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ROADMAP

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Seventh periodical bulletin

ROADMAP in a nutshell

The ROADMAP (EuROpean observAtory on Disaster risk and crisis MAnagement best Practices) Project, is a 18 months project funded by DG-ECHO under the call UCPM-2020-KN-AG. The project started on the 1st January 2021 and the main objective is to establish a European "Doctrine on disaster risk and crisis management", funded on the mutual cooperation between scientific communities and DRM authorities. The doctrine, that is intended as "a shared understanding of disaster management between decision-makers and scientific actors", will be based on selected experiences, best practices and implemented solutions in EU Member States.

- **Advisory Group**
  The Advisory Group (https://roadmap.ci3r.it/advisory-group/) is formed by selected experts on both science and decision-making in DRM from several Countries, covering different risks and phases of DRM cycle. The networking activities between the Project Consortium, that is composed by recognized research institutes, competence centres for disaster risk reduction and Civil Protection authorities, and the Advisory Group will result in the establishment of a European think tank/ observatory on disaster risk and crisis management good practices that could represent a first step towards a Community of Practice to operate within the Union Civil Protection Mechanism, in collaboration with the Disaster Risk Management Knowledge Center.

Project updates

In these last months of the project many activities have been carried out, in particular:

- on-going work on the definition of the Solutions Explorer web platform;
- publication of the 1st Thematic paper "Good practices in multi-hazard risk scenarios" (https://roadmap.ci3r.it/publications/);
- on-going work on the content of the next two thematic papers that will be published in June 2022;
- the 3rd webinar, entitled "Challenges and opportunities for the future of research and practice in Disaster risk management", was held on 19 May 2022, 10:00-12:30 AM (CET) (https://roadmap.ci3r.it/publications/);
- on-going work on the organization of the final workshop that will take place on 10 June 2022 in Rome;
- on-going work on the drafting of the Vision Paper;
- submission of two papers derived from the 1st Thematic Paper, one to the ESREL conference (https://www.esrel2022.com/) and the other to the EGU2022 Conference (https://meetingorganizer.copernicus.org/EGU22/EGU22-12597.html);
- constant engagement with the AG.

RISK – Good practices

Earthquake	Forest fires	**Industrial accident**
Hydrogeological	**Biological**	**Climate**

This seventh bulletin focuses on the management of emergencies related to industrial accidents and environmental pollution.
The World Health Organisation (WHO) defines a chemical accident as 'the uncontrolled release of a toxic substance, potentially resulting in harm to public health and the environment'[1]. Chemical accidents may be caused by industrial accidents or natural disasters, in addition to deliberate releases (e.g., due to terrorist activities).Chemicals released can include medicines, food additives, toxic industrial chemicals, illicit drugs and domestic chemicals (e.g., cleaning products). Industrial accidents may happen in a short-term period or in a longer term when there is a smaller but continues chemical release.
In this light, the term chemical accident might refer to anthropogenic or technological events, including:

- Fire, explosion or chemical spill at a fixed site like a factory or a warehouse that stores or uses chemicals;
- Leaking containers at a factory;
- Toxic black smoke – e.g., from or plastics factory;
- Contamination of the food or water supply with a chemical;
- An oil spill;
- A leak from a storage unit during transportation;
- A human unintentional error;
- Deliberate or accidental release of chemicals in conflict or terrorism.

In addition, chemical accidents may also be driven by natural events such as volcanos eruption, earthquakes and forest fires.
Overall, WHO estimated 65,000 people died due these accidents between 2009-2018[1] causing also significant environmental pollution and massive economic loss[2].
In terms of environmental impacts, the damage to ecosystems typically begins right after the industrial accident happens and may impacts on various environmental media (air, soil and water). Some examples may include the following:

- Soil Contamination: From industrial accidents to illegal waste dumping, harmful pollutants can be deposited in the soil by a range of sources which may lead to complete degradation of the soil chemical makeup which is harmful to the flora and fauna of the area.
- Air Contamination: Fallout, dust, or gaseous clouds may disperse pollutants that can harm local flora and fauna, spreading out into neighboring areas.
- Water Contamination: Water contamination can also come from several sources. One of the most well-known cases of water contamination was caused by the BP oil spill in the Gulf of Mexico, the largest marine oil spill in history. After an oil platform exploded, large amounts of oil spilled out into the ocean. This ravaged the aquatic water life in the area, which in turn greatly impacted the local community and food chain.

