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**Committee of Experts on the Transport of Dangerous Goods  
and on the Globally Harmonized System of Classification  
and Labelling of Chemicals****Sub-Committee of Experts on the Transport  
of Dangerous Goods****Sixtieth session**

Geneva, 27 June-6 July 2022

Item 14 of the provisional agenda

**Other business****Sub-Committee of Experts on the Globally Harmonized  
System of Classification and Labelling of Chemicals****Forty-second session**

Geneva, 6-8 July 2022

Item 6 of the provisional agenda

**Other business****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****Note by the secretariats of the Organisation for Economic Co-operation  
and Development (OECD) and of UNECE\*****I. Background****A. The Beirut port explosion**

1. The Beirut port explosion revealed 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 resulting 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, the surrounding area and healthcare facilities amid 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. Recent major accidents are: the West Fertilizer Company explosion (United States

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\* A/75/6 (Sect.20), para. 20.51

of America, 2013), the Angellala Creek truck explosion (Australia, 2014), the Tianjin port explosion (China, 2015) and the Bata explosions (Equatorial Guinea, 2021).

## **B. Objectives**

2. 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. Accidents involving AN and AN-based fertilizers should be prevented or – should prevention not be possible – mitigated through effective preparedness and response.

3. The seminar's more specific objectives were to:

- (a) Share lessons learned from past accidents involving AN and AN-based fertilizers;
- (b) 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;
- (c) 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
- (d) Encourage cooperation among the authorities, industry and other stakeholders at the national, regional, local and international levels.

## **C. Content and participation**

4. The [UN/OECD seminar in follow-up to the 2020 Beirut port explosion](#) was held online on 14 December 2021<sup>1</sup>. 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 the consequences. Speakers shared knowledge on (i) past accidents involving AN and AN-based fertilizers, related lessons learned and regulatory changes; (ii) international legal and policy instruments and recommendations addressing hazardous substances and related accident prevention, preparedness and response; and (iii) experiences and good practices in implementing them.

5. The seminar brought together representatives of international organizations, of national, regional and local government authorities, from industry, from academia and other stakeholders from across the globe. 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 understanding and managing the risks of hazardous substances more broadly.

6. 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, Czechia, 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.

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<sup>1</sup> <https://unece.org/info/Environmental-Policy/Industrial-Accidents/events/358445>

7. Representatives of the following 15 international or intergovernmental organizations attended: CIS Inter-State Council on Industrial Safety, European Union (includes 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)), 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 Office for 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 (UNEP/OCHA Joint Environment Unit), United Nations International Computing Centre (UNICC) and United Nations Institute for Training and Research (UNITAR).

8. In addition, many non-governmental entities attended the seminar. This includes 5 non-governmental organizations (NGOs) and 102 industry associations or companies. Academics from more than 32 universities or national research institutes also attended, from Canada, China, Costa Rica, Belarus, Finland, France, Germany, Jamaica, Japan, Lebanon, Netherlands, Norway, 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.

#### **D. Sessions**

9. 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.

10. The seminar was 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. Both emphasized the need to do the utmost to prevent these accidents and to mitigate the resulting effects should they occur. To that end, 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 IV.C below).

11. 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 given (see Section IV(C) below).

12. 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 for hazardous substances, including AN and AN-based fertilizers, and on industrial/chemical accident prevention, preparedness and response. The presentation of UNECE showcased also other existing instruments and activities under the auspices of the European Union, OECD, UNDRR, UNEP and WHO.

13. The third session covered good practices and lessons learned from the 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 (Klaipėda State Seaport Authority), South Africa (South African Police Service), and United States of America (Occupational Safety and Health Administration). A special joint presentation on industry practices was given by Australian Explosives Industry and Safety Group Inc. (AEISG), Fertilizers Europe, Institute of Makers of Explosives (IME) and South African Futures Exchange (SAFEX).

14. 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). The panel included representatives of the European Commission (Directorate General Environment), France (Ministry of Ecological Transition), Canada (Transport Canada), 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 to take account of past accidents, and how the regulations are implemented in practice.

## **II. Mandate and organization**

15. 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.

16. 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 OECD, ILO, IMO, UNEP/OCHA Joint Environment Unit and UNDRR Regional Office for Arab States. Each organization administers international instruments, recommendations and/or mechanisms on: 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, a preceding survey, the agenda and the present document. The organization of the seminar was led by UNECE.

