperative that authorities and operators effectively cooperate to mitigate the effects of any accident, to ensure that preparedness (on- and off-site contingency) plans are in place, and that response measures are taken effectively, to mitigate damage to human lives, health and the environment.
- To address challenges in coordination and cooperation, national and local authorities and industry operators should aim to develop common understandings (e.g. on the basis of safety data sheets), clear communication paths and protocols (e.g. notification systems) and regular tests to ensure and update existing on- and off-site contingency plans, with the latter involving the community/public. It is advised that harmonized or joint off-site contingency plans be developed with potentially affected countries.
- Transboundary cooperation in managing the risks of hazardous substances, including AN and AN-based fertilizers, is crucial. This should include: exchanging information across countries on the location of hazardous installations with possible transboundary effects; and related risk assessments; harmonized or joint contingency planning; joint preparedness and response exercises; and prompt notification and mutual assistance in case of an accident. Implementation of the UNECE Industrial Accidents Convention and relevant principles of the OECD Guiding Principles on Chemical Accident Prevention, Preparedness

and Response provides a basis for ensuring that effective principles for transboundary cooperation are in place.

- Continuous international exchanges and information-sharing on, among others, risk assessment and management, the lessons learned from accidents and good practices, are important to advance transboundary cooperation in accident prevention and preparedness.

#### ***i. Sharing knowledge and information, capacity building and the role of international organizations***

Many countries' national laws and regulations that address the safe storage, handling and transport of hazardous substances and related industrial accident prevention, preparedness and response are developed to implement international legal instruments, including recommendations and industry guidance. Sharing knowledge and information on national and international instruments can foster enhanced implementation and capacity building. The following conclusions were drawn from the seminar:

- **Effective implementation of existing legal and policy instruments is essential to ensure all measures are in place to prevent industrial/chemical accidents from happening.**
- **Measures need to be in place to mitigate any possible effects of an accident, including transboundary effects, e.g. through risk assessment and land-use planning and siting decisions (see Section 4(d) above). International organizations support countries in the implementation of international legal and policy instruments, and can provide assistance to those aspiring to implement them which are not yet Parties.**
- **Emergency management planning is a key component of accident prevention and preparedness. International organizations can assist countries in building their readiness for response and in providing emergency response assistance in the event of major accidents that may exceed local, national or regional capacities.**
- **Some countries struggle to ensure the provision of the required human and financial resources, institutional capacities (including for inter-agency coordination), technology and training (i.e. of authorities, experts and workers) for full and effective implementation of legal and policy instruments. This is particularly important for developing countries and countries with economies in transition, as some major economic activities (e.g. agriculture and mining) often require using AN and AN-based fertilizers.**
- **Capacity building activities, including with the support of international organizations, can further assist countries in strengthening their capacities, as can the sharing of knowledge by other countries, industry and stakeholders that have expertise (e.g. through their research programmes or lessons learned from past accidents in their jurisdiction).**
- **International organizations have an important role to play to facilitate information and knowledge exchanges (e.g. on good practices, lessons learned, new technologies, guidance) and to support countries in policy-making and governance (inter-institutional cooperation), as well as in training of authorities and stakeholders.**

## **6. Actions needed and next steps**

The seminar highlighted key areas of challenges and gaps that need to be addressed. **Related actions that could be considered by national authorities, industry and stakeholders** comprise:

- Strengthening the implementation of existing legal and policy instruments and recommendations

- Reviewing and, as necessary, updating national (implementation) laws and regulations, as well as guidance materials and industry standards, to ensure they are up-to-date, sufficient and accessible to all stakeholders
- Raising awareness of the characteristics and types of hazardous substances, including AN and AN-based fertilizers, and their intrinsic hazards and risks among national authorities, industry, operators, workers, first responders, etc., and providing training for these groups to ensure safety
- Ensuring sufficient resources, training and tools are available for the testing, classification and labelling of AN and AN-based fertilizers
- Enhancing public information on the hazards and risks of hazardous substance, including AN and AN-based fertilizers, that are stored, handled and transported nearby, including response measures in case of emergencies, and involving the affected public in neighbouring countries
- Ensuring that inspections of sites containing hazardous substance, including AN and AN-based fertilizers, have the appropriate criteria and are conducted with the appropriate frequency
- Using and/or developing new traceability systems, inventory systems or monitoring systems for the storage, transport and handling of hazardous substances
- Mainstreaming human-made hazards and technological disasters into disaster risk reduction plans and strategies
- Sharing experiences, lessons learned and good practices with other countries to assist other countries in preventing accidents and mitigating their consequences should they occur
- Sharing research with other countries avoid the duplication of work and developing joint research on AN and AN-based fertilizers
- Using international notification systems and mutual and international assistance mechanisms, including by conducting tests and exercises to ensure readiness in case of emergencies
- Reviewing and testing internal and external contingency plans to ensure their sufficiency and to ensure readiness
- Developing capacity building projects to enhance inter-agency coordination and to train authorities on tools and methodologies