Due to their very nature these events may cause far-reaching transboundary effects. Indeed, even small amounts of hazardous substances released for example into waters can cause significant environmental damage with far-reaching effects, especially when transboundary rivers and lake basins are affected. These risks can be aggravated by increased frequency and intensity of extreme weather events due to climate change.
Past Accident Analysis (PAA) is one of the most powerful and used exercises for gaining insights into the reasons why accidents occur in Chemical Process Industry (CPI) and the damage they cause. PAA provides precious knowledge with which strategies to prevent accidents or attenuate the impact of accidents can be developed.
In this regard, it is useful to remind that a number of databases exist that maintain record of past accidents in CPI. The most comprehensive of the existing databases include the Major Accident Reporting System (eMARS), and Failure and Accidents Technical Information Systems (FACTS).

1 WHO – Chemical Incidents. 2020. https://www.who.int/health-topics/chemical-incidents#tab=tab_1.
2 Gaulton T., Orford R., Hague C., Thomas E., Duarte-Davidson R. Surveillance of chemical incidents. In: Duarte-Davidson R., Gaulton T., Wyke S., Collins S., editors. Chemical health threats: assessing and alerting. Issues in toxicology, No. 38. London: The Royal Society of Chemistry; 2019. p. 96–113.

FACTS (http://www.factsonline.nl/) is an accident database which contains information on more than 25,700 (industrial) accidents involving hazardous materials or dangerous goods that have happened all over the world during the past 90 years.
The eMARS database (https://emars.jrc.ec.europa.eu/EN/emars/content) collects data about the major industrial accidents and near misses in the SEVESO III companies in the EU. The purpose of the database is to provide data for the statistic assessment with the goal to avoid development of such events and it also serves as a source of lessons from the accidents.
Data collected by eMARS shows that by the end of 2021 European Member States reported a total of 11,776 establishments as falling under the scope of the Seveso-III Directive[3] in 2018 with an increase of 479 from the previous reporting period (2012-2014).
The proportions of upper-tier establishment (UTE) and lower-tier establishments (LTE) was nearly constant during the reporting period, with on average 43% (5,090 establishments) being UTE and 57% (6,686 establishments) LTE[4].
The number of major accidents is one of the key indicators to measure the overall effectiveness of the Seveso-III Directive in minimizing the number of accidents and their harmful impacts.
To this end, the eMARS database registered a total of 518 accidents between 2000 and 2018. Out of those 518 accidents, 442 (85%) have been identified as major accidents meeting the criteria specified in Annex VI of the Seveso-III Directive.
When it comes to the industrial activity involved, the collected data shows that chemicals manufacture (114 major accidents) and the petrochemical & oil refineries sectors (105 major accidents) are the most prone ones to major accidents.
On a global scale, the recorded incidents presented in these results relate to the period between November 2014 and June 2020, covering the global Event-based surveillance (EBS) strategy. As of the end of June 2020, 1,592 chemical incidents were recorded in 121 countries, involving 252 unique chemical agents[5]. The top 5 countries with the highest number of incidents detected, comprising over half of the detected incidents, include USA, with 322 (20.2%), India with 225 (14.1%), UK with 130 (8.2%), China with 117 (7.3%) and Russia with 55 (3.5%) detected incidents, respectively.

