



Summary statement

- Within the field of chemical accidents, the activities of safety and security continue to (by-and-large) take place in silos. When it comes to chemical safety, safety and security measures are (in most cases) mutually reinforcing not only at the national, EU, and international levels, but also at the company (operator) level, and the incentives to do-away with this separation are considerable.
- Coordination is of crucial importance. Depending on the sector and/or the chemical involved, chemical accidents have wide-ranging effects that may even spill-over into neighbouring countries. Coordination can take the form of many activities which fall between information sharing and joint training exercises, and if beneficial not only at the national, EU, and international levels, but also at the industry level.
- Improving safety and security within industrial operations leads not only to improved safety and security (which means it benefits public safety) but has also been tied to increased value for shareholders, increased employee productivity, and reduced damage costs and sustainable economic growth. A wealth of relevant information is available through (among others) IChemE and the Major Accidents Hazards Bureau.

Introduction

This CoU brief summarises the topic of chemical accidents and relevant EU-funded projects that participated in the 10th Meeting of the Community of Users (CoU) on Secure, Safe and Resilient Societies that took place 5-8 March 2018 at the BAO convention centre in Brussels.

The Community of Users is a DG HOME initiative that aims to improve information transfer of research outputs and their usability by different categories of stakeholders. During the meetings

and thematic workshops, policy updates and information about H2020 projects are provided and interactive discussions facilitated to ensure that solutions and tools resulting from research will reach users.

Scope & Relevance

A wide range of industries – chemical, petrochemical, food, manufacturing, energy, and mining included – are potentially at risk of experiencing chemical accidents. Chemical accidents may exact an immediate death toll (as was the result with, among others, the 2001 disaster in Toulouse killing 29 people). They may equally have severe environmental impacts (e.g. the cyanide spill in Baia Mare

in 2000). Long term impacts may manifest themselves under the guise of foregone economic output, the erosion of health and/or living conditions, or environmental degradation. Chemical accidents may also result into the disruption of vital services, e.g. in the energy sector.

Current debates & stakeholder perspectives

This section describes why the topic is particularly important for each stakeholder group.

Practitioners

First responder organisations constitute a reactive group of practitioners which are mobilised to mitigate the negative effects of a chemical accident once it unfolds. As protection against chemical accidents is highly dependent on preventive mechanisms (i.e.: best practices relating to the prevention of a spill and/or cross-reaction), the list of relevant practitioners expands well beyond the first responders which are called on to mitigate a crisis once it begins to unfold.

Industry

Industry plays a central role within the context of chemical accident safety because actors within this category are tasked with adopting best practices, securing supply chains, and upgrading infrastructure that is used during the manufacturing process. Industry additionally plays a role in contributing to the development (research) of new solutions, and – as many industries adopt best practices as a cost-saving mechanism (the costs associated with mitigating an industrial disaster often justify extensive investment in this regard) – frequently emerge as trend-setters.

Policy

At the national level, government agencies and regulators frequently play a role in funding research programmes and in prescribing (and incentivising / enforcing) the widespread adoption of best practices. At the European level, all member states are involved in the regulation of chemicals. The EU has moved to mitigate the (potentially) negative impacts of chemical accidents through the adoption of various regulations. These are geared towards tackling the threat posed by such an accident by (among others) enforcing standardised practices, preventing the use of specific compounds, and facilitating information sharing at the EU-level. The following EU regulations and/or international agreements were discussed during the CoU meetings that took place between 5-8 March 2018:

- **Seveso-III.** The Seveso-III Directive (2012/18/EU) has a dual purpose. First, it aims to prevent major accidents involving

chemical accidents. Second, it aims to limit – in the event that such an accident should occur – the consequences exacted upon human health and the environment. In its most basic form, it achieves this goal by outlining in which establishments and in what quantity dangerous substances may be present during various phases of the supply chain. The regulation differentiates between lower and upper-tier establishments on the basis of the amount of dangerous substances they store. Member States are required to subject upper-tier to more stringent oversight than their lower-tier counterparts. As an example, Member States are required to ensure not only that the operators of upper-tier establishments (among others) draw up internal emergency plans for the measures to be taken inside the establishment, but that they supply competent authorities with all information necessary to draw up external emergency plans. Seveso-III also requires member states to conduct regular inspections of establishments, report accidents to the Commission, and prohibit the unlawful use or operation of establishments.¹