The international organizations of the Organizing Committee stand ready to further support the efforts to strengthen the implementation of the legal and policy instruments developed under their auspices. More specifically, building on work from the seminar, the **following follow-up activities may be conducted by international organizations**, if supported and financed:

- Maintaining dialogue to ensure knowledge and information is regularly exchanged across international organizations and relevant international organizations are engaged at key events; coordinating and cooperating across relevant international organizations in the development of tools and guidance that can serve multiple constituencies; and further exploring and promoting the synergies between international organizations, including their instruments and mechanisms
- Further exchanging of information and management of knowledge, including through the development of an information repository on: international legal and policy instruments for risk management of AN, and derived products; industrial accident prevention, preparedness and response; and implementation experiences, lessons learned and good practices (UNECE)
- Updating and expanding the section dedicated to port areas in the forthcoming third edition of the OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response; and considering setting up another seminar dedicated to the management of hazardous installations at port areas (OECD)
- Mainstreaming/integrating technological disaster risk reduction into national (and local) disaster risk reduction strategies prepared by countries under the Sendai Framework (UNDRR, UNECE)
- Continuing emergency readiness and response services for accidents involving AN and AN-based fertilizers by the UNEP/OCHA Joint Environment Unit. The unit's experience in

responding to the Beirut port explosion, as well as the more recent Bata explosions in Equatorial Guinea, is being reflected upon and used to inform future work.

- Strengthening countries' legal and compliance framework on occupational safety and health and chemical management, including in Lebanon based on the ILO's national legislation gap analysis
- Mainstreaming and updating existing toolkits (e.g. the IOMC toolbox for decision-making in chemicals management) with the conclusions from the seminar and integrating them into training modules (ILO, OECD, other organizations, as opportunities arise)

