IMPROVED RISK EVALUATION AND IMPLEMENTATION OF RESILIENCE CONCEPTS TO CRITICAL INFRASTRUCTURE

D1.5 Report of operator workshop 2

Marianthi Theocharidou[1], Athina Mitsiara[1], David Lange[2]

Contributors: Helene Degerman[2], Laure Fallou[4], Laura Petersen[4], Bjarte Rød[6], Elisa Serafinelli, Terese Urth[3], Karolina Storesund[5]

1.   European Commission, Joint Research Centre
2.   RISE Research Institutes of Sweden
3.   Danish Institute of Fire and Security Technology
4.   European-Mediterranean Seismological Centre
5.   RISE Fire Research AS
6.   UiT The Arctic University of Norway

Deliverable Number: D1.5

Date of delivery: 12th January 2018

Month of delivery: M32

Coordinator:	David Lange at SP Sveriges Tekniska Forskningsinstitut (SP Technical Research Institute of Sweden)

Table of Contents

1   Executive Summary

IMPROVER is a Horizon 2020 project focusing on how to improve European critical infrastructure resilience to crises and disasters through the implementation of resilience concepts to real life examples of pan-European significance, including cross-border examples.

The project, in collaboration with the JRC's European Reference Network for Critical Infrastructure Protection have planned to organise three annual workshops for CI operators and with a theme related to IMPROVER.

This is the report of the second workshop of the series, which was held in JRC, Ispra (Italy) on the 11th and 12th May 2017. The report outlines the planning and the minutes of the workshop, as well as the themes of discussion that emerged during this two-day event.

Over 50 operators, experts and researches joined forces for two days of presentations, knowledge sharing, and networking.

2   Nomenclature

CI	Critical Infrastructure
CIO	Critical Infrastructure Operator
CIP	Critical Infrastructure Protection
DG HOME	Directorate General for Migration and Home Affairs, European Commission
ERNCIP	European Reference Network for Critical Infrastructure Protection
EPCIP	European Programme for Critical Infrastructure Protection
TG	Thematic Group

3 Planning

3.1 Aim and theme

Like last year's workshop, this workshop was prepared in a collaborative manner between the IMPROVER consortium and the JRC's ERNCIP office. This joint approach was selected back in 2016. This way the workshop would serve as a continuation of JRC's ERNCIP series of operators workshops[1] and at the same time, the IMPROVER project could raise awareness of the projects goals as well as obtain feedback from operators, ensuring a more widespread and efficient uptake of the projects results.

This series of three joint operators workshops are contributing in a complimentary way to the activities of WP1 in collecting requirements and expert feedback by relevant stakeholders. The first one took place in April 2016 and its results are presented in Deliverable D1.4 Report of operator workshop 1. For the first joint workshop, the following aim was defined: "*to strengthen the collaboration with CI operators and to receive feedback on their requirements and practises with respect to resilience*". This goal continued also for this second workshop, which also shared the same main theme of "Resilience of Critical Infrastructures".

However, this year's workshop placed emphasis on organisational and community resilience. As Laura Petersen (EMSC) stated during the workshop "*Community resilience is important because it brings together all actors in order to better respond to crisis and disasters*". Timothy Prior (ETH) also stated the importance of not only focusing on the technical aspect of resilience but also focusing on community resilience. He identified two important aspects of organisational resilience: anticipation and adaptation. To be able to anticipate, what might happen through scenario planning, strategic planning, and capability assessments is extremely important for organisations to prepare. However, it is equally as important that organisations are able to adapt and respond to situations. An organisation can then change behaviour and processes in order to adapt to new situations so that it can respond in better ways in the future.

3.2 Design and planning

The workshop was designed as a two-day event, in the same format as its predecessor. For each of the above-mentioned themes, dedicated, group-based working sessions were designed to explore them further.

The participants were assigned to three different groups. Each group was facilitated with experts from the IMPROVER project, who had the responsibility to moderate the discussion, take notes and report to the plenary. To drive the discussion, a set of predefined questions was prepared in advance. These were provided to the moderators of the working sessions as guidance. The moderators received instructions before the sessions to not limit the group to strictly discuss these questions.