- **Directive on European Critical Infrastructures.** The Directive on European Critical Infrastructures established a procedure for identifying and designating European Critical Infrastructures. It also formulates a common approach for assessing the need to improve their protection. The Directive is mindful of the fact that critical infrastructure within the transport and/or energy sectors (nuclear reactors, airports, etc.) routinely handle dangerous substances and – as a result – constitute attractive targets for actors which aim to disrupt society. The Directive is accordingly geared towards preventing the destruction of critical infrastructure (and towards mitigating the consequences thereof) by ensuring that the aforementioned facilities observe a *modus operandi* that a.) minimizes the chance of an internal failure, and b.) minimizes the facility's vulnerability to tampering by external actors. The Directive requires Member States to (among other) designate European Critical Infrastructure (ECIs) within their own borders, mandate ECI operators to implement operator security plans (OSPs) and ensure that all ECIs within their territories possess a security liaison officer (SLO) which can function as a point of contact between the ECI's owner/operator and the relevant Member State authority.²

1 For a short introduction to the Seveso-III Directive, see DG ENV, "Seveso Legislation - Industry - Environment - European Commission," European Commission, August 22, 2018, <http://ec.europa.eu/environment/seveso/legislation.htm>. See European Commission, "Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the Control of Major-Accident Hazards Involving Dangerous Substances, Amending and Subsequently Repealing Council Directive 96/82/EC Text with EEA Relevance," Pub. L. No. 32012L0018, OJ L 197 (2012), <http://data.europa.eu/eli/dir/2012/18/oj/eng>, for an in-depth reading of the regulation itself.

2 For an overview of the Directive on European Critical Infrastructures, see "Council Directive 2008/114/EC of 8 December 2008 on the Identification and Designation of European Critical Infrastructures and the Assessment of the Need to Improve Their Protection," Pub. L. No. 32008L0114, OJ L 345 (2008), <http://data.europa.eu/eli/dir/2008/114/oj/eng>.

- **Communication CBRN-E Risks.** The Communication on a new EU approach to the detection and mitigation of CBRN-E risks proposes a set of 30 actions aimed at facilitating practical cooperation for the detection and mitigation of CBRN-E (chemical, biological, radiological, nuclear, explosive) risks at the European level.³ It calls for the development of concrete tools, ranging from guidance materials, training and awareness building, and testing activities. The communication builds upon the previously published EU CBRNE Action Plan which was geared towards complementing national measures and to promote exchanges of information and best practices within the field of CBRN-E security, and whose implementation was found to be uneven in 2012 progress reports.⁴ The Commission recently published a Communication which proposes to further expand the Action Plan through the implementation of actions which hedge against the threats posed by modern technologies such as (among others) the unmanned aerial systems (UASs) fielded by Daesh.⁵
- **UNECE Industrial Accidents Convention.** The UNECE Industrial Accidents Convention promotes active international cooperation between contracting parties before, after, and during an industrial accident. The convention aims to protect human beings and the environment from industrial accidents by preventing them where possible and by reducing their frequency, decreasing their severity, and mitigating their effects. The convention spells out policies that contracting parties can implement towards improving prevention, preparedness, and response. The convention also calls on all contracting parties to set up special notification systems which are geared towards providing other contractors with early warning, providing information, and requesting assistance. The UNECE Industrial Accidents Convention places particular emphasis upon the fact that the effects of industrial accidents may spill over into other countries. In doing so, it aligns closely with the Seveso-III-Directive and (at least in spirit) the Directive on European Critical Infrastructures (which also allows Member States to designate facilities located within the territory of neighbouring nations as ECIs).

In addition to the regulations discussed during the CoU meeting, several regulations (including REACH and CLP, which form the basis of EU chemicals legislation) are of relevance within the field of chemical accident prevention.

