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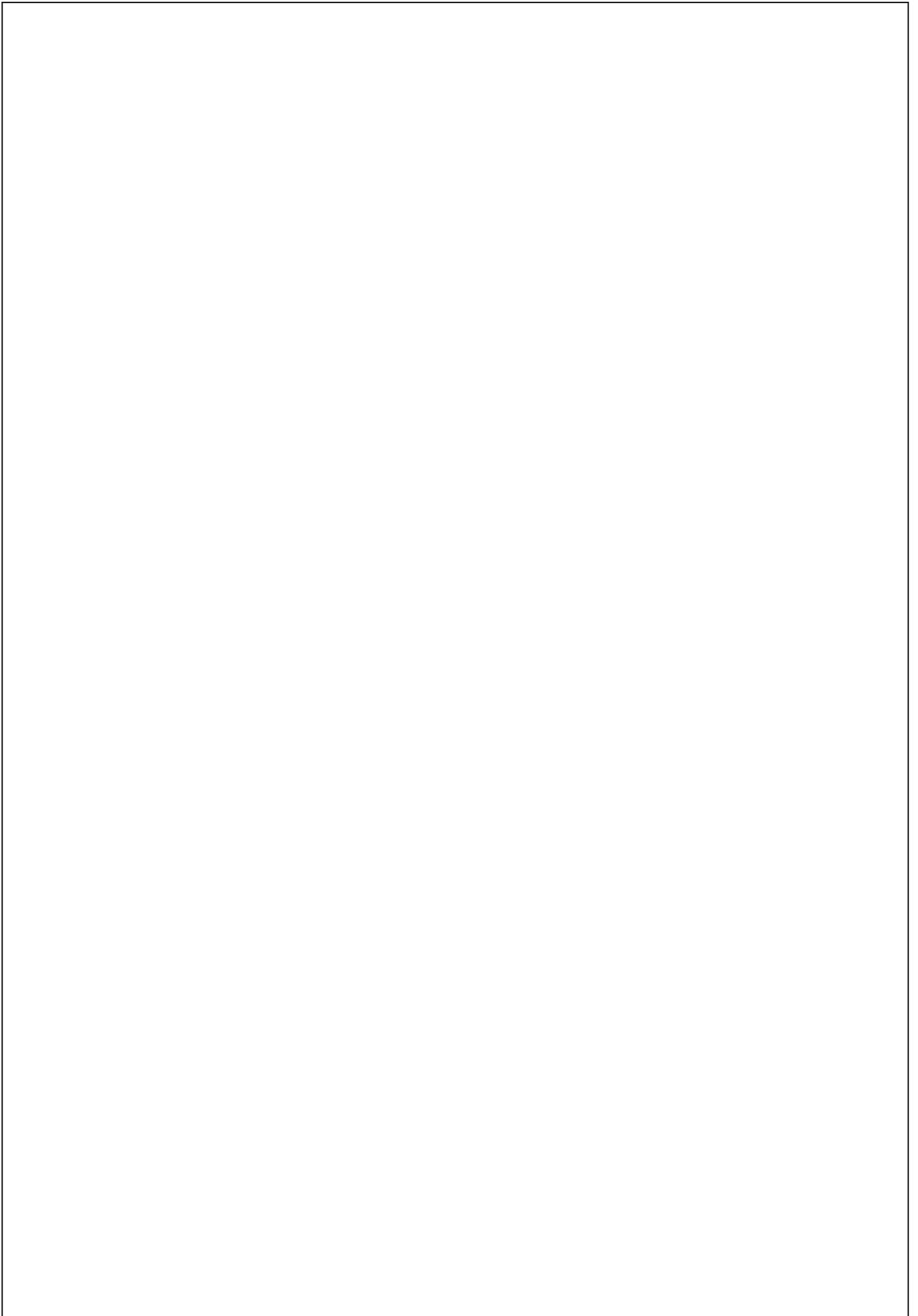
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Abstract

Deliverable D8.14 “MATRIX results to disaster management community” summarized the activities carried out during the MATRIX project. In contrast, deliverable D8.15 “Platforms and MATRIX community: Performance evaluation of interaction between platforms and the MATRIX community” assesses the interactions between MATRIX and its Cooperation Partners, including the National Platforms for Disaster Risk Reduction, the UN-ISDR, EC, CoE and other involved bodies (e.g., the private sector, including insurance companies). The current deliverable comprises also the synthesis of the stakeholder feedback sheets received after the 2nd MATRIX Stakeholder Workshop held in Königswinter on 27/28 June 2013.