## Annex – Participating authorities and institutions

National and local authorities	
Country	Authorities (national and local)
Australia	<ul style="list-style-type: none"> <li>- Australian Federal Police</li> <li>- Department of Mines, Industry Regulation and Safety, Western Australia Environment Protection Authority (EPA) New South Wales</li> <li>- Resources Safety and Health Queensland</li> <li>- SafeWork New South Wales</li> </ul>
Austria	<ul style="list-style-type: none"> <li>- Federal Ministry for Climate Action</li> <li>- Federal Ministry for Digital and Economic Affairs</li> <li>- Federal Ministry for Environment, Energy, Mobility and Technology</li> </ul>
Belarus	<ul style="list-style-type: none"> <li>- Administration of State Control</li> <li>- Ministry for Emergency Situations (Gospromnadzor)</li> </ul>
Belgium	<ul style="list-style-type: none"> <li>- Administration of Wallonia (SPW ARNE)</li> <li>- Federal Public Service Employment, Labour and Social Dialogue</li> <li>- Flemish government-External Safety-Division Enforcement, Supervision of Major Hazard Companies</li> <li>- FPS Economy, SMEs, Middle Classes, and Energy</li> <li>- Ministry of Economy</li> <li>- Service Public de Wallonie</li> <li>- SPW ARNE Agriculture, Ressources naturelles et Environnement (Wallonie)</li> </ul>
Brazil	<ul style="list-style-type: none"> <li>- Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA)</li> </ul>
Bulgaria	<ul style="list-style-type: none"> <li>- Ministry of Environment and Water</li> </ul>
Canada	<ul style="list-style-type: none"> <li>- Canada Border Service Agency</li> <li>- Ministry of Transport of Quebec</li> <li>- Natural Resources Canada</li> <li>- Transport Canada</li> </ul>
China	<ul style="list-style-type: none"> <li>- Ministry of Transport (Civil Aviation Administration of China (CAAC))</li> </ul>
Costa Rica	<ul style="list-style-type: none"> <li>- Costa Rican Fire Department</li> <li>- Ministry of Finance</li> </ul>
Cyprus	<ul style="list-style-type: none"> <li>- Department of Labour Inspection</li> <li>- Ministry of Labour, Welfare and Social Insurance</li> </ul>
Czech Republic	<ul style="list-style-type: none"> <li>- Ministry of the Environment</li> </ul>
Denmark	<ul style="list-style-type: none"> <li>- Danish Environmental Protection Agency (EPA)</li> <li>- Municipality of Vejle</li> </ul>
Estonia	<ul style="list-style-type: none"> <li>- Consumer Protection and Technical Regulatory Authority</li> <li>- Environmental Board of Estonia</li> <li>- Estonian Rescue Board</li> <li>- Ministry of Interior</li> <li>- State Fire and Rescue Service</li> </ul>
Finland	<ul style="list-style-type: none"> <li>- Finnish Safety and Chemical Agency</li> </ul>
France	<ul style="list-style-type: none"> <li>- Ministry for the Ecological Transition</li> </ul>
Germany	<ul style="list-style-type: none"> <li>- Bundeswehr (Design Safety of Ammunition and Range Safety)</li> <li>- Fire and Rescue Services Hamburg</li> <li>- German Environment Agency (Umweltbundesamt)</li> <li>- Ministry for Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia (MULNV)</li> <li>- Ministry for the Environment, Nature Conservation and Nuclear Safety</li> <li>- LUBW State Institute for Environment Baden-Württemberg</li> </ul>
Greece	<ul style="list-style-type: none"> <li>- Ministry of Environment and Energy</li> </ul>
Hungary	<ul style="list-style-type: none"> <li>- National Directorate General for Disaster Management</li> </ul>
Ireland	<ul style="list-style-type: none"> <li>- Department of Agriculture, Food and the Marine (DAFM)</li> <li>- Department of Enterprise, Trade and Employment</li> </ul>