17. The Advisory Group comprised experts from 11 countries (Austria, Canada, Germany, France, Latvia, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States) and the European Union Joint Research Centre. The experts were nominated by the Bureaux of the Industrial Accidents Convention and OECD Working Party on Chemical Accidents and communicated to the Sub-Committees of Experts on TDG and GHS. It also included contributions from representatives of 4 industry associations (AEISG; Fertilizers Europe; IME; Responsible Packaging Management Association of Southern Africa (RPMASA) as observers. The Group met twice to organize the seminar and to guide the Organizing Committee.

18. 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 the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety.

## **III. Results of the survey**

19. Prior to the seminar, the Organizing Committee, under UNECE's leadership, with feedback from the Advisory Group, developed a joint UN/OECD survey on: 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 for enhancing AN risk management. The survey, 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, and European Union Joint Research Centre.

20. One-hundred-and-one 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. Several key areas of concern were found on AN: classification, coordination among authorities, port management, safe storage and transport, land-use planning, inspections, public information and security.<sup>2</sup> Below are summaries of some of the significant findings:

- (a) The Beirut port explosion prompted many governments to take national actions, including heightened site inspections to ensure compliance with laws and regulations, reviews of laws and regulations, and awareness-raising through media and expert dialogues.
- (b) Most countries apply multiple international instruments and have national legislation and regulations that address hazardous substances, including AN; relevant rules were reported in customs, economics, environment, occupational safety and health, port, security, trade and transport law, and in building and fire codes.
- (c) Most countries have not explicitly defined “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 port storages as soon as practicable, and rather, deliver them to ports just before loading.
- (d) Respondents provided information on AN risk management in port areas:
  - (i) 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 training;
  - (ii) Lessons learned were the need: to ensure sufficient information was provided on dangerous goods, for companies to have their own emergency response teams that did not rely only on firefighters, and for different industries using AN and AN-based fertilizers to have the specialized, technical knowledge as required;
  - (iii) Challenges entailed: assessing why AN and AN-based fertilizers detonate in some situations but not in 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.
- (e) Most countries apply international classification and labelling standards; however, knowledge needs to be improved on the different types of AN mixtures and on their resistance to detonation. Some respondents also emphasized the importance of safety data sheets when communicating the information to others and the importance of inventory and traceability systems when storing and transporting hazardous substances.
- (f) Most countries have requirements for the training of workers at sites with hazardous substances and some have requirements for detailed training at major hazards facilities. Moreover, some countries have rules requiring the appointment of a certified safety advisor who ensures safety and compliance with laws and regulations.
- (g) Various authorities are in charge of inspections at the national, regional and local levels; inspection criteria (e.g. testing, storage with other substances, safety distances, security seals) and frequency need to be scrutinized, particularly for storage sites with mass amounts or multiple hazardous substances.

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<sup>2</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 terrorist attack, whereas “safety” entails preventing accidents or mitigating impacts in the case of an unintended accident or event

(h) Rules on land-use planning, siting and risk assessment commonly apply to the development of new hazard installations,<sup>3</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 adjoining population, protecting nearby environments, distancing from explosives and security assessments.

(i) While many countries maintain national legislation on informing the public about 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 when providing public information.

(j) At port areas, the port authorities are often responsible for the safe 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 the 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 inputs from the operators, surrounding communities and in consultation with the public (and aligned with the on-site plan). Coordination and cooperation among all involved authorities, operators and communities is thus essential. Sometimes difficulties arise when communicating contingency plans to the adjoining public, and in fully resourcing and testing them with all subjected stakeholders.

21. These findings, and others, substantiated 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 summary of the analysis of each survey question was presented at the seminar.

## IV. Summary and conclusions

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

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

23. 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) and 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

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<sup>3</sup> The term “hazardous installations” used in this report covers “hazardous activities” holding hazardous substances within specific threshold quantities (annex I) of the UNECE Convention on the Transboundary Effects of Industrial Accidents and “establishments” holding dangerous substances within specific threshold quantities (annex I) of the EU Seveso Directive (2012/18/EU) on the control of major accident hazards involving dangerous substances.