Research

Research institutes and universities play a central role in the development of best practices. Because researchers also preside over in-depth knowledge of the subject matter, they also routinely play a role in the analysis (and formulation) of regulations.

Civil Society

Members of civil society are directly affected by chemical accidents. The public is consequently afforded several fundamental rights. These include the right to access to information, the right to participate in associated decision making (e.g. on the siting of potentially hazardous activities), and the right to access to justice. Non-governmental organisations usually represent civil society in relevant processes, and thus play an important role.

³ European Commission, "Council Conclusions on Strengthening Chemical, Biological, Radiological and Nuclear (CBRN) Security in the European Union - an EU CBRN Action Plan - Adoption," Pub. L. No. 1505/1/09 (2009), <http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%201505%202009%20REV%201>.

⁴ See European Commission, "PROGRESS REPORT ON THE IMPLEMENTATION OF THE EU CBRN ACTION PLAN, May 2012" (Brussels, 2012), https://ec.europa.eu/home-affairs/sites/homeaffairs/files/what-we-do/policies/crisis-and-terrorism/securing-dangerous-material/docs/eu_cbrn_action_plan_progress_report_en.pdf.

⁵ See European Commission, "Action Plan to Enhance Preparedness against Chemical, Biological, Radiological and Nuclear Security Risks," Pub. L. No. COM(2017) 610 (2017), https://ec.europa.eu/home-affairs/sites/homeaffairs/files/what-we-do/policies/european-agenda-security/20171018_action_plan_to_enhance_preparedness_against_chemical_biological_radiological_and_nuclear_security_risks_en.pdf.

Relevant projects and project outputs

Activities conducted as part of the following projects and/or organisations were outlined during the 10th CoU meeting:

- **Major Accidents Hazards Bureau (MAHB).** The MAHB is an organ of the European Joint Research Centre (JRC). It focuses on industrial accident prevention by working with DG ENV and with EU Member States to implement the Seveso-III Directive. The MAHB additionally works with DG ECHO, international bodies, and third (non-EU) countries to support improvement in chemical accidents prevention and preparedness globally. The Bureau specialises in accident analysis, risk analysis, and the facilitation of the exchange of best practices. Within the entities where it is active, the MAHB advises a range of stakeholders. These range from representatives of local or national governments to industry operators, policymakers, and Seveso inspectors. As part of its activities, the Bureau has developed web-applications such as (among others) eSPIRS and eMARS.⁶ It has additionally published a wide range of policy/technical briefs, developed a chemical accident scenarios handbook, and hosted training workshops for the ADAM online risk awareness tool.
- **The European Reference Network for Critical Infrastructure Protection (ERNICIP).** ERNICIP is a European effort currently being implemented by the Commission's Joint Research Centre (JRC). The primary aim of ERNICIP is to support EU policymaking in the area of critical infrastructure protection. ERNICIP consists of a network of more than 450 security-related experts from over 200 organisations in 18 EU Member States. ERNICIP is divided into a number of thematic groups: chemical and biological risks to drinking water; detection of indoor airborne CB agents; detection of explosives and weapons in secure locations; protection of structures against explosive effects; radiological and nuclear threats; extended virtual fencing, and; cybersecurity. ERNICIP thematic groups are encouraged to collaborate (wherever possible) with other relevant EU/H2020 projects. The organisation delivers recommendations pertaining to the standardisation of research activities and to actions which support EU policy initiatives (gap analysis, input requirements, etc.), guidance of infra operators and protective security, and an online database of facilities with capabilities for testing security solutions (security related products). Its largest (current) challenge manifests in a lack of end-user participation in thematic groups, which can be attributed largely to the time limitations which govern practitioner availability.
- **SAF€RA / ETPIS:** SAF€RA is geared towards fostering cooperation between national research programmes. The ultimate goal is to defragment EU investment into R&D pertaining to chemical safety and to reduce redundancies at the regional level. SAF€RA builds upon the progress made by a previous project hosted under the ETPIS framework, which were also geared towards defragmenting EU research investments into industrial safety. SAF€RA is (first and foremost) a funding platform. Previously funded projects include VaLoSa, HAZPRED, RISING, SAPHIR, SmartPro, ECCSSafe, TORC, and STARS.
- **IChemE Safety Centre.** The IChemE Safety Centre is a multi-company, subscription-based, industry-led consortium which collects and analyses information shared by its members to develop knowledge relating to process safety. The IChemE Safety Centre differentiated itself from other groups (CCPS, IOGP, API, EPSC, etc.) in its focus on bringing different industry sectors together. This allows the development of a process safety knowledge which spans multiple industries, and (in turn) facilitates the diffusion of best practices from one industry to another. The Centre's findings are routinely published in guidance documents which are geared towards making lessons learned available to 3rd parties.