Both IMPROVER and ERNCIP provided contacts for invitation, in addition to the associate partners in the project. The aim of this year's workshop was to include as many operators as possible, but we also extended the invitation to participants who were representatives of governmental services, as well as representatives by other H2020 projects (DRS-07 and DRS-14).

---

[1] https://erncip-project.jrc.ec.europa.eu/networks/opworkshops

The invitation process followed a two-step procedure, where potential participants were asked whether they wish to receive a formal invitation and then, upon receipt of interest, JRC issued a formal invitation. In total, the workshop gathered 54 participants, including CI operators, representatives of governmental services, as well as civil protection and infrastructure protection and resilience experts.

Moreover, invited speakers were identified, to complement the working sessions of the workshop and enrich the discussion. The final agenda is presented in Appendix 1.

4   Workshop Minutes

This section outlines the main observations of the workshop. For additional information, the reader can also consult this page, where all presentations are available on the ERNCIP website[2]. Moreover, **a video from the event is available online[3].**

4.1   Presentations

4.1.1   Day 1

Welcome by DG JRC

Georgios Giannopoulos (JRC) opened the workshop and provided an overview of the RESIST project's activities. He stated that the interest for Resilience as a term has extended from the Resilience of the Critical Infrastructures to the Resilience of Societies. He mentioned that the Societal Resilience is the core of the IMPROVER project, in which JRC participates, and which scope is to bring together the research community with the CI operators. He stressed the need to raise awareness concerning the challenges that the modern societies face and therefore to develop training programs (resilience indicators, risk assessment, etc.), which will facilitate the application of the resilience principles into the real world. He stated that Resilience as a theme is a high political priority for the European Commission and that there are a number of relevant initiatives:
- A communication in progress by the external action services
- The revised EPCIP (2013)
- The Cyber-Resilience Strategy
- Four new H2020 projects for the "Resilience" thematic, whose results will provide input to policy decision-making.

IMPROVER project: Improved risk evaluation and implementation of resilience concepts to critical infrastructure

David Lange (SP Technical Research Institute of Sweden) presented the H2020 project IMPROVER. The main objective of the project is to "***Improve European critical infrastructure resilience to crises and disasters through the implementation of combinations of societal, organizational and technological resilience concepts to real life examples of pan-European significance***". That means to understand the definition of resilience and how it can be measured, and to develop methods and tools for the operators to measure, evaluate and improve the resilience of their infrastructure and

---

[2] https://erncip-project.jrc.ec.europa.eu/events/2nd-improver-erncip-joint-operators-workshop-2017

[3] https://vimeo.com/220636901/7dc07c7afe

continue providing the service required. The projects' stakeholders work within four "living labs", comprised of the projects associate partners; the Oslo harbour region (Sweden), the Oresund region (Denmark), the A31 highway (France), the water supply and distribution in Barreiro (Portugal).

Resilience is approached as a multidisciplinary concept with several dimensions (technical, organizational, social, economic), the successful implementation of which to CI "relies on its successful integration in existing security activities; including the risk assessments at a CI operator, a system and a national level". The project's life cycle was then presented in detail. It has been implemented in three stages:

- Stage 1: A **survey** of available approaches for the definition, implementation and evaluation of resilience concepts to critical infrastructure
- Stage 2a: An **evaluation** of promising available approaches
- Stage 2b: Further **development** to improve their effectiveness, linking the developed approaches with EU risk assessment guidelines
- Stage 3: A **demonstration** of the methodologies, which are presented in the guideline, in operation

Finally, the purpose of the workshop was defined; increase the collaboration between the operators and established networks, as the ERNCIP and IMPROVER, with the aim to improve organizational resilience and achieve community resilience.

