



Summary statement

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- The CBRN-E domain would benefit from a more integrative approach; exchanges between various domains as well as knowledge sharing activities between Member States as well as between CBRNe related national and/or international civil and/or military organisations are encouraged. Efforts in the CBRN-E field should be bundled both internally and externally (cross-border) to create a level playing field across the EU.
- In developing new solutions, the practitioner perspective and requirements should be key. Novel technologies and tools need to address needs voiced by practitioners e.g. regarding their usability and, therefore, it is recommended to include practitioners in an early phase of the projects as well as in a demonstration and testing phase at the end.
- The risks that the application of technology in the CBRN-E domain could potentially pose requires further research, in particular with regards to Artificial Intelligence and threats from within the system.

Introduction

This CoU brief summarises the topic CBRN-E and relevant EU-funded projects that participated in the 13th Meeting of the Community of Users (CoU) on Secure, Safe and Resilient Societies that took place 25 – 29 March 2019 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

CBRN-E events are naturally of low probability and of high impact. The threat that CBRN-E emergencies pose has increased over the past years; both CBRN accidents and man-made events pose a serious challenge to the European society.¹ In terms of attacks, the potential destruction caused by CBRN-E events is significantly larger than the effects of attacks with conventional weapons. What further intensifies the vulnerability of the EU is that Member States are

often less equipped to deal with consequences for health services and infrastructure.²

Given the vast impact that CBRN-E events can have on a variety of policy domains, an integrative approach towards prevention and response is required. Such response should go beyond the CBRNE domain and encompass the health-, environmental-, and defence

¹ Member States' Preparedness for CBRN Threats, Directorate General For Internal Policies Policy Department For Citizens' Rights and Constitutional Affairs, 2018
² Ibid.

sector, among others. These neighbour domains could benefit from sharing technologies and capabilities. In recent years, the EU has made efforts to mainstream CBRN-E strategies across different policy areas, however, this process needs to be further intensified.

However, the domain is faced with a relatively low willingness of stakeholders to invest in prevention measures; the low frequency of occurrence impacts the priority that CBRN-E issues enjoy. In addition, the CBRN-E domain suffers from fragmentation and new innovations do not always meet the needs of practitioners. Therefore, the CBRN-E domain would benefit from a more practitioner-driven approach in which different stakeholders unite their forces and work towards a more coherent EU strategy. As an initial step, the JRC has developed a CBRN-E glossary which aims to develop a common understanding across the Union.³ Moving forward, the JRC intends to serve as a vehicle to address the fragmentation in the CBRN-E domain.

Thematic focus areas

During the 13th CoU event, the Thematic Workshop on CBRN-E was divided into six different subthemes: New actions in CBRN Research, Chemical Accidents, CBRN Forensics, RN Emergencies, Civil-Military and International Cooperation and Water Security. The discussions held during these sessions are presented below.

New Actions in CBRN research

The panel discussed a number of actions and areas including the need for a more holistic approach to further advance the EU's preparedness and response to CBRN-E events. This approach needs to take into account other systems such as health, environment and the need for improved human factors. Issues were raised such as whether there is a risk in introducing Artificial Intelligence systems for use in low probability events, new capabilities of CBRNE sensors and requirements for new decontamination systems and forensics. The panel also discussed the use of innovative approaches to chemical sensor networks and the use of CBRNE threats detection in high throughput of containers and the development of a harmonised CBRN training curriculum for first responders and emergency doctors (EU-SENSE, COSMIC, MELODY). The importance that solutions need to be scalable and interoperable was emphasised.

The panel concluded with a number of recommendations to advance the EU's preparedness and response to CBRN-E events. These ranged from the need to provide solutions that are holistic and cover multi domains and disciplines and the challenge of how do we take prototypes into operation and whether there is a need for new mechanisms to facilitate this. In addition, as EU digital transformation progresses and technologies such as Artificial Intelligence (AI) grow, a question that will need to be addressed is who or what in the future will make the decision, the AI system or the person in the loop, and can the person understand what is being presented by the AI system is correct. Finally there is a further

challenge for the security programme as a whole and that is how long does an incident stay in the memory of the citizen or the responsible authority. With low probability, events such as CBRN there is a challenge concerning the cost benefit and risk appetite for implementing innovations into operation.