- UNECE Convention on the Transboundary Effects of Industrial Accidents
  - ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air<sup>4</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.
24. Numerous guidance documents have been published and training material are available that support countries to implement the above-mentioned instruments.
25. A number of industry guides and good practices are also available:
- Fertilizers Europe runs a product stewardship programme to establish and enhance safety, security, health and environment performance, including the 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 solid technical grade AN.
  - IME developed guidance on the safe handling of solid AN.
  - the National Fire Protection Association's (NFPA) Code 400 has a chapter on AN.
26. The following conclusions were drawn at the seminar:
- (a) **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) and industrial/chemical accident prevention, preparedness and response, their **implementation needs strengthening. Countries can use the numerous guidelines and good practices**, developed by international organizations and industry, that are available for support. In addition, they can seek assistance from international organizations and industry associations to strengthen implementation and apply related principles.
- (b) **Implementation can be challenging for countries and industries due to, for example: lack of institutional and financial capacities; lack of coordination among authorities; insufficient understanding of legal and policy instruments and the interlinkages; lack of implementation and eventual non-compliance; lack of coherence in policy-making; and lack of adequate training for 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.**
- (c) **Such challenges can be addressed by the following means, among others:**
- (i) **Raising awareness at all levels of national, regional and local governance and with industry, operators and workers;**
  - (ii) **Ensuring that inspections are conducted at regular intervals and follow-up inspections are conducted as needed;**
  - (iii) **Ensuring that operators and workers are trained and equipped;**
  - (iv) **Putting in place monitoring and reporting mechanisms;**

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<sup>4</sup> Please note that only certain types of AN can be transported by air; others are forbidden.

(v) **Building the capacity of countries to reach full implementation.**

(d) **It is essential to ensure a multi-hazard approach to disaster risk reduction (i.e. natural and man-made hazards to 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. Legislation and strong governance can support. All stakeholders need to be involved. International organizations, such as UNDRR and UNECE provide guidance on the efforts.**

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

27. The scientific community has significant knowledge on AN and AN-based fertilizers, such as on their characteristics, types and intrinsic hazards and risks. Experts were present at the seminar to share this knowledge. Complemented presentations were given on law, policies and good practices in implementation for the safe management of AN and AN-based fertilizers, taking into consideration this knowledge in an effective way. The conclusions from the seminar include:

(a) **Differentiation 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 important 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 differ significantly, producing different effects.**

(b) **Testing, classification and labelling should be in accordance with the applicable internationally agreed on recommendations, which is 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). Both are regularly updated to incorporate new information, and provide a worldwide harmonized approach, thus ensuring equal level of safety for all, when implemented.**

(c) **Testing, classification and labelling practices require sufficient resources, and the proper training and tools for those conducting the tests.**

(d) **Hazardous substances, including AN and AN-based fertilizers, should be inventoried at storage sites and in port areas so that authorities, inspectors, operators, workers and responders know what is stored, and where and how multiple hazardous substance could interact or react to e.g. fires or heat.**

(e) **Educating and training those (e.g. staff of authorities, workers) who handle and transport AN and AN-based fertilizers and who 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 Section IV.G. below). Too many firefighters – in addition to too many members of the public – have lost their lives in accidents involving AN, e.g. in Beirut (2020), Tianjin, China (2015) and West Fertilizer, United States (2013), going in to extinguish a fire. They were not aware of the imminent explosion nor that sufficient knowledge is available to avoid such tragedies.



### C. Lessons learned from Beirut and previous accidents

28. The Beirut port explosion showed 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 the lessons learned from 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. Specifically, he noted the following points:

- (a) **Good governance is essential.** Lebanon was in the final phase of completing its National DRR strategy, that is to be adopted and subsequently implemented, which seeks to save lives, assets and development gains.
- (b) **Having good preparedness and response plans in place pays off when disaster strikes.** In addition to the efforts of national authorities, the roles of local level authorities and city administrations 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.**
- (c) Experts must be involved in the response and the humanitarian efforts is important for safety, as some debris from the explosion was found to be hazardous and harmful to volunteers working immediately after.
- (d) Keeping track of all response actions is essential, in cooperation with all actors (national, including army forces and international assistance). A response framework and standard situation reports are essential.
- (e) Having realistic disaster drills and underground hospital functions is also essential; the hospitals in Beirut were overwhelmed after the explosion.
- (f) 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.
- (g) Mutual sharing of lessons and experiences are important, support the efforts to enhance safety, develop and implement related legal and policy instruments and plans.