In addition to ERNICIP, past projects geared towards addressing risks associated with chemical accidents (and funded under the FP7 and H2020 frameworks) include – but are not limited to – SPIRIT (2010-2013), EDEN (2013-2016), CRIM-TRACK (2014-2017), EXPEDIA (2014-January 2018), and ChemSniff (2015-2017). An ongoing project is ENCIRCLE (March 2017 – March 2021), which proposes an innovative approach to establish a specialised, efficient and sustainable industry to improve EU resilience to new CBRN attacks and threats.

⁶ eSPIRS is a database in which Member States must report Seveso establishments to the Commission. eMARS is a major accident reporting system.

Lessons learnt and challenges

- Although (as outlined by HSE) some instances do exist in which safety and security are mutually exclusive, by large the two are two sides of the same coin when it comes to the prevention of chemical accidents and the mitigation of their effects. This is true not only at the national, EU, and international level, but also at the company level. Safety is geared towards ensuring that systems work 'as they should,' and are thus capable – *ceterus paribus* – of safely transporting and/or storing dangerous materials. Security is geared towards prevention, particularly with regards to human interference. Improving safety also has positive downstream effects on (among others) civil protection and disaster risk reduction. In reducing the chance that an incident will recur, such activities also directly support the objectives of the EU's CBRN-E Action Plan and of the Commission's Directive on European Critical Infrastructures.
- Extensive stakeholder cooperation is necessary in order to ensure safety and security at the national, EU, and international levels. As shown by IChemE, inter-industry cooperation is also extremely valuable. Cooperation (both between authorities *within* Member States and between Member States themselves) can help to identify expertise gaps, ensure the sharing of best practices, and to avoid complacency. It can take the form of (among others) information sharing, adherence to shared practices, and – crucially – training exercises.
- Ensuring practitioners engage in regular training sessions – particularly when they are conducted with practitioners from other countries – is of paramount importance. As serious chemical accidents are likely to require a transboundary response, such exercises increase preparedness by building trust.
- Observations from within SAFERA programmes indicate that planning for business continuity is of utmost importance when it comes to securing the sustainability of project post-funding.
- Storage at facilities is (for the most part) appropriately enforced. Procedures relating to human factors (these range from the vetting of staff and the issues associated with 'long working' to the taking stock of security measurements relating to a facilities' ability to withstand a targeted attack) continue to lag behind optimal levels.
- Critical infrastructure is defined differently in different Member States. This poses a challenge for the safeguarding of infrastructure such as gas pipelines, which may cross borders. In these cases, MS are currently obliged to take it upon themselves to agree on definitions and/or safety protocols.
- It is absolutely necessary to not only look into immediate costs of a (potential) chemical accident, but to also consider image or reputation of an industry or sector, as the immediate repercussions of an accident affect other industries as well. Positive effects of preventing chemical accidents include continuity and stability of production, which leads to competitive advantages. Another indirect benefit is that if employees are given the impression that they work in a safe environment, they will be more engaged, which also leads to competitive advantages.
- Industries which engage in the storing and/or transport of dangerous chemicals tend not to want to compete on safety and can thus generally be counted upon to participate in initiatives which facilitate the sharing of best practices and/or solutions with competitors. This is at least partially because the losses associated with a spill and/or an uncontrolled event are considerable (the costs of safeguarding cargo justify the means of doing so). A topical example presents in the Dutch Tank Storage Association, which provides a safety maturity tool that gauges industry performance within the domains of personnel management, hardware, and software. Systems such as these may represent a viable alternative to government audits, as they dis-incentivise a race to the bottom and allow for more real-time (interactive) improvement measurement.