Chemical Accidents (Seveso)

The impact of a chemical accident on society is vast; such threat poses a serious risk to humans, economies and the environment alike. As the usage of chemicals is inevitable in some sectors, the EU has developed guidelines and measures to minimise risks such as the Seveso Directives.⁴

Over the last couple of years, the notions of security and safety in the CBRN domain have become more aligned. During discussions at the 13th CoU, the need for further integration of those two areas was voiced in assessment and monitoring. In addition, the wish to enhance cooperation between various stakeholders and authorities was identified as a major challenge for the upcoming years; efforts are needed to enhance the level of trust between the different players in order for effective cooperation to take place.

It remains challenging to accurately measure the impact of a CBRN-E event. Chemical accidents do not occur frequently and not every accident causes casualties. The available EU data only covers deaths and injuries at Seveso sites and, thus, merely presents part of the full picture. This, in turn, thwarts the comparison between cases. In a similar vein, the vulnerabilities of transporting dangerous goods are insufficiently taken into account as the Seveso directive is predominantly concerned with the safety and security of chemical sites and to a lesser degree with the transport of substances.

The technological developments at chemical sites are perceived to be a blessing and a curse; they help eradicating human error but also give leeway for cyber security threats from external and internal actors (i.e. such systems can independently initiate unwanted actions). Therefore, further attention is needed to develop adequate mechanisms for the integration of technologies in the CBRN-E domain.

CBRN Forensics

Forensic investigation is a key component in the fight against crime and the protection of European societies. Forensics is part of a broader process of (criminal) investigation. Given the various stages of investigations, it is essential for each stakeholder to understand which knowledge of (CBRN) forensics is relevant at what point in time. To facilitate investigations and ensure effective knowledge exchange, the approach by the Netherlands Forensic Institute (NFI) was identified as a best practice. NFI employs forensic advisors who are familiar with both the work of the police officer at the crime scene as well as with the researcher in the lab. They can help coordinate and streamline the processes. In addition, the NFI

³ www.opencbrne.jrc.ec.europa.eu/main

⁴ Directive 82/501/EEC; Directive 96/82/EC; Directive 2012/18/EU

developed a glossary on different definitions which further facilitate the effective collaboration between practitioners and researchers.

A key challenge in the domain of (CBRN) forensics is trust; for forensic evidence to be used in courts abroad, the quality of the evidence needs to be verified. Further research effort is needed to improve and validate the support of technological systems to improve their reliability and maybe use them as evidence in courts. Another important challenge is cross-border cooperation within CBRN forensics and the broader law-enforcement system, because within the EU member states have different approaches towards (CBRN) forensics including different systems and laws.

Currently, the domain of forensics is still perceived as a separate capability and as an element of the CBRN-system. Ideally, once the field has matured more, the field would be approached as an integral part of the CBRN domain.

RN emergencies

Throughout the last couple of years, the focus in the CBRN-E domain has predominantly been on C and B (chemical and biological emergencies). As a result, radiological and nuclear events have received fewer resources and the ambition level in this domain has generally been lower. During the discussions at the 13th CoU Event, the need was flagged to prioritise RN emergencies and, more specifically, to shift the attention towards the prevention of such events. In order to do so, one needs to understand the impact of a RN event (in particular concerning the vast economic and societal impacts) and to communicate those to the public in an effort to raise awareness.

In order to develop prevention strategies, data sharing between Member States and other stakeholders is key. It is essential to share knowledge to avoid duplications and to help improve capabilities across Member States to create a level playing field. What complicates data sharing is that CBRNE competences are held on the Member State level. As a result, the designated competent authority differs across Member States which thwarts cooperation. To ensure smoother data exchange, increased EU involvement is welcomed. In a similar vein, information-sharing on the national level would benefit from a more inclusive approach towards other stakeholders (i.e. law enforcement and the public).

Looking at response strategies, virtual training courses were identified as an effective tool for capability development. Such training courses would circumvent the risks that training courses with RN materials pose (both in terms of training and regarding transport).

Civil-Military and International Cooperation

Civil-Military and International Cooperation (CIMIC) is an issue area that is often neglected by various actors, both at the national and

EU level. As a result, relevant stakeholders miss out from the lack of attention for cooperation on various aspects (R&D, training, standards, etc.). This is particularly worrisome as cooperation is key in the domain of CIMIC. In order to facilitate smooth cooperation, the differences in operational processes (structured military approach vs first response approach by humanitarian aid organisations) require additional thoughts. During the 13th CoU Event, various starting points for more intense collaboration between the two fields were identified, these include civil protection operations (where, naturally, a fast response and intense collaboration between various actors is required) and the military police (as this unit is familiar with both domains). As the military generally enjoys more resources, one of the ways moving forward could be to apply military capacities in civil-led operations.