29. The JRC presented its analysis from a review of 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:

- (a) Proper storage and handling practices could avoid contamination.
- (b) Avoid sources of ignition in proximity of fertilizer piles.
- (c) Ensure appropriate preparedness measures (e.g. effective fire detection systems and extinguishing practices).
- (d) Hazard and risk assessments and inspection practices should include all AN products so as to overlook “off-specs” products.
- (e) Awareness of risks and hazards associated with ammonium nitrate among operators may be more widespread than originally thought.
- (f) More knowledge is needed to identify sub-standard products and associated hazards.
- (g) Ammonium nitrate should be considered in hazard assessment.
- (h) Separation of combustible materials from organic substances reduces the possibility of conflagration and explosion.
- (i) In some cases, the existing professional standards on preventing AN accidents can be confusing, contradictory and out-of-date.
- (k) Development should be restricted around sites that handle or store AN.

- (l) Local authorities and responders should be aware of all AN storage sites and the risks.
  - (m) Storing AN and AN-based fertilizers in bulk should not be allowed without proper measures for fire prevention, protection and mitigation.
30. National authorities from different regions also discussed the lessons learned and the actions undertaken following the Beirut port explosion and other accidents:
- (a) The Brazilian Institute for the Environment and Renewable Natural Resources (Ibama) established a task force on preventive actions in port areas and hazmat warehouses following the São Francisco do sul incidents and the Beirut port explosion.
  - (b) 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 related recommendations following the Beirut port explosion. A new law was also adopted on the technology of risk prevention following the Toulouse accident.
  - (c) Several agencies in 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.
  - (d) Many national authorities increased inspections at sites with hazardous substances, particularly involving AN and AN-based fertilizers, and conducted follow-up inspections to ensure compliance following the Beirut port explosion.

#### **D. Risk assessments: land-use planning and siting**

31. Many governments have put in place requirements for risk assessments in an effort 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 good practices and lessons learned from the seminar showed the importance of conducting risk assessments and considering the results during procedures for land-use planning and siting. The following conclusions are from the seminar:

- (a) **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.
- (b) **National and local authorities, including land-use planners, need to take account of the results of risk assessments to make informed decisions on:**
  - (i) **Measures to mitigate on-site risks for the storage, handling and transport, including how much is allowed to be stored and under which conditions;**
  - (ii) **Land-use planning and siting, including the minimum distance of storage, handling and transport sites from people and places to ensure safety; and**
  - (iii) **Emergency management/contingency planning, including on- and off-site contingency plans.**
- (c) France made a statement on its land-use planning legislation for high-risk industrial activities, that was developed following the Toulouse explosion (2001), emphasizing that it covers future and present urbanization. Its laws regulate future constructions and present situations where urbanization is near industrial plants. Its rules allow for expropriation measures in high-risk areas and population protection measures in lower risk areas.

(d) **Information and knowledge on risk assessment methodologies should be regularly shared across countries. Land-use plans and siting decisions should take account of the possible transboundary effects of accidents and seek to mitigate these, including the population of affected neighbouring countries. Decisions on land-use planning and siting should be taken following consultation with the affected public.**

## **E. Inspections and follow-up inspections for hazardous sites**

32. Inspections can ensure that rules and regulations are implemented and complied with. Presentations at the seminar, including from the authority of the Lithuanian Port of Klaipėda and the South African Police Service, showed that **regular inspections can ensure that 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 direct sunlight; packaging and labelling conditions; fire extinguishing devices; and emergency management plans. Following the Beirut port explosion, many countries heightened their inspection practices on sites with AN and AN-based fertilizers.

33. The following conclusions were drawn from the presentations and statements:

(a) **Countries should ensure that high levels of inspections are developed and maintained for the safe and secure management of hazardous substances.**

(b) **Inspections of sites with hazardous substances are an important means to ensure that rules and guidelines are being implemented and complied with.**

(c) **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 neighbouring residential, commercial or public space, as well as 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**

34. 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 as being classified, labelled, transported, traded or when confiscated (e.g. in the Beirut port). The following conclusions were drawn from the seminar:

(a) **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.**

(b) **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 lengths of time.**

(c) **Intermediate/temporary storage often requires various sets of actors to coordinate and cooperate in handing over or disposal of hazardous substances, for example national authorities, customs and border patrol, port authorities, companies, ship crews, truck drivers, etc.**

(d) **Countries should take the above factors or issues into consideration when reviewing their regulations and inspection criteria, to ensure hazardous**

substances, including AN and AN-based fertilizers, are always safety managed and accounted for when in intermediate/temporary storage.