Stories of good practices:

International efforts for industrial and chemical accidents prevention, preparedness and response[6]

The brochure "International efforts for industrial and chemical accidents prevention, preparedness and response" has been prepared by the Inter-Agency Coordination Group for Industrial and Chemical Accidents. The Inter-Agency Coordination Group is an informal forum that brings together international organizations and institutions working on prevention of, preparedness for and response to industrial and chemical accidents. In this brochure are reported international tools and support for industrial and chemical accident in prevention, preparedness and response, as:

- OECD's programme on Chemical Accidents;
- Guidelines developed under the UNECE Industrial Accidents Convention;
- eMARS database;
- Awareness and Preparedness for Emergencies at Local Level (APELL) handbook;
- Addressing Chemical Accident Prevention and Preparedness (CAPP) guidance (2010) and implementation support package (2012), case studies of implementation (2015);
- Environmental Emergencies Centre tool.

In-Depth Report 15 - Tackling mercury pollution in the EU and worldwide[7]

The Science Communication Unit, published in 2017 the In-depth report 15 "Tackling mercury pollution in the EU and worldwide". This In-Depth Report summarises the latest scientific studies and research results on mercury pollution in the global environment. A large number of treatment technologies are available which extract mercury from contam-

3 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0018
4 The Directive covers establishments where dangerous substances may be present (e.g. during processing or storage) in quantities exceeding certain threshold. Depending on the amount of dangerous substances present, establishments are categorised in lower and upper tier, the latter are subject to more stringent requirements.
5 Gaulton, T., Hague, C., Cole, D. et al. Global event-based surveillance of chemical incidents. J Expo Sci Environ Epidemiol (2021). https://doi.org/10.1038/s41370-021-00384-8.
6 https://unece.org/environment-policy/publications/international-efforts-industrial-and-chemical-accidents-prevention.
7 Science for Environment Policy (2017) Tackling mercury pollution in the EU and worldwide. In-depth Report 15 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol. Available at: http://ec.europa.eu/science-environment-policy https://op.europa.eu/en/publication-detail/-/publication/7b956417-deee-11e7-9749-01aa75ed71a1

inated substances (e.g. soil) then transform or stabilise it, so that it can be 'locked away' and will not contaminate the surrounding environment when stored. Of the many aspects of mercury pollution, the document, in particular analyse:

- Approaches to monitoring;
- Modelling frameworks;
- Reduction, treatment and storage of waste mercury.

Best Practices in Citizen Science for Environmental Monitoring[8]

The European Commission in 2020 prepared the document "**Best practices in citizen science for environmental monitoring**", which summarizes the opportunities for and benefits of using citizen science for environmental monitoring, highlights good practices and lessons learnt, and identifies the obstacles preventing its broader uptake. It also puts forward recommendations and possible actions for the various actors in the field (public authorities, citizen science networks and communities, researchers/academics) to facilitate and enhance the use of citizen science in environmental monitoring. These recommendations are clustered around four areas: match-making between knowledge needs and citizen science, promoting awareness, promoting standards for data quality and interoperability, and supporting coordination, cooperation and resources for policy impact. Possible actions include supporting existing and new initiatives in environment policy areas under the Green Deal, promotion of availability of citizen science data on open platforms, and communication of data quality requirements and methodologies in close cooperation with inter alia environmental protection agencies and statistical offices.

Best Available Techniques (BAT) to Prevent and Control Industrial Pollution[9]

A growing number of governments seek to adopt an approach based on Best Available Techniques (BAT) as part of the regulatory framework to prevent and control industrial emissions. The Organisation for Economic Co-operation and Development (OECD) report on Value chain approaches to determining Best Available Techniques (BAT) for industrial installations demonstrates that more systematic consideration of value chain aspects in the BAT determination process can help mitigate overall environmental impacts. This guidance aims to provide the governments with relevant steps, tools and best practices on how to identify and establish BAT, BAT-associated emission levels (BAT-AELs) and other environmental performance levels (BAT-AEPLs), as well as BAT-based permit conditions, including emission limit values. The Best Available Techniques (BAT) concept has emerged as a key policy tool to prevent and control industrial emissions, thus ensuring a high level of environmental and human health protection. BAT and similar concepts constitute essential elements for setting emission limit values and other permit conditions for industrial emissions in many countries around the world. The process for selecting BAT at the national level under the Convention could be expected to include the following five general steps:

- establish information about the source, or source category, including on associated processes, input materials, feedstocks or fuels, actual or expected activity levels, including throughput, in addition to, where relevant, information on the expected life of the facility and any requirements or plans for controlling other pollutants;
- identify all optional techniques, and combinations of techniques, for emission control of relevance for the source of concern, including the common techniques and techniques for specific source categories described in the BAT/BEP guidance;
- among the full range of options, identify the control techniques that are technically viable, taking into account whether the techniques are applicable to the type of facility within the sector, in addition to any physical limitations which may influence the choice of certain techniques;
- select which of these options that are the most effective in terms of controlling and, where feasible, reducing emissions of mercury, taking into consideration the performance levels referred in the BAT/BEP guidance, and in terms of achieving a high general level of protection of human health and the environment as a whole; and
- determine which of these options that can be implemented under economically and technically viable conditions, taking into account associated costs and benefits and whether they are accessible to the operator of the facility as determined by the party concerned.

Words into Action guideline: Man-made/technological hazards[10]

The UN Office for Disaster Risk Reduction (UNISDR), the UN Environment Program (UNEP) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) have collaborated to develop this targeted guide, which

8 https://ec.europa.eu/jrc/communities/en/community/examining-use-and-practices-citizen-science-eu-policies/page/best-practices-citizen
9 https://www.oecd.org/chemicalsafety/risk-management/best-available-techniques.htm
10 https://www.preventionweb.net/files/54012_manmadetechhazards.pdf

aims to strengthen national and local disaster management plans, support training and capacity building and to raise awareness of the risks and impacts of man-made and technological hazards. This guide provides a set of evidence-based, practical activities for implementation at national and local levels for chemical, industrial and transport accidents, and nuclear and radiological hazards under each of the Sendai Framework's four priorities for action. The guide also highlights the existing diversity of thematic frameworks, institutional and legal mechanisms at global and regional levels that are related to and used for addressing man-made hazards. It also draws attention to existing collaborations to implement these tools within the disaster risk reduction community and key partners. Finally, the guide promotes and strengthens communities of practice and professional networks.

INCLUDING: Innovative Cluster for Radiological and Nuclear Emergencies[11]

August 1st 2019 marked the start of the 5-year (60 months) European project Innovative Cluster for Radiological and Nuclear Emergencies (INCLUDING), which brings together infrastructures, equipment and experts coming from Medical Organizations, Fire Corps, Government Department, Municipalities, Law Enforcement Agencies, Ministries, Governmental and Civilian Research Institutes and Industries operating in the field of radiological and nuclear emergencies from across the EU, for a total of 15 partners from 10 EU Member States. The INCLUDING project pursues to develop a Federation in which individual Members will cooperate to provide a common framework to standardize access to their respective facilities, enhance interoperability and to allow a more intensive use of expensive equipment. The project is coordinated by ENEA, the Italian Agency for the New Technologies, Energy and Sustainable Economic Development. The main objectives of the project are:

- Provide a Pan-European Federated model of RN Security sector cluster to optimize sharing of resources and expertise;
- Develop a centralized management tool for remote booking and utilization of resources in the Federation;
- Develop a common learning framework for RN training;
- Capitalize results and training facilities developed in previous EU projects;
- Execute several real threats driven Joint Actions at Federation facilities to validate the federated model;
- Collaborate with RN community, on-going EU and national projects and other cluster for long-term sustainability of the Federation.

DRM Initiatives & News

Within the ROADMAP project goal of establishing a European observatory on disaster risk and crisis management good practices, some recent initiatives at international level have been scanned and pertinent information was collected and hereafter briefly summarized here.