European Reference Network for Critical Infrastructure Protection: update on activities

Peter Gattinesi (JRC) provided an overview of the ERNCIP project, "a JRC-facilitated network of security related experts volunteering to address issues of pre-standardization at EU-level, towards fostering the development of innovative and competitive security solutions". Its core activities include the facilitation of Thematic Groups (TGs) and the ERNCIP Inventory of 124 CIP-related experimental facilities. He focused on the proceedings of the currently running TGs: Chemical/Biological (CB) Risks to Drinking Water; Radiological/Nuclear threats to critical infrastructure; Detection of Indoor Airborne CB agents; Detection of explosives and weapons at secure locations; Protection of structures and soft targets; Extended Virtual Fencing – application of video and biometric technologies; IACS components Cybersecurity Certification Framework; A couple of events, conferences and initiatives were presented:

- The "Water" TG , a successful example of a 2-year thematic group with a wide participation of operators, with focus on the outcomes of the last conference on water security and safety and the proposal of a Water Security Plan for water utility operators to complement their Water Safety Plans
- An ERNCIP/Global Initiative to combat nuclear terrorism, a joint workshop in Ispra, March 2017, where experts from the nuclear security field discussed the roles and responsibilities, challenges, and opportunities of technical expert support within Nuclear Security Detection Architectures, in the event of a serious radiation event.
- The completion of the Detection of Explosives and Weapons in Secure Locations thematic group, the outcome of which was the "Secure perimeter", a plan for establishing secure entrances of critical sites)
- The launch of the Extended Virtual Fencing thematic group, which will assess the use of biometric/video technologies which now provide the possibility to perform risk mitigation at a distance, enabling more effective human intervention.

Building resilience using business continuity management systems

Ricardo Messias (EDP) presented the EDP approach on building resilience. He stressed the difficulty to define the term resilience and understand the frameworks to take into consideration. He concluded that exploiting the business continuity management principles is an effective way to ensure organizational resilience. He referred to the recent incident in Lisbon airport as a typical example in which the infrastructure could have remained resilient, if an effective business continuity program had been in place. EDP has tailored the ISO 22301:2012 standards series to make it operational to their own reality, culture and external environment, with the scope to ensure business continuity. The analysis and implementation of the standards include the following stages:

- The identification of the critical processes and activities
- The business impact analysis and the prioritization of activities
- The assessment of implemented measures and proposals for new ones
- The establishment of processes, crisis management and communication plans to ensure continuity
- The execution of exercises and tests to establish an effective communication among the different units involved
- The definition of responsibilities, the promotion of awareness and additional measures to be implemented

The company's approach for the business impact analysis and the risk assessment is resource -people, physical infrastructure, technological infrastructure, suppliers- loss-based rather than scenario-based. The significance of the exercises was stressed. It's crucial to bring together the IT experts, the dispatch center, the higher management, etc. so that everyone understands their roles.

Consequently, with deeper awareness of the vulnerabilities, more comprehensive plans and higher focus of all actors, you can anticipate, prepare, respond and adapt to the challenges to come, which is what the concept of resilience is about. Therefore, the standards for business continuity is a comprehensive tool towards building resilience.

The audience inquired about the "resource loss"-based approach in the exercises design. The response focused on the importance of the human resources actions and "how" they respond instead of "what" type of threat they have to deal with. Another comment was about the difficulties that EDP faced in order to put in place their business continuity program. It was stated that before 2013, even the term BC was relatively unknown, although there were contingency/emergency plans in place. The importance of the human factor was stressed. People tend to comply easily with plan that concerns critical services, but not for less critical assets. There is a real benefit from establishing a close collaboration, with remote teams in particular, so that they understand the importance of back-up plans.

The Trans Adriatic Pipeline Security Management System

Mark Lindsay (Trans Adriatic Pipeline-TAP) presented the TAP project and its security management system. TAP is a high priority energy Project of Common Interest (PCI), since it promotes security and diversification of energy supplies in Europe. The project's mission is to safely deliver Caspian Gas to Europe by 2020. The project's objective is to identify the security risks and the political variations of the different areas where the project takes place, and implement mitigation measures which comply with national security laws and international standards. The security management cycle, based on ISO 28000, was rendered in four sections –governance and organization, security risk assessment, security risk mitigation, assurance and continual improvement- and presented in detail. It was also stated that TAP complies with the voluntary principles on security and human rights, which comprises three main parts: risk assessment, interactions between companies and public security and interactions between companies and private security. The presentation concluded with the security challenges that the company has faced in Italy, including a number of political and economic threats,

such as crime and terrorism at national level, but also local security risks. A list of mitigation measures was provided as well.