Possible synergies

Several areas of potential synergy were identified during the CoU meeting on Chemical Accidents. First and foremost, it was clearly showcased that the creation of synergies between the safety and security sectors is not only mutually beneficial, but beneficial to the policy objectives of (among others) disaster risk reduction and to the Sustainable Development Goals. It was also clearly formulated that there is extensive room at the EU MS level to increase cooperation within the area of chemical accident prevention through the organisation of joint exercises and through information sharing.

The ERNCIP Inventory (an online database of facilities with capabilities for testing security solutions) is a tool which can feed

into the lessons learned – and disseminated by – organisations such as IChemE. The best practices and/or lessons learned derived from IChemE facilitation of cross-industry information sharing have, in turn, the potential to feed into The MAHB's guidance documents and/or training activities (and vice versa). The MAHB eMARS database, in addition to IChemE's list of cross-industry best practise, can also serve to increase the impact of the (already synergised) activities of SAFERA and ERNCIP by allowing for better allocation of funds. As one of ERNCIP's challenges presents in the form of lack of involvement from external stakeholder groups, possibilities relating to the organisation's ability to access the platform provided by IChemE could also be explored.

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For an overview of Chemical safety-related projects funded under the Horizon 2020 (H2020) framework prior to 2016, see sections 5 (CBRNE threats) and 6 (Crime and terrorism) of **DG HOME, “Community of Users on Secure, Safe and Resilient Societies - Mapping H2020 and ISF Projects Funded under 2014-2015 Programmes,” Working Paper (Brussels: European Commission, forthcoming)**. The projects referenced within this section of the aforementioned document are universally geared towards tackling similar subjects as those discussed in this brief, and thus have the potential of exhibiting synergies with them.

Way forward

Good progress is made in bringing the safety and security communities together during the 10th CoU meeting, but the surface of the issues has only been scratched. There is a need for continuous efforts and repetition of this coordination exercise (as part of next year's CoU programme) in order to dive deeper into the issues and break down the pillars between safety and security.

There is a need for future joint research and exercises in the safety/security area. Exercises really matter in the prevention of chemical accidents, whether it is a security or safety accident. Exercises contribute significantly to trust building amongst parties. After exercises there is normally an increase in trust between authorities and industry, or between several companies involved in the exercise.

Related readings / publications:

See Edition 2 of the IChemE Safety Centre Guidance (forthcoming) at www.bit.ly/ISCP521.

For further reading, see also:

- [The Importance of Human Error and Reliability Management in Critical Conditions and Infrastructures \(2018\)](#)
- [A Typology of Cybersecurity and Public-Private Partnerships in the Context of the European Union \(2018\)](#)
- [Lessons Learned from the Implementation of the Seveso-III Directive in the Slovak Republic \(2018\)](#)
- [Analysis of Fire Safety System for Storage Enterprises of Dangerous Chemicals \(2018\)](#)
- [Design Principles of Regenerative Design \(2018\)](#)

Forthcoming CoU events & other related events

- CoU meeting [June 2018](#)
- CoU meeting [December 2018](#)
- Workshop on ADAM Consequence Assessment Tool – [20-21 March 2018 \(Ispra, Italy\)](#)
- [Seminar on land-use planning and industrial safety – 16-17 May 2018 \(Mechelen, Belgium\)](#)
- 3rd IMPROVER-ERNICIP Joint Operations Workshop – [23-24 May 2018 \(Lisbon, Portugal\)](#)
- [Workshop on EUSES update needs – 4-5 June 2018 \(Brussels, Belgium\)](#)
- SAFERA Symposium 2018 – [14-15 June \(Bilthoven, The Netherlands\)](#)