WHY IS CHEMICAL AND BIOLOGICAL WASTE MANAGEMENT RELEVANT TO CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVE MATERIAL RISK MANAGEMENT?

The example of Project 67 of the European Union Chemical Biological Radiological and Nuclear Risk Mitigation Centres of Excellence Initiative

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Over the last few decades, awareness about environmental issues has increased significantly among the general population. Including, the understanding by the public of the importance of appropriate waste management, exemplified by the 3 R's concept: Reduce, Reuse and Recycle. However, not everyone is aware of the fact that addressing waste management issues is also essential for the mitigation of risks related to chemical, biological, radiological, nuclear, and explosive (CBRNE) materials. And, vice versa: strengthening CBRNE risk-mitigating frameworks and infrastructures enhances general waste management systems.

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Therefore, international and national CBRNE programs and initiatives, such as the European Union Chemical Biological Radiological and Nu-


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clear Risk Mitigation Centres of Excellence Initiative (EU CBRN CoE), have concentrated efforts and resources on hazardous waste management projects. Such projects aim at strengthening and developing the frameworks and infrastructures to manage the risks associated to CBRNE incidents.

Incidents involving hazardous CBRNE contaminants can create significant challenges, such as: minimising the amount of waste generated during clean up and remediation; segregating waste types; packaging and safe transportation of the waste; and treating and disposing of waste and debris. Furthermore, these complexities related to waste management are in some countries compounded by:

- Limited disposal and treatment expertise, capabilities and capacity to manage CBRNE contaminated waste.
- Lack of experience of decision-makers and absence of waste management facilities to handle these wastes.
- Hesitancy on the part of some disposal facilities to accept these wastes.
- Limited resources to cover the (at times high) costs of disposing of hazardous waste.

Throughout the incident response and clean-up process, wastes must be characterised to minimise human and environmental exposure to contamination and determine how and where to transport, treat and/or dispose of contaminated materials. Response to a large-scale incident is also difficult because there are often interrelated activities. For example, choosing a decontamination approach has an impact on the timeline of the remediation as well as the cost and the amount of waste generated. Therefore, decision-makers need to be aware of the trade-offs involved in their decisions to optimise the response. In order to enhance the effectiveness of the response, a multi-sectoral stakeholders decision making approach is to be encouraged.

To address these challenges and to manage the risks associated with CBNRE materials, certain frameworks and conditions need to be in place, among others:

- Legislative and regulatory framework.
- Implementation and enforcement.
- Incidence response.

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Legislative and regulatory framework

The foundation for risk management is a clear legal framework at international, national and local levels, which establishes the main rules for safe and secure work with CBRNE materials, including waste. Violations of these rules can entail responsibility, including criminal responsibility by individuals, organisations or states. Without such a framework, it would not be possible to prevent, investigate or prosecute criminal conduct properly.

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Although such a legal framework focusses on safe and secure work with hazardous materials, such as production, transport and waste disposal of chemical and/or biological materials. These frameworks also address the response to incidents due to natural disasters, industrial accidents, and criminal/terroristic acts, which are the primary focus of CBRNE programs. Therefore, by strengthening this general legal framework, the specific legislative tools required for CBRN risk management are also reinforced.

Additionally, it is of great importance to have international agreements in place that stimulate harmonised national legislation to prevent geographical loopholes. This is especially true in light of the trade of hazardous materials by multinationals and criminal organisations that operate globally.

Implementation and enforcement

Even if comprehensive, global agreements are in place, it is important to implement and enforce them adequately. In order to do so, governmental structures that have the right to enforce legislation with respect to production, transportation and disposal of chemical and biological materials need to be in place. The staff of these departments and agencies should be trained

appropriately in national and international legal requirements and have sufficient technical understanding of the issues involved. Additionally, technical infrastructures should be established to inspect or investigate, respond to contamination events and, in certain cases, remediate sites, which require capacity (i.e., equipment) and capabilities (trained staff) or the ability to access these.

Moreover, legislative/guidance resources need to be available to companies that work with chemical and biological materials in order to establish their operation within the legal requirements. Examples of such resources could be having access to clear guidelines on how to operate legally; a formal system of registration of their activities (including waste generation); and opportunities to consult with regulatory authorities (including training on requirements).