The presentation triggered discussion on the way the company collaborates with the local communities and how communication among the groups can be established. The common practice of the company is to identify the key-persons involved and open communication channels. It has built a comprehensive communication strategy which is generally successful. Although the local governance can still oppose to certain decisions, the company responds with transparency. The importance of the interaction of the company with the citizens and the efforts for the community engagement through effective communication channels (also through social media) was identified. The case of Italy was used as an example in order to provide some lessons learned and confirm the above-stated arguments; a) the communication of the company with the public has always been transparent, by issuing individual statements on any comment/concern of the community, b) the law enforcement availability to be taken into consideration during the design of the projects' operations. Finally, it was mentioned that the company has applied the Enterprise Risk Management framework (ISO: 31000), which is very detailed for the oil & gas sector, has taken into consideration the Cyber-security aspects and constantly develops systems to forecast and calculate risk probability.

H2020: The ResiStand Project – Increasing disaster resilience by establishing a sustainable process to support standardization of technologies and services

Pettri Woitsch (Geowise) presented the EU-funded ResiStand Project, including its objectives and approach, as well as its expected impact and future steps. The concept of standardization and the types of standards were presented. The focus was set on the issues concerning the standardization of the Disaster Resilience on European level, namely the constant increase of the number of disasters (all-hazards), the inadequate participation of the stakeholders, the slow progress of the working groups, etc. The objectives of the project were summarized into three main ones: 1) new proposals for standardization (roadmap, plans, ideas), 2) understanding the potential of standardization (evaluation, constraints, impact), 3) a new sustainable process to improve standardization (new workflows, matching of demand-supply of standards, efficient dissemination). The ResiStand Assessment Framework (RAF), taking into consideration the needs of the supplier and the end-user community and the available work of the standards community towards establishing a standardization roadmap at European and international levels, leading to new standards and its consequent contribution to disaster resilience, was presented in detail. Finally, the next steps of the project and a couple of future events were announced.

A discussion on the high cost of implementing the concept of resilience and the difficulty in finding experts who can contribute to the latter was initiated. It was highlighted that one of the projects objectives is to try to avoid standards that are very specific and thus should be handled on National level. Instead the importance that EC develops EU-wide applicable standards was stressed.

Understanding the drivers of Organizational Resilience by CICERO, Organizational Resilience Engineering and Research Centre

Max Moulin (CICERO Association) gave an overview of the activities of the Organizational Resilience Engineering and Research Center. Their approach on the OR concept and its application was presented. An interesting concept was presented, i.e. the role of the "toxic handler", which refers to an individual that facilitates the resilience of firms during crises (Teneau, 2010). Their various types and characteristics were analysed, as well as their importance during crises. Such aspects of human resilience are a very important part of organizational resilience.

Particular emphasis was put on the MIRO operational model, which stands for Measurement Indicators for Organizational Resilience, and aims at evaluating the OR. The model is based on the life cycle of a crisis (Before, During, After) and integrates the three components of the Organizational Identity (Structure, Strategy, Management).

The DARWIN Resilience Management Guidelines and their testing in Healthcare and Aviation related Pilot Cases

Luca Save (DBL) presented the DARWIN project, which scope is to develop Resilience Management Guidelines (DRMG), to help CI stakeholders create their own guidelines/procedures towards improving resilience. The guidelines primarily refer to the Air Traffic Management and the Healthcare sector and are meant to be extended in other domains.

The DRMG development process was divided in two working packages. The first one includes among other interview studies with relevant stakeholders and the development of resilience concepts for the evaluation of the DRMG. The second work package includes the design of Concept Cards and the development of a Guideline Repository in a WIKI format. A number of Pilot Exercises were listed to reflect the different reference crisis types, with focus on the exercise which was about an aircraft crashing in an urban area close to Rome Fiumicino Airport, shortly after taking off. The audience were interested to find more about the exercises that were conducted, the information sharing among the authorities involved and the communication with the public.

AESOP: Guidelines for effective communication between Critical infrastructure operators and the public during crisis situations

Elisa Serafinelli (University of Sheffield) presented the AESOP guidelines developed as part of IMPROVER, the objective of these guidelines is to promote the effective communication between the CI operators and the public during crisis situations. The development of the guidelines comprised an analysis of the information-seeking behavior of the public (traditional and social media at local, regional and national level) and stresses that the CIOs should review their current communication strategies to meet the expectations of the audience. The need to engage the key stakeholders in order to ensure message consistency across traditional and social platforms was stressed. Particular emphasis was put on the exploitation of the social media, which can be used to provide real-time updates to citizens about the progress of the recovery of the services. It was mentioned that the information dissemination by the CIOs should comply with the national frameworks addressing emergency management organizations. Finally, the importance of the regular review of existing communication protocols and the establishment of communication channels where the public can provide information about the interrupted services were highlighted.