Implementation of UNECE Industrial Accidents Convention[12]

The United Nations Economic Commission for Europe (UNECE) hosted a Special Session of the Working Group on Implementation (WGI): Seminar on good practices and lessons learned in implementing the UNECE Convention on the Transboundary Effects of Industrial Accidents on February 3-4, 2022. The Convention helps the parties to prevent industrial accidents that can have transboundary effects and to prepare for, and respond to, accidents if they occur. The Special Session promoted national and transboundary good practices and lessons learned in the implementation of the Industrial Accidents Convention, in order to help overcome implementation gaps by facilitating the exchange of information among Parties and other countries. It brought together more than 100 participants from national authorities in the UNECE region and beyond, international organizations, NGOs, industry associations and academia, to provide a basis to learn about and exchange information on the Convention, discuss new and innovative approaches and ways forward to strengthening its implementation. Parties and committed countries have highlighted good practices and guidelines prepared for national use on relevant areas of the Convention of the Transboundary Effects of Industrial Accidents.

17th International Conference on Industrial Pollution and Environmental Degradation[13]

The International Conference on Industrial Pollution and Environmental Degradation (ICIPED) organized by World

[11] https://including-cluster.eu/
[12] https://unece.org/media/news/364921
[13] https://conferenceindex.org/event/international-conference-on-industrial-pollution-and-environmental-degradation-iciped-2022-june-barcelona-es

Academy of Science, Engineering and Technology will be held on June 10-11, 2022 in Barcelona, Spain. World Academy of Science, Engineering and Technology is a federated organization dedicated to bringing together a significant number of diverse scholarly events led by academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Industrial Pollution and Environmental Degradation. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Industrial Pollution and Environmental Degradation.

15th International Conference on Mercury as a Global Pollutant[14]

The 2022 event will be a Virtual Event running on July 25-29, 2022. This Conference seeks to assess implementation of solutions to reduce the emissions and exposure to mercury as a global environmental pollutant and test the efficiency of implementation of the Minamata Convention in various parts of the world. The conference brings together representatives from industry, government, research institutions, non-governmental organizations (NGOs) and academia to discuss, inter alia, options for low-mercury energy and industrial technologies and the concept of low-mercury society. The event also showcases new equipment to measure mercury in various environmental samples, and technology to reduce mercury emissions and exposure.

Air Quality and Emissions show[15]

The Air Quality and Emissions show, is a blended event that focuses on instrumentation and services for air quality and emissions monitoring. The Environmental Industries Commission (EIC) is a partner for the hybrid event which takes place in Telford, Shropshire on October 12-13, 2022.
The 2022's edition will focus on industrial air emissions, stack monitoring, ambient air quality monitoring and all aspects of air quality monitoring, protection and treatment and will once again run alongside WWEM, the international conference and exhibition on Water, Wastewater and Environmental Monitoring. Visitors to AQE (Air Quality Emissions) and WWEM will be able enter both these complementary events free of charge and will now benefit from attending two shows at one time under one roof showing a full range of products and services for air and water monitoring.

17th International Conference on Pollution and Pollution Control Technologies[16]

The 17th International Conference on Pollution and Pollution Control Technologies scheduled for June 09-10, 2022 in Tokyo, Japan, and aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Pollution and Pollution Control Technologies. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Pollution and Pollution Control Technologies.

EU Green Week 2022[17]

The EU Green Week 2022 will take place from May 30 to June 5, 2022. The EU Green Week is an annual opportunity to debate European environmental policy with policymakers, leading environmentalists and stakeholders from Europe and beyond. The Green Week hybrid conference opens on 30 May with a high level debate on what happens to the EU environmental policy in times of crisis. The following day, three important aspects of the transformation – circular economy, zero pollution, and biodiversity, will be in the spotlight. Throughout the week, partner events will be taking place across Europe and beyond.

14 https://www.ilmexhibitions.com/mercury2022/
15 https://eic-uk.co.uk/events/partnered-events/air-quality-emissions-show/12-13-october-2022/
16 https://waset.org/pollution-and-pollution-control-technologies-conference-in-june-2022-in-tokyo
17 https://ec.europa.eu/environment/eu-green-week-2022_en