	<ul style="list-style-type: none"> <li>- Department of Justice (Government Inspector of Explosives)</li> <li>- Health &amp; Safety Authority</li> <li>- Irish Maritime Administration</li> </ul>
Israel	<ul style="list-style-type: none"> <li>- Ministry of Environmental Protection</li> </ul>
Latvia	<ul style="list-style-type: none"> <li>- Kurzeme Regional Environmental Board</li> <li>- Lielrīgas Regional Environmental Board</li> <li>- Maritime Administration</li> <li>- Ministry for the Interior (State Fire and Rescue Service)</li> <li>- Ministry of Environmental Protection and Regional Development</li> <li>- Ministry of Transport</li> <li>- National Armed Forces</li> <li>- Port Authority of Liepāja</li> <li>- Port Authority of Salacgrīva</li> <li>- State Emergency Medical Service</li> <li>- National Armed Forces</li> <li>- State Environmental Service</li> </ul>
Lebanon	<ul style="list-style-type: none"> <li>- Presidency of the Council of Ministers</li> </ul>
Lithuania	<ul style="list-style-type: none"> <li>- Ministry of Interior (Fire Rescue Department)</li> <li>- SE Klaipėda State Seaport Authority</li> </ul>
Luxembourg	<ul style="list-style-type: none"> <li>- Inspection du Travail et des Mines</li> </ul>
Malta	<ul style="list-style-type: none"> <li>- Occupational Health and Safety Authority</li> </ul>
Mexico	<ul style="list-style-type: none"> <li>- Secretariat of Infrastructure, Communications and Transportation</li> </ul>
Myanmar	<ul style="list-style-type: none"> <li>- Ministry of Natural Resources and Environmental Conservation (MONREC)</li> </ul>
Netherlands	<ul style="list-style-type: none"> <li>- Ministry of Infrastructure and Water Management</li> </ul>
New Zealand	<ul style="list-style-type: none"> <li>- Environmental Protection Authority</li> <li>- Worksafe, New Zealand Government</li> </ul>
Norway	<ul style="list-style-type: none"> <li>- National Criminal Investigation Service</li> <li>- Norwegian Coastal Administration</li> <li>- Norwegian Directorate for Civil Protection (DSB)</li> <li>- Norwegian Police</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>- Food and Drug Administration</li> </ul>
Poland	<ul style="list-style-type: none"> <li>- Chief Inspectorate of Environmental Protection</li> <li>- Ministry of Economic Development, Labour and Technology</li> <li>- National Headquarters of the State Fire Service</li> </ul>
Portugal	<ul style="list-style-type: none"> <li>- Public Security Police, Special Police Unit</li> <li>- Portuguese Environment Agency</li> </ul>
Republic of Korea	<ul style="list-style-type: none"> <li>- Korea Fire Institute</li> </ul>
Republic of Moldova	<ul style="list-style-type: none"> <li>- General Inspectorate for Emergency Situations</li> <li>- Ministry of Agriculture, Regional Development and Environment (Monitoring Department, Environmental Agency)</li> <li>- Ministry of Infrastructure and Regional Development (Agency for Technical Supervision)</li> <li>- Permanent Mission of the Republic of Moldova to the United Nations Office and other international organizations in Geneva</li> </ul>
Romania	<ul style="list-style-type: none"> <li>- Ministry of Internal Affairs (General Inspectorate for Emergency Situations)</li> <li>- Ministry of the Environment, Water and Forests (Risk Secretariat)</li> </ul>
Russian Federation	<ul style="list-style-type: none"> <li>- Federal Service for Environmental, Technological and Nuclear Supervision (Rostekhnadzor)</li> <li>- Ministry of Emergency Situations of the Russian Federation (EMERCOM)</li> </ul>
Serbia	<ul style="list-style-type: none"> <li>- Ministry of Environment Protection (Department for Risk Management and Accident Response)</li> </ul>
Slovakia	<ul style="list-style-type: none"> <li>- Ministry of Environment (Environmental Risk and Biosafety Department)</li> <li>- National Labour Inspectorate</li> </ul>
Slovenia	<ul style="list-style-type: none"> <li>- Ministry of Defence (Administration for Civil Protection and Disaster Relief)</li> <li>- Ministry of the Environment and Spatial Planning</li> </ul>
South Africa	<ul style="list-style-type: none"> <li>- Dangerous Goods Inspectorate</li> </ul>

	<ul style="list-style-type: none"> <li>- Department of Employment and Labour</li> <li>- Department of Environmental Affairs (DFFE)</li> <li>- Department of Transport (Dangerous Goods Inspectorate)</li> <li>- Fire and Emergency Services (FPASA)</li> <li>- National Department of Transport</li> <li>- South Africa Maritime Safety Authority</li> <li>- South African Civil Aviation</li> <li>- South Arica Police Service</li> </ul>
Spain	<ul style="list-style-type: none"> <li>- Ministry for Ecological Transition and Demographic Challenge</li> <li>- Ministry of Transport</li> <li>- Port Authority of Ceuta</li> </ul>
Suriname	<ul style="list-style-type: none"> <li>- Ministry of Natural Resources</li> </ul>
Sweden	<ul style="list-style-type: none"> <li>- County Administration Board of Östergötland</li> <li>- County Administrative Board of Kalmar County</li> <li>- County Administrative Board of Norrbotten</li> <li>- County Administrative Board of Södermanland</li> <li>- County administrative board of Stockholm county</li> <li>- County Administrative Board of Västmanlands Län</li> <li>- Länsstyrelsen Dalarna</li> <li>- Swedish Civil Contingencies Agency (MSB)</li> </ul>
Switzerland	<ul style="list-style-type: none"> <li>- Federal Office for Environment (FOEN)</li> </ul>
United Kingdom of Great Britain and Northern Ireland	<ul style="list-style-type: none"> <li>- Health &amp; Safety Executive</li> <li>- Health Security Agency</li> </ul>
United States of America	<ul style="list-style-type: none"> <li>- Bureau of Alcohol, Tobacco, Firearms and Explosives</li> <li>- Defence Explosives Safety Board</li> <li>- Department of Defense</li> <li>- Department of Homeland Security</li> <li>- Department of Interior</li> <li>- Department of Labor</li> <li>- Environmental Protection Agency</li> <li>- National Cargo Bureau</li> <li>- Occupational Safety and Health Administration (OSHA)</li> <li>- US Agency for International Development (USAID)</li> </ul>
Yemen	<ul style="list-style-type: none"> <li>- Ministry of Water and Environment</li> </ul>