The presentation prompted discussion about the use of social media, its reliability and the credibility of the information spreading during a crisis. A combined use of traditional and social media was suggested. Several CIOs provided examples over their practices for retrieving information from the media. The establishment of an internal communication team which verifies the information and the engagement of external players (i.e. trusted journalists) in order to disseminate accurate information to the public were considered.

4.1.2   Day 2

Socio-technical Resilience – Center for Security, ETH Zurich

Timothy Prior (ETH) presented some of his work on Socio-technical Resilience. His work approaches CIs and the community as an interdependent socio-technical structure and distinguishes Resilience from the concept of the Business Continuity Management. It was stated that the technical structure is the basis for approaching the concept of resilience, however the social elements are important and should be taken into consideration. The proposed methodology analyses the correlation of the object resilience and reliance of the technical structure in order to understand the direct/indirect relationship of the objects and how resilient they are. Other aspects to be taken into consideration are the ability to anticipate and the ability to return to normal, or even better, level of operations. In order to ensure the system preparedness, it is important to invest in strategic planning and identify what is likely, probable and possible. The establishment of dedicated info-sharing and lessons-learned structures is imperative in order to achieve system preparedness. Lastly, the concept of "Panarchy" was introduced to describe the adaptation-cycle of the system; Conservation, Release, Re-organization, Exploitation.

The audience debated on the benefits of information sharing. The fact that stakeholders are hesitant to share their experience and that a significant level of trust needs to be built was highlighted. The limitation that some countries are less mature to contribute to the information exchange than others was identified. Lastly, sharing information on how to reach individuals in a crisis and the ways that people find, interpret and act on these information was suggested.

Enhancing Community Resilience: a U.S. Perspective

Kathleen Almand (NFPA) presented the US approach to Community Resilience and Critical Infrastructure Resilience. The NFPA scope is to develop standards that facilitate emergency response and business continuity, and build protection. The focus was set on the adaptation of existing systems to respond to a crisis. Two similar cases of natural disasters in the city of New York and New Jersey were presented to highlight the differences in the preparedness of the systems. Moreover, the US strategies and regulations on resilience and disaster management were introduced as well as the NIST Community Resilience Planning Guide, a practical methodology to set priorities and allocate resources to reduce risks. The planning steps for Community Resilience and the challenges of interdependencies were discussed. The difficulty of the communication between the many disciplines, methods, vocabulary, input and output data was highlighted.

The presentation prompted discussion on the variations of the emergency response frameworks per area. It was highlighted that the FPRF framework is a guide, however, with a mandatory language. Concerning the communication with the public, the existence of a standard for an emergency communication language was mentioned. Lastly, the audience inquired about the lessons learned from the "Katrina" case. The evaluation of the case revealed the lack of emergency evacuation planning and the non-enforcement of federal regulations on local level.

Smart Mature Resilience (SMR)

Pierluigi Potenza (Risorse per Roma S.p.A.) presented the SMR project which focuses on Urban Resilience. The project's objectives include the development of a System Dynamics Model (SDM) and a Resilience Engagement and Communication Tool to integrate the public in the "Community Resilience".

The overall scope of the project was defined as to develop Resilience management guidelines for urban environments. It was highlighted that, in the case of a city (Rome case), there are numerous interdependencies and rinks to identify, as well as many socio-dynamic and environmental challenges (e.g. immigration, terrorism, climate change) to take into consideration. Lastly, it was mentioned that a communication tool, concerning an experimental Early Warning System for heavy precipitation in the

area of Genoa (Italy) that broadcasts targeted text messages, is under development - the use of social media was not considered due to lack of reliability.