Furthermore, given the differences in constitutional and legal frameworks, the processes of civil-military cooperation require further alignment in cross-border cooperation. In addition, cooperation on the national level can be improved by enhancing communication between different actors (e.g. relevant ministries). The platform that the Belgium Federal Crisis Centre seeks to develop serves as an illustration of a strategy to enhance communication and information exchange.

In addition, training courses on coordination are welcomed by actors in the civil-military domain. During the 13th CoU meeting the need for practical courses instead of theoretical ones was expressed; practitioners would benefit from having more guidance in operational aspects. However, a key challenge is the lack of standards in training courses. Therefore, it would be beneficial to develop a systematic description of the courses and to enhance the transparency on where and by whom trainings are provided. Ideally, such overview would also be provided on the available mobile training solutions.⁵⁶ Furthermore, during the 13th CoU Event, the need was voiced to continue the harmonisation of EU and NATO CBRN-training efforts. At the moment it is being explored whether and how the JCBRN Defence Centre of Excellence,⁷ currently already the NATO discipline leader for CBRN Training and Education, might also become the discipline leader for EU military CBRN training. Ultimately, the trainings provided to those active in the civil domain could be integrated with the military trainings in order to further fuel cooperation between the two.

Standards are not only needed with regards to CIMIC trainings; the general CIMIC domain would benefit from developing and applying standards with regards to Standard Operating Procedures (SOPs). At the moment, military standards are developed based on NATO standards and regulations by national authorities. At the same time, civil security standards are not very well integrated at the EU level. The CIMIC domain would, therefore, thrive by a more integrative approach towards standards and SOPs.

⁵ This might be a topic considered by the HORIZON 2020 project eNOTICE.

⁶ Mobile refers to mobility. These courses can be held at a requested (geographical) location.

⁷ www.jcbrncoe.cz

Water Security

CBRN-E threats are generally of low probability but of high impact; this goes in particular for water-related threats, as other critical infrastructures are heavily dependent on water supplies (e.g. health services, food supplies). In order to safeguard the water security in the Union, a number of policies have been developed (see next section). The Water Safety Plans are a good example of strategies targeted towards ensuring safety for our water supplies. However, the Water Safety Plans would benefit from being extended with water security aspects as such plans are only focused on water safety.⁸ Threats to water security can come from different angles: they might relate to cyber security, stem from extreme weather events or result from biological or chemical contamination, therefore, the domain would benefit from applying a multi-hazards approach.

At the moment, national authorities are often the competent body for the water security domain.

In order to boost efforts on the European level, national authorities are encouraged to cooperate more closely with each other as well as with various national stakeholders. Currently, the approaches to water security in the EU are fragmented: terminology differs, standards for water security are generally absent and information is not available and/or sharable. A more coherent strategy is needed in order to develop the European level playing field.

In addition, authorities would benefit from focusing on adequate implementation of regulations and solid training for personnel. Such training courses can cover issues such as secure handling of sites (i.e. using passwords), cyber security and compliance.

Given the focus on detection and early warning, continuous monitoring was identified as a key asset in the safeguarding of water supply systems. Hereby, continuous monitoring contributes to risk reduction and prevention (water safety) as well as it allows for analysing the system at multiple points at various points in time (water security). Nevertheless, such investments come at a price; the low probability of water security events impacts the willingness of actors to invest in mitigation strategies. In particular, smaller utilities might struggle to make such security investments. Identifying adequate resources for security-related investments remains a challenge for the domain of water security.

Operational support DRR

The main objective of most projects involved in DRR is to offer targeted support to disaster management professionals. A key challenge for projects in this domain is to identify and reach out to the target audience who is in need of operational support. In this regard, it can be beneficial to build public private partnerships and solid business models for resilience to make operational support efforts sustainable. Opportunities for such partnerships could be to embed and institutionalise them into wider ecosystems at the local, national or EU level

In addition, knowledge management forms a challenge in this domain; more standards, handbooks and practical recommendations are needed to reduce fragmentation and reach a common understanding of operational support across Europe. Scenarios are perceived as a useful instrument to build bridges between stakeholders and to enhance common understanding. Furthermore, operational preparedness can be enhanced by digitising preparedness plans and making them widely accessible.