## International or intergovernmental organizations

- CIS Inter-State Council on Industrial Safety
- European Union (Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO), Directorate-General for the Environment (DG Environment), and Joint Research Centre of the Major Accident Hazards Bureau (JRC)), as well as the European Investment Bank (EIB)
- Food and Agriculture Organization (FAO)
- Intergovernmental Organization for International Carriage by Rail (OTIF)
- International Labour Organization (ILO)
- International Maritime Organization (IMO)
- North Atlantic Treaty Organization (NATO) (Munitions Safety Information Analysis Center)
- Organisation for Economic Co-operation and Development (OECD)
- Organization for the Prohibition of Chemical Weapons (OPCW)
- United Nations Disaster Risk Reduction (UNDRR)
- United Nations Economic Commission for Europe (UNECE)
- United Nations Environment Programme/Office for the Coordination of Humanitarian Affairs Joint Environment Unit (OCHA/OCHA JEU)
- United Nations Institute for Training and Research (UNITAR)
- United Nations International Computing Centre (UNICC)

## Non-governmental organizations (NGOs)

- Earthjustice
- France Nature Environment
- International Dangerous Goods and Containers Association (IDGCA)-Russian Federation
- ONG LA GRANDE PUISSANCE DE DIEU (Benin)
- Responsible Packaging Management Association of Southern Africa (RPMASA)

## Industry associations and companies

- Absa Insurance Company Limited (South Africa)
- Afdeling Handhaving (Belgium)
- Agricultural Industries Confederation (AIC) Ltd (UK)
- Allianz Global Corporate & Specialty (UK)
- An Garda Siochana (Ireland)
- Anglo American
- Arrmz - Arkema
- AS DBT, Estonia
- Associated British Ports
- Association for Development, Education, Law, Training, Art and Security (ADELFAS) (Spain)
- AST (Rep of Moldova)
- Austin Powder Co.
- Australasian Institute of Dangerous Goods Consultants (AIDGC)
- Australian Explosives Industry and Safety Group Inc. (AEISG)
- Austrian Federal Economic Chamber
- BakerRisk Baker Engineering and Risk Consultants, Inc.
- Bienz, Kummer & Partner AG (Switzerland)
- Borealis Chimie
- BSL (Sweden)
- Bulk Mining explosives
- Chain Solutions
- Chamber of Shipping UK
- China Explosive Materials Trade Associations
- China Railway
- CIS Center
- Compressed Gas Association (CGA) (USA)
- CSBP (Wesfarmers Chemicals, Energy & Fertilisers)
- Cuerpo de Bomberos de Costa Rica
- Danube Logistics SRL
- DBT AS, Estonia
- Deepak Fertilizers & Petrochemicals Corporation Limited
- Dev Global Logistics Services
- Dublin Port Company
- E.M.I- Medical Equipment and Supplies Manufacturing Industry- Pumping Technologies LTD (Israël)
- E.M.I. (1997) L.T.D. Explosives Industries Ltd. (Israël)
- East African Business Company Ltd (Kenya)
- Estonian, Latvian & Lithuanian Environment
- EuroChem Antwerpen NV
- Eurodyn Sprengmittel GmbH (Germany)
- European Association for Study of Safety Problems in Production and Use of Propellant Powders
- European Chemical Industry Council (CEFIC)
- Experts Mountain Works – AV Group (Russian Federation)
- Federation of European Explosives (FEEM)
- Fertiberia