From Crisis Management to Community Resilience – A railway perspective

A joint presentation was held by Grigore Havarneanu (UIC Security Division) and Laura Petersen (EMSC) on an integrated railway crisis management plan with focus on crisis communication. The project concerns passengers, freight and rail systems and examines the impact of security threats and risks for railways. It covers the whole Crisis Management cycle and analyses the human behavior during major incidents. A survey was conducted to identify the public expectations of CIOs in crisis situations. The findings of the survey reflected the expectation of the public for continued mobility after crisis and the participation of operators to provide aid. The latter has been the introductory part of a benchmark study which concluded in the development of Recommendations for Crisis Management, dedicated to the railway sector. The structure and content of the crisis management plan were presented in detail. The final part of the presentation comprised the expectations from CIOs to establish effective crisis communication channels. The need for preparing a Crisis Communication Plan was stressed. Finally, a deeper analysis of the Business Continuity and the Crisis management aspects will be conducted to study further and meet the public communication expectations (IMPROVER project towards developing a communication strategy).

The audience inquired details about the crisis management methodology. A number of energy operators were interested to know whether a similar crisis management plan exists for the energy sector.

Presentation of the IMPROVER tool and framework

Miguel Mira da Silva (INOV) and David Lange (RISE) presented the IMPROVER resilience analysis tool and the IMPROVER Critical Infrastructure Resilience Framework. The IMPROVER Critical Infrastructure Resilience Framework integrates the paradigm of resilience into the paradigm of risk assessment according to ISO 31000. It is based on a mapping of the definitions for risk management to a resilience management process and is intended as a process for resilience management of Critical Infrastructure. It relies on different methodologies developed within the IMPROVER project for resilience analysis, and resilience evaluation and has helped the consortium to identify where existing risk management activities can be complemented by resilience. The tool is web based and supports the application of the Resilience Framework as an online platform for the definition of resilience analysis and assessment frameworks, and their application through the assessment of different indicators.

The framework for CI resilience management is scalable and was also illustrated in application to societal resilience framework which could inform national risk assessments.

Much of the discussion which followed the presentation of the framework revolved around the relationship between Critical Infrastructure resilience, governance of Critical Infrastructure risk management and how these can be incorporated into the national risk assessments. One of the participants shared a comment about how loss of Critical Infrastructure is incorporated in their own national risk assessments, however without consideration of the recovery capability when doing the risk evaluation.

4.2   Working Sessions

4.2.1   Working Group Discussion: Organizational resilience for CI operators

On Day 1, the three groups discussed, based on the following driving questions:

- How does the resilience concepts discussed today relate to your current practices (e.g. risk management, business continuity)?

- Based on what you have heard today, would you incorporate resilience in your current procedures? Are there sector-specific characteristics that make this more challenging?

- How do you ensure the resilience of your personnel? Can the resilience concepts discussed today affect your corporate approach to awareness raising, training and exercises?

- Do you think new resilience standards would benefit your organization?

- Do you identify any gaps in your business processes with respect to resilience where standardization could help?

- Are there obstacles in such an approach?

- One may argue that "hard" standardization may hinder the capacity of an organization to adapt? How would/do you achieve a balance in your organization?

Group A reported that there is need for flexible standardization, as not all situations are the same. Standards need to consider the different pre-conditions (scale, geography, organization size, context, sector, etc.). Also, a revisit to existing standards may be needed, as not all are considered to be essential.

Operators value significantly training and exercises and the opportunities such activities offer to "get to know each other". They identified challenges, such as collaboration or communication barriers, when dependencies with other countries or other operators/sectors need to be taken into account. They also highlighted the need for various types of exercises, with emphasis on practicality and more real-like exercises as opposed to table-top ones. The operators expressed the need for an information sharing platform to share best practices, standards, and good example cases. This will allow the expression of different views, beyond traditional risk approach.

Finally, the group felt that at the moment the tools available are not mature enough to measure resilience (especially across sectors or MS) and a checklist approach is not enough. Key factor for progress would be to identify concrete examples of how resilience can benefit the organization.

Similarly, **Group B** identified the importance of resiliency as a change in way of thinking and going beyond planning. To this end, the operators reported that they are not interested in Standards with a capital S, but very interested in guidelines/best practices so as to not have to start from zero. Also, operators don't welcome further legislation, but are aware that legislation can provide some incentives or that it levels the playing field. The main obstacle identified for implementing resilience was the inability to quantify return on investments for resilience.