(e) Implementation of the IMO Revised Recommendations on the safe transport of dangerous cargoes and related activities in port areas provides a basis to safely store dangerous cargoes, including those with AN and AN-based fertilizers, in port areas temporarily. The recommendations can be reviewed for measures in warehouses, terminal areas and infrastructure in ports, as well as minimum training requirements, security provisions, responsibilities of different actors and more.

(f) Intermediate/temporary storage needs further discussion and consideration, such as 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**

35. 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 to work with substances and mixtures. Sharing information and training help to ensure that all stakeholders are prepared to manage hazardous substances safely. The following conclusions were drawn from the seminar:

(a) 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 know: (i) the characteristics and type of the substance/mixture they are working with; (ii) the associated hazards and risks; and (iii) the measures that need to be taken to prevent, prepare for and respond to accidents. They also need training to properly implement safety measures.

(b) The public needs to be informed of the existence of nearby hazardous substances, including AN and AN-based fertilizers, which 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.

(c) Some challenges are: (i) information is not always provided to all those who need it to properly do their job to ensure safety or to respond to accidents; (ii) information is not always communicated in an understandable manner to different target groups; and (iii) authorities and companies may not always prioritise safety.

(d) Such challenges could be addressed by fully scoping the target groups and ensuring information is effectively channelled to them. This information is often highly technical, so tailoring it for target groups and clearly presenting it to them is essential. Different forms of communication could include drills/exercises, letters, manuals, trainings, websites, etc.

(e) The application of relevant international instruments, such as the ILO Conventions and Recommendations supports the engagement and training of workers.

## H. Cooperation and coordination between authorities

36. Many hazardous substances can be used for different purposes and in a variety of sectors. AN and AN-based fertilizers are used in the agricultural and chemical industries, in explosives, in mining and more. During the lifecycle of hazardous substances, including AN and AN-based fertilizers, many 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 were drawn from the presentations and discussions:

- (a) **The implementation and enforcement of all applicable regulations and the related inspections, audits, etc. (see Section IV(E) above). Safety needs to be given the utmost priority, with the objective of accident preventing.**
- (b) **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 the damage to human lives, health and the environment.**
- (c) **Coordination and cooperation between national and local authorities, and industry operators should aim to develop a common understanding (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 neighbouring countries that may be affected.**
- (d) **Transboundary cooperation to manage 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 for Chemical Accident Prevention, Preparedness and Response are a basis for ensuring that effective principles for transboundary cooperation are in place.**
- (e) **Continuous international exchange 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

37. Many countries' national laws and regulations on the safe storage, handling and transport of hazardous substances, and the 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:

- (a) **The effective implementation of existing legal and policy instruments is essential to ensure that all measures are in place to prevent industrial/chemical accidents.**

(b) Measures may be needed 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 IV(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.

(c) Emergency management planning is a key component of accident prevention and preparedness. International organizations can assist countries in building their response and in providing emergency assistance in the event of major accidents that may exceed local, regional or national capacities.

(d) 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 a 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 the use of AN and AN-based fertilizers.

(e) 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).

(f) International organizations have an important role in facilitating the exchange of information and knowledge (e.g. on good practices, lessons learned, new technologies, guidance), to support countries on policy making and governance (inter-institutional cooperation), and to train authorities and stakeholders.

## V. Actions needed and next steps

38. 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:

(a) Strengthen the implementation of existing legal and policy instruments and recommendations.

(b) Review and, as necessary, update 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.

(c) Raise awareness of the characteristics and types of hazardous substances, AN and AN-based fertilizers, and their intrinsic hazards and risks among national authorities, industry, operators, workers, first responders, etc. Training should be provided for these groups to ensure safety.

(d) Ensure that sufficient resources, training and tools are available for the testing, classification and labelling of AN and AN-based fertilizers.

(e) Improve public information on the hazards and risks of hazardous substances, and AN and AN-based fertilizers, that are stored, handled and transported nearby, including response measures in case of emergencies, and involve the populations in neighbouring countries.

(f) Ensure that inspections of sites with hazardous substances or AN and AN-based fertilizers, use the appropriate criteria and are in the appropriate frequency.

(g) Use and/or develop new traceability, inventory or monitoring systems for the storage, transport and handling of hazardous substances.