⁸ Also echoed in JRC's Proposals for a guidance related to a Water Security Plan to protect Drinking Water, 2016

Current debates & stakeholder perspectives

This section describes why CBRN-E is particularly important for each stakeholder group.

Practitioners

As CBRN-E materials require sensitive treatment, it is in the interest of practitioners that resources are invested in the development of solid protection gear and good trainings. In recent years, improvements in gear have been made and the ability to protect practitioners has been improved. Still, training courses could be further improved. One way to do this is by exploring opportunities that virtual training courses can offer. Throughout all discussions held en marge the 13th CoU event, it was emphasised that adequate implementation of measures and tools is of absolute necessity for policies to succeed. Therefore, practitioners would benefit from elaborate training with a specific focus on operational procedures.

Industry & SMEs

A key challenge for industry players are the costs that come with preparedness and response activities in the CBRN-E domain. The low probability of CBRN-E events affect the willingness of organisations to invest in this domain; in particular smaller organisations are likely to struggle. The industry can play a role by providing tailored solutions that address the needs of different types of organisations and, thereby make the adaption of such solutions more attractive.

Policy

Given the effects of a CBRN-E event spread are felt across different domains and is particularly impactful for critical infrastructures, it is essential for policymakers to integrate the CBRN-E component, where possible, across different policies. Currently, the EU has a variety of policies in place related to CBRN-E:

- **Seveso Directives I, II, III.**⁹ These are the EU guidelines that intend to minimise CBRN-E risks and prevent major accidents from happening. The Seveso Directives help Member States to develop response and mitigation measures. In order to maximise its impact, the Seveso directive has been integrated in other EU policies such as the Union's Civil Protection Mechanism, the Security Union Agenda and the Regulation on the classification, labelling and packaging of chemicals, among others.
- **Drinking Water Directive**¹⁰ concerns the quality of drinking water (for human consumption). The Directive intends to protect human health from any contamination of water. A recast of the current Directive is expected soon.

- **Water Framework Directive (WFD)**¹¹. The WFD is the European Union's overarching framework for water policy. It aims to improve the ecological and chemical quality of ground and surface water (rivers, lakes, transitional waters and coastal waters) in the EU.
- **EU Critical Infrastructure Directive (ECI)**¹² establishes the process for identifying and designating European critical infrastructures. In addition, the ECI lays out the approach for improving the protection of these infrastructures.
- **The NIS Directive**¹³ aims to boost the level of cybersecurity across the EU. It intends to do so by enhancing Member States' preparedness, facilitate and encourage cooperation between Member States and encourage a culture of security within sectors that are vital for our economy and society.
- **Action plan to enhance preparedness against CBRNE risks**¹⁴ The Action Plan intends to enhance European cooperation in order to strengthen CBRN security. It is specifically focused on prevention, preparedness and response to CBRN threats and terrorism attacks and aims to reduce the accessibility of CBRN materials, ensure a more robust preparedness for and response to CBRNE incidents, build stronger internal and external links with key regional- and EU partners and enhance our knowledge of CBRN risks.
- **EU Action Plan on Enhancing the Security of Explosives**¹⁵ The EU presents 48 measures related to prevention, detection and response to risks related to explosives. In addition, measures related to horizontal aspects such as information sharing mechanisms are presented.

Research

During the 13th CoU event, the need for research into future application of technology in the CBRN-E domain was voiced. Technology is perceived as a blessing and a curse and the academic field was invited to explore how potential threats related to technology (cyber security) can be best mitigated. In (CBRN) forensics, the cooperation between researcher and practitioner is key. The research done in the lab can be decisive in a (criminal) investigation.

9 Directive 82/501/EEC; Directive 96/82/EC; Directive 2012/18/EU

10 Directive 98/83/EC, Directive (EU) 2015/1787

11 Directive 2000/60/EC

12 Directive 2008/114/EC

13 Directive 2016/1148

14 COM(2017) 610 final

15 COM/2007/0651 final

Relevant projects & project hubs

Activities conducted as part of the following projects were outlined by project representatives during the Disaster Risk Reduction and Resilience session at the 13th CoU meeting:

- **ERNICIP** aims to enhance the protection of critical infrastructures across the EU against all types of threats and hazards. It does so by providing a framework in which experimental facilities and laboratories can share knowledge and expertise. Hereby, protocols throughout Europe can (ultimately) be harmonised.
- **COSMIC** (ongoing): COSMIC proposes a novel technological approach for the detection of CBRNE materials hidden in shipping containers. COSMIC project includes research, design and implementation of a three stage (primary, secondary, focused manual inspection) detection system using new set of innovative sensors in all 3 stages. The COSMIC system is built on top of the existing flow and the systems that are in use at the existing security flow. Each one of the stages will include all CBRNE sensors that will be combined from existing and new COSMIC sensors.
- **GIFT-CBRN** (September 2014 – august 2017), short for Generic Integrated Forensic Toolbox for CBRN incidents, developed a forensic toolbox for investigating CBRN incidents. This toolbox provides (1) procedures, sampling methods and detection of CBRN agents at the crime scene, (2) traditional forensic laboratory methods for contaminated evidence and (3) laboratory methods for profiling the CBRN agents released at the incident.
- **MELODY** (ongoing) intends to develop a harmonized CBRN training curriculum for first responders and medical personnel. Practitioners will be actively involved throughout the development and fine-tuning of the curriculum and, therefore, the trainings will be needs-based and grounded in the reality on the ground.

In addition, the European Union Chemical Biological Radiological and Nuclear Risk Mitigation Centres of Excellence Initiative (or EU CBRN CoE)¹⁶ aims to strengthen the institutional capacity of countries outside the EU in terms of mitigating CBRN risks. The EU CBRN CoE invites partner countries to assess needs, offers to assess risk dimensions and supports partner countries in developing national CBRN action plans. The overall goal of the CoE is to promote a culture of safety and security with regards to CBRN for Europe through its region.

Possible synergies (and links to policies and practitioners' operations)

For an overview of CBRNE-related projects funded prior to 2018, see section 5 (CBRNE threats) of DG HOME, "Community of Users on Secure, Safe and Resilient Societies – Mapping Horizon 2020 and EU-funded Capacity-Building Projects under 2014-2017

Programmes". 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.

Lessons learnt, challenges and way forward

The core challenge in the CBRN-E domain results from the low probability and high impact of the events. As a result of the low probability, authorities and organisations struggle to find sufficient resources to implement innovations and changes. However, given the vast impact that CBRN-E event can have, the EU would benefit from integrating CBRN-E strategies across various policy domains. In addition, enhancing efforts to align research, development and innovation activities could help to avoid duplication and conflicts of interests. Furthermore, moving forward more efforts are required to highlight the E in CBRN-E.

Exchange of knowledge is not only necessary on the national or European level; also within an organisation (i.e. between safety and security) further cooperation is needed. A solution identified during the 13th CoU event was an obligatory 'traineeship' of engineers in the safety domain in order for them to understand this domain better and to, subsequently, build bridges between the security and safety field.

16 www.cbrn-coe.eu

In the years to come, the application of technologies is expected to form a serious challenge. The integration of technology in the domain of CBRN-E helps to eradicate human errors but, on the other hand, it exposes the systems and, in that sense, enhances the vulnerability of the EU in terms of cyber attacks. Nevertheless, technologies are not only vulnerable to external threats, the impact of Artificial Intelligence and the risks this brings along need to be better understood.

Furthermore, it is essential to maintain the practitioner perspective at the core of CBRN-E activities, rather than a strong academic approach. In order for innovations to become successful, research should to address the needs of practitioners. In the domain of CBRN-E, implementation of new technologies and methods is key and, therefore, significant attention and resources need to be dedicated towards training practitioners.

Finally, building trust between Member States and different stakeholders on the European and national level is essential to ensure the exchange of knowledge and the development of capabilities. Best practises identified in one Member State are to be shared across the European Union in order to develop a level playing field. In addition, the EU CBRNE domain (and in particular CIMIC) could benefit from developing a more standardised legal framework (that would benefit cross-border cooperation).

Moreover, the EU could benefit from reaching out to partner countries to improve their CIMIL capabilities and capacities in mitigating incidents and disasters. An example of the collaboration with such partners is DG DEVCO's request to strengthen Morocco's CBRN first responders by sending a mobile training team from NATO's CBRN Defence Centre of Excellence.

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Forthcoming CoU events & other related events

- 14th CoU event, 16 – 20 September, Brussels, Belgium
- 13th CBRNe Protection Symposium and Exhibition of CBRNe protection equipment, 24 – 26 September, Malmö, Sweden
- Security Research Event, 6 – 7 November, Helsinki, Finland

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