The group also highlighted the importance of education and understanding of resilience before one operator can try to implement resilient practices in his/her organization. This relates to the need for a shift in organisational culture in accepting the resilient way of thinking. As a first step, common terminology and common understanding (internal and external) were identified. The operators demanded workshops and/or working groups (sector specific, or cross sectorial) where operators can come together and discuss resilience, as a key way to propel resilience thinking forward. Moreover, identifying personnel that have resilient characteristics (ex. Toxic handlers) can be another step, while keeping in mind that resiliency can be taught, e.g. through improvisation exercises and the use of non-linear thinking.

Group C also discussed the need for more dynamic standardization as well (stable vs flexible standards). In the process of standardization, previous experience from other operators is important. Standard is considered to be a checklist which describes the whole process that the organization is supposed to follow when disturbances happen. It shall document the basic level of resilience that the operator shall guarantee. The group identified interoperability, dependencies, new technologies and

emerging threats as key challenges, coupled with the difficulty to achieve a unique regulatory framework.

Business continuity has been discussed and there was not a unique interpretation of its relation with resilience. However, training and exercising are considered to be very helpful to build resilience. Such efforts shall be realistic, challenging, and focusing on people so that social learning can be inspired. Experience sharing is also extremely important, in terms of understanding the operators interdependencies, enhancing the flexibility, adaptability and credibility of BCPs, and the potential collaboration before, during and after risks. Challenges in joint training/exercising/collaboration appear when cross-border operator or various administrative levels are involved. Implementation of a consistent national CI protection strategy is still a pending issue. Education of operators, and the public during all phases with training and exercises.

4.2.2 Working Group Discussion: Community resilience

On Day 2, the three groups discussed, based on the following driving questions:

- In your context (sector or country), which elements do you consider as key enablers for collaboration between CI operators and public authorities?

- Is establishing a public-private partnership important? Based on your experiences, what could be potential obstacles?

- Do you participate in any joint exercises within your sector or across sectors? Do you collaborate with Civil Protection?

- What means of communication do you use? Do you use social media or any other means (normally and during crisis)? Is this part of a corporate communication plan?

- Do you communicate with the public? With other CI operators? With public authorities?

  o Explain whether this is a two-way communication.

- Do you seek feedback from the public? Have you considered the use of crowd-sourcing?

- Are your communication data used for post-disaster learning?

When considering community resilience, **Group A** reported that it is useful to consider cultural differences, as some countries may appear more mature than others. There was agreement that CI operators should improve collaboration in order to identify cascading effects. But there was a difference in opinion as to whether collaboration should be mandatory or on a volunteer basis. For this reason, establishing trust ensuring clear roles are very important. Moreover, CI operators and the public should promote community resilience by involving people and establishing roles to representatives. Key elements are leadership and training of both operators and the public.

Group A commented that communication is essential but the quality of communication is very important as well. The group elaborated on various communication means, such media, e-mail, sms, social media, communication platforms for emergency response and disaster management, advertisement, or dedicated applications developed for this purpose. The communication may also vary depending on the event.

Group B discussed Private-public Partnerships and all stated that they have to collaborate with authorities and even amongst themselves (depending on the geographical scale), but that there are issues with cultural differences. Moreover, sensitivity in sharing information and the necessity of trust

between actors are key factors for a successful PPP. This group also identified the need to clearly define the roles of each actor.

With respect to communication, even though there is high social media use, the operators do not feel confident about using it, especially in consideration of high public expectations to respond to queries. Radio is an important communication tool for communication in the organization of the operator, between operators, and between operators and emergency services. The resiliency of radio is recognized by actors. There was also discussion about the use of SMS vs. cell broadcast. Finally, the privacy issues as well as costs are key parameters to consider when making a communication plan.

Group C focused more on communication. There is the necessity of communication plans, but differences among operators and stakeholders exist, as some have communication plans, while others do not. The group identified factors that can make the communicative processes more difficult to establish, such as hierarchy structure within the organization. They also highlighted that communication is dependent on the type of threat, which may affect the way they need to inform the public. According the group at the moment there is not an established process to evaluate the feedback received by the public, which can be equally important to communication the public. The group has not reported the use of crowdsourcing tools.