- (h) Mainstream human-made hazards and technological disasters into disaster risk reduction plans and strategies.
- (i) Share experiences, lessons learned and good practices with other countries to assist other countries in preventing accidents and mitigating their consequences should they occur.
- (j) Share research with other countries to avoid the duplication of work and developing joint research on AN and AN-based fertilizers.
- (k) Use international notification systems and mutual and international assistance mechanisms, including by conducting tests and exercises to ensure readiness in case of emergencies.
- (l) Review and test internal and external contingency plans to ensure their sufficiency and to ensure readiness.
- (m) Develop capacity-building projects to enhance inter-agency coordination and to train authorities on tools and methodologies.

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

- (a) Maintain dialogue to ensure that knowledge and information are regularly exchanged across international organizations and the relevant organizations engage in the key events; coordinate and cooperate across relevant international organizations to develop the tools and guidance that can serve multiple constituencies; and further explore and promote the synergies between international organizations, e.g. their instruments and mechanisms.
- (b) Further exchange of information and management of knowledge by for example, the development of an information repository on: (i) international legal and policy instruments for risk management of AN, and derivatives; (ii) industrial accident prevention, preparedness and response; and (iii) implementation experiences, lessons learned and good practices (UNECE).
- (c) Update and expand the section on ports in the forthcoming third edition of the OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response, and also consider another seminar on managing hazardous installations at ports (OECD).
- (d) Mainstream/integrate technological disaster risk reduction into national (and local) disaster risk reduction strategies prepared by countries under the Sendai Framework (UNDRR, UNECE).
- (e) Continue emergency readiness and response services for accidents involving AN and AN-based fertilizers by the UNEP/OCHA Joint Environment Unit. The response of the Unit to Beirut port explosion and to the more recent Bata explosions in Equatorial Guinea are being examined and analysed for future work.
- (f) Strengthen countries' legal and compliance framework on occupational safety and health, and chemical management, including in Lebanon based on the ILO national legislation gap analysis.
- (g) Mainstream and update existing toolkits (e.g. the IOMC toolbox for decision-making in chemicals management) with the conclusions from the seminar and integrate them into training modules (ILO, OECD, other organizations, as opportunities arise).

**Annex**

[English only]

**Participating authorities and institutions**

<b>National and local authorities</b>	
<b>Country</b>	<b>Authorities (national and local)</b>
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 of 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 Services 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>
Czechia	<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 the Interior</li> <li>- State Fire and Rescue Board</li> </ul>
Finland	<ul style="list-style-type: none"> <li>- Finnish Safety and Chemicals 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 German State of North Rhine-Westphalia (MULNV)</li> <li>- Ministry for the Environment, Nature Conservation and Nuclear Safety</li> </ul>
Greece	<ul style="list-style-type: none"> <li>- Ministry of the 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> <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 of 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 Liepaja</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 the Interior (Fire and 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 Service</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 (EMERCOM)</li> </ul>
Serbia	<ul style="list-style-type: none"> <li>- Ministry of Environmental 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> <li>- Department of Employment and Labour</li> <li>- Department of Environmental Affairs (DFFE)</li> <li>- Department of Transport (Dangerous Goods Inspectorate)</li> <li>- Fire Protection Association of South Africa (FPASA)</li> <li>- Department of Transport</li> <li>- South African Maritime Safety Authority</li> <li>- South African Civil Aviation Authority</li> <li>- South African Police Service</li> </ul>
Spain	<ul style="list-style-type: none"> <li>- Ministry for the Ecological Transition and the 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</li> <li>- County Administrative Board of Norrbotten</li> <li>- County Administrative Board of Södermanland</li> <li>- County Administrative Board of Stockholm</li> <li>- County Administrative Board of Västmanlands</li> <li>- Länsstyrelsen Dalarna</li> <li>- The Swedish Civil Contingencies Agency (MSB)</li> </ul>
Switzerland	<ul style="list-style-type: none"> <li>- Federal Office for the 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 Economic Commission for Europe (UNECE)
- United Nations Environment Programme/Office for the Coordination of Humanitarian Affairs Joint Environment Unit (JEU) (UNEP/OCHA Joint Environment Unit)
- United Nations Institute for Training and Research (UNITAR)
- United Nations International Computing Centre (UNICC)
- United Nations Office for Disaster Risk Reduction (UNDRR)

## 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 (Republic 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 (Israel)
- E.M.I. (1997) L.T.D. Explosives Industries Ltd. (Israel)
- 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 (Israel)
- 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 Bulkiers (Denmark)
- Jensen Hughes
- Lukasiewicz 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 (Israel+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
China	– Beijing Jiaotong University
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 – LUBW State Institute for Environment Baden-Württemberg
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 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

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)

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