Many of the technical capacities and capabilities required for chemical and biological waste management are also necessary for CBRN risk management. Therefore, like with the legislative framework, enhancing chemical and biological waste management implementation and enforcement also strengthens CBRN risk management.

Incident response

In case of an industrial accident, criminal disposal, environmental outbreak or terrorist attack involving chemical or biological materials, correct capacities and capabilities need to be in place to deal with such crises. Some of the response capacities and capabilities overlap with those required for waste management implementation and enforcement. However, certain capacities and capabilities are specific to incident responses and require additional equipment and training of personnel dealing with such situations. Most if not all of the capacities and capabilities in incident responses match the ones needed for CBRN risk management.

Moreover, many countries worldwide deal with legacy waste deriving from previous economic or governmental activities. The way they address the issue of legacy waste is similar to incident response, although there are differences between the two cases. For example, if the issue to be addressed involves chemical or biological materials in storage facilities or contaminated sites, the tools first used to identify this type of waste are similar to the investigative tools necessary to control current companies or respond to incidents. Ad-

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ditionally, the technological solutions for remediation of contaminated sites by legacy waste are similar to those involved in the clean-up after an incident. However, often, the scale of the legacy sites will require either significant governmental or private investment to remediate a site to an acceptable level.

Therefore, in summary, by strengthening chemical and biological waste management, the (legislative) tools and components (infrastructures and human resources) to prevent, respond and mitigate chemical and biological incidents are enhanced as well. It is also imperative to support and stimulate a multi-sectoral stakeholders' coordination and response, as each stakeholder will have different responsibilities, capabilities, capacities that need to be organised appropriately to achieve an effective response.

As stated above, the EU CBRN CoE Initiative is funding multiple projects on CBRN waste management to address some of the challenges and issues mentioned earlier. One example is Project 67 (P67), titled 'Strengthening CBRN Waste Management Capabilities in South-East and Eastern European Countries'. Several areas previously discussed are addressed within the framework of this project, such as:

Supporting the strengthening of legislative frameworks

Legislative assessments were performed, and recommendations formulated for the ten partner countries (Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia, Serbia and Ukraine) with regards to chemical, biological and radioactive waste management. Several partner countries expressed interest in receiving further support to strengthen their legislative framework and enhance implementation and enforcement.

Strengthening waste management infrastructures

All partner countries were visited, and a list of equipment required for waste management was formulated, with the expectation that some of the costs of the requested items will be covered under the umbrella of a follow-on project. The overall aim of this activity was to identify the areas where the technical capacities of the partners need to be strengthened.

Development of training capabilities

As indicated above, it is essential to provide entities working with hazardous materials resources to understand their legal and technical obligations. One of the means to address this need is by having a cadre of experts in the country that can train stakeholders on the legislative and technical aspects of waste management. Therefore, as part of P67, training-of-trainers workshops are conducted on chemical and biological waste management in order to support partner countries to create a team of trainers that can teach governmental and private stakeholders in chemical and biological waste management issues (legislative issues, packaging, transportation, treatment, disposal, remediation, etc.).

Enhancing technical capabilities

Sixteen technical workshops and study visits are planned to discuss/demonstrate methodologies and best practices covering different aspects of chemical, biological or radioactive waste management to increase capabilities and regional cooperation.

Stimulate cross-sectoral and international cooperation

As for all EU CBRN CoE Projects, one of the P67 objectives is to stimulate cooperation between the national and regional partners on CBRN issues. In order to achieve this, the engagement of multiple stakeholders is stimulated during the various activities implemented under P67, including regional workshops.

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P67 is funded within the framework of the EU CBRN CoE initiative. The EU CBRN CoE Initiative involves 62 partner countries in eight regions. The European Commission (EC) leads the project, that is implemented with support from the EC's Joint Research Centre (JRC) and the United Nations Interregional Crime and Justice Research Institute (UNICRI). The project is implemented in close cooperation between experts from the ten partner countries of the South-East and Eastern European region, and by an EU consortium headed by the Sustainable Criminal Justice Solutions Europe (SCJS Europe). Other partners involved are, the Cranfield University, the International Security and Emergency Management Institute (ISEMI), the Nuclear and Decommissioning Company (JAVYS), Public Health England (PHE), and the Verification, Research, Training and Information Centre (VERTIC).

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