5   Future steps and acknowledgements

One more workshop is planned for Spring 2018. The workshop will not take place in Ispra, but at the INOV premises in Lisbon, Portugal. This will be the concluding workshop of the project and its goal will be to bring together operators and policy makers. The project will seek to collaborate further with the other H2020 projects working in the same area, but to also demonstrating the results of the pilot implementations, one of which takes place in Barreiro, Portugal. Main goal is to provide future strategic input to the policy-making cycle (DG-Home). This would ensure that the results of IMPROVER, and of the other relevant projects, are further used at the EU level.

Finally, on behalf of ERNCIP and IMPROVER, we would like to thank the attendees and speakers of the workshop for their active participation and lively discussions, as well as the moderators of the working sessions for facilitating this dialogue. We would also like to thank the JRC colleagues who helped in organizing this event, especially Ms. Maria Giovanna Giuliani and Ms. Agnes Hegedus.

There are three heading levels included in the table of contents layout.

All body text should be Times New Roman size 11.

Please use single line spacing within the body of the text. Paragraph spacing should be twelve point, this is built into the 'Normal' style.

Tables and figures should be inserted in the body of the text. When referencing them from within the text, please capitalize them, i.e. Table 1.1 or Figure 1.1 as opposed to table 1.1 or figure 1.1. Do not abbreviate Figure to "Fig.".

6 Appendix 1: Agenda

This is the final agenda of the workshop.

2nd IMPROVER-ERNCIP Joint Operators Workshop

JRC Ispra, 11-12 May 2017

Day 1: Improving organisational resilience for critical infrastructure operators

Time	Session/Activity
09:00-09:15	**Arrival at the Joint Research Centre / Welcome coffee**
09:15-10:00	Welcome — Georgios Giannopoulos, JRC IMPROVER project update — David Lange, RSE ERNCIP project news — Peter Gattinesi, JRC
Session 1:	**Organizational Resilience for CI operators**
10:00- 10:30	Building resilience using business continuity management systems Ricardo Messias, EDP
10:30-10:45	Coffee break
10:45- 11:30	The inter/national security challenges and opportunities for the construction of a transnational gas pipeline across Europe Mark Lindsay & Claudio Moruzzi, Trans Adriatic Pipeline AG
11:30-12:00	Standardization needs on Resilience: the Resistand Project Pertti Woitsch, Geowise
12:00-12:30	Organisational Resilience Max Moulin, CIRERO
12:30-13:30	Buffet Lunch
13:30-14:00	The DARWIN Resilience Management Guidelines and their testing in Healthcare and Aviation related Pilot Cases Luca Save, Deep Blue Srl
14:00-16:00	**Working Group Discussions** *Group A: Bldg 100/Room 1102 Group B: Bldg 101/Room 1302
16:00-16:15	Coffee Break
Session 2:	**IMPROVER Activities and Results**
16:15-17:15	David Lange, RSE & Miguel Mira da Silva, INOV
17:30	**Departure**
20:00	**Social Dinner at Hotel Europa, Ispra**

Day 2: Achieving community resilience in collaboration with critical infrastructure operators

Time	Session/Activity
08:45-09:00	**Arrival at the Joint Research/Welcome coffee**
09:00-09:15	Day 2 Opening
Session 3:	**Community resilience**
09:15-10:00	Community resilience and socio-technical aspects Timothy Prior, ETH Zürich
10:00-10:30	Enhancing Community Resilience: a U.S. Perspective Kathleen Almand, US NFPA
10:30-10:45	Coffee break
10:45-11:15	Results of the SMR project Pierluigi Potenza, Rsorse per Roma Sp.A.
11:15- 12:00	From Crisis Management to Community Resilience: A railway perspective Grigore Havarneanu, UIC & Laura Petersen, EMSC
12:00-12:30	AESOP Guidelines for effective communication between CI operators and members of the public during crisis situations Elisa Serafinelli, University of Sheffield
12:30-13:30	Buffet Lunch
13:30-15:30	**Working Group Discussions** *Group A: Bldg 100/Room 1102 Group B: Bldg 101/Room 1302
15:30-16:00	Coffee Break
16:00-17:00	Results of the workshop and closing
17:00	**Departure**

http://improverproject.eu