- Fertilizer Industry Assurance Scheme (FIAS) in the UK (KIWA)
- Fertilizers Canada
- Fertilizers Europe
- FM Global
- Forcit Sweden AB
- Framesi-Mexico
- Givaudan International
- Groupe Somavrac (Water Transportation Industry) and is part of the Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing Industry (Canada)
- Grupa Azoty ZAK S.A, Poland
- HCB (UK)
- HighChem East Africa Ltd, Kenya
- Huc Todo en Mercancias peligrosas, S. de R.L. de C.V
- Hutchison Ports
- ICHCA International- Independent Children’s Homes Association (UK)
- ICL Essential Minerals and Specialty Solutions (Israël)
- ICL-Group (Democratic People's Republic of Korea)
- Industrial Chemicals (AECI) (South Africa)
- Industrial Engineer (South Africa)
- Infraestructura, Comunicaciones y Transportes (Mexico)
- Institute of Makers of Explosives (IME)
- Institution of Chemical Engineers (ICChemE) (United Arab Emirates)
- IOS
- ISO Standardization, Testing and Certification
- J. Lauritzen Bulkshippers (Denmark)
- Jensen Hughes
- Lukaszewicz Research Network-Institute of Industrial Organic Chemistry (Poland)
- Maxam Dantex
- NCP Chlorchem (South Africa)
- OCI NV - global producer of natural gas-based fertilizers and industrial chemicals - nitrogen fertilizers, methanol and other natural gas based chemical products, serving agricultural and industrial customers around the world (Netherlands)
- Old Mutual Insure
- Omnia Fertilizer (South Africa)
- Orica
- Petrokemija Plc. Fertilizer Company (Croatia)
- QatarEnergy
- Remote Sensing and Space Sciences Office (Syrian Arab Republic)
- Research Group Energetic Materials TNO (Netherlands)
- Rheinmetall Denel Munition (south Africa)
- Riga Fertilizer Terminal
- Risk Exchange (DIFC) Limited
- Risk Integrated Solutions and Technology Ltd. (RiskTech) (Turkey)
- SAFEX International (South Africa)
- Sawa’a for Community Development
- Shanghai Research Institute of Chemical Industry
- Shannon Foynes Port Company, Ireland
- South African Insurance Association (SAIA)
- Southern African Institute for Occupational Hygiene
- Sporting Arms & Ammunition Manufacturers’ Institute (SAAMI)
- SQM (Chile)
- TDG-GHS Consulting International (France)
- TNO, Research Group Energetic Materials (Netherlands)
- Toxicology Brazilian Society
- Transnet National Ports Authority (TNPA) (South Africa)
- TT Club & International Cargo Handling Co-ordinating Association- International Ltd (ICHCA)
- VURUP, a.s.- Laboratory testing (Slovakia)
- Wesmans Scandinavia AB (Sweden)
- World Shipping Council (WSC)

- Yara International
- Zhoushan Hazardous Emergency Rescue Base

<b>Universities and national research institutes</b>	
<b>Country</b>	<b>Name</b>
Canada	– Université de Sherbrooke, Quebec, Canada
Costa Rica	– University of Costa Rica
Belarus	– State Educational Institution, University of Civil Defense of the Ministry of Emergency Situations of the Republic of Belarus
Finland	– Finnish Defence Research Agency (FDRA)
France	– National Institute for Industrial Environment and Risks (Ineris) – Sciences Po
Germany	– Federal Institute for Materials Research and Testing (BAM) – Federal Institute of Risk Assessment
Jamaica	– University of Technology
Japan	– National Institute of Advanced Industrial Science and Technology (AIST) – National Institute of Occupational Safety and Health
Lebanon	– American University of Beirut
Netherlands	– National Institute for Public Health and the Environment (RIVM)
Norway	– Norwegian Defence Research Establishment (FFI) – Oslo University Hospital
Republic of China	– Beijing Jiaotong University
Republic of Moldova	– Technical University of Moldova
Russian Federation	– All-Russian Scientific Research Institute of Civil Defence and Emergencies of the EMERCOM of the Russian Federation (Federal Science and High Technology Center) – Institute of blast
South Africa	– North-West University – University of Kwazulu-Natal – University of Johannesburg – University of Pretoria – Cape Peninsula University of Technology
Suriname	– National Institute for Environment and Development in Suriname (NIMOS)
Switzerland	– University of Geneva-Switzerland
United Kingdom of Great Britain and Northern Ireland	– University of Cambridge – University College London – University of Sherbrooke
United States of America	– University of Alabama – Texas A&M University System (TEES Mary Kay O'Connor Process Safety Center)