Acknowledgments

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Table of Contents

| | |
|---|----|
| Abstract | 1 |
| Acknowledgments | 2 |
| 1. Introduction..... | 4 |
| 2. MATRIX and National Platforms – Assessment of major interactions | 7 |
| 3. Conclusions..... | 12 |
| Appendix I..... | 13 |

1. Introduction

One of the important tasks of WP8 was to establish and encourage interactions between the disaster management communities, in particular the National Platforms, and the MATRIX project.

In Europe, there are altogether 22 National Platforms for Disaster Risk Reduction (NPDRR). During MATRIX, 13 out of 15 (84%) selected European countries were involved with the project, as indicated in Tab. 1¹. This included 11 countries with an established NPDRR (50% of the total number), their members or designated representatives, and 2 countries without a National Platform (Austria and Iceland). This left only two of the selected countries not being involved in any of the performed interactions (Liechtenstein and the National Platform of Spain). As seen from Fig. 1, those who participated represented many different parts of Europe.

Furthermore, the MATRIX presentation held during the 4th meeting of the European Forum for Disaster Risk Reduction on 23-25 September in Oslo, Norway, gave the possibility further introducing MATRIX and to present some of its results to a variety of National Platforms, Civil Protection authorities, European agencies and the UN-ISDR² (United Nations – International Strategy for Disaster Reduction).

In addition to the National Platforms, **regional entities** were involved and informed about MATRIX, including the European Commission, the Council of Europe (CoE) and the ISDR Europe. Although National Platforms provided promising contacts to the **private sector**, including insurers and operators of critical infrastructures, gaining the involvement of these groups was challenging, although eventually the German Insurance Association was involved, while two other companies - the Icelandic Natural Hazard Insurance Company and The Austrian Railway (ÖBB) – asked to be kept updated on the progress of MATRIX.

Fig. 2 depicts the key interactions of MATRIX with the above discussed organisations and shows that from the very beginning of the project, Cooperation Partners were informed about and involved with MATRIX.

¹ For all interactions with National Platforms performed by MATRIX, please refer to Appendix 3 of the deliverable D8.14 “MATRIX results to disaster management community”.

² Albania, Armenia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Finland, France, Georgia, Germany, Hungary, Italy, Montenegro, Netherlands, Norway, Portugal, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Turkey, United Kingdom, DPPI-SEE, CoE, EC DG-ECHO, EC DG Climate Action, UNISDR, UNISDR Europe

| | Country | National Platform | Status of cooperation |
|----|----------------|-------------------|---------------------------|
| 1 | Austria | No | Confirmed cooperation |
| 2 | Bulgaria | Yes | Confirmed cooperation |
| 3 | Czech Republic | Yes | Confirmed cooperation |
| 4 | Croatia | Yes | Confirmed cooperation |
| 5 | France | Yes | Confirmed cooperation |
| 6 | Germany | Yes | Confirmed cooperation |
| 7 | Hungary | Yes | Cooperation confirmed |
| 8 | Italy | Yes | Confirmed cooperation |
| 9 | Liechtenstein | No | Cooperation not confirmed |
| 10 | Norway | Yes | Confirmed cooperation |
| 11 | Poland | Yes | Confirmed cooperation |
| 12 | Spain | Yes | Cooperation not confirmed |
| 13 | Sweden | Yes | Confirmed cooperation |
| 14 | UK | Yes | Confirmed cooperation |
| 15 | Iceland | No | Confirmed cooperation |

Table 1: National Platforms or other bodies that were contacted to be involved in the MATRIX project (note 13 out 15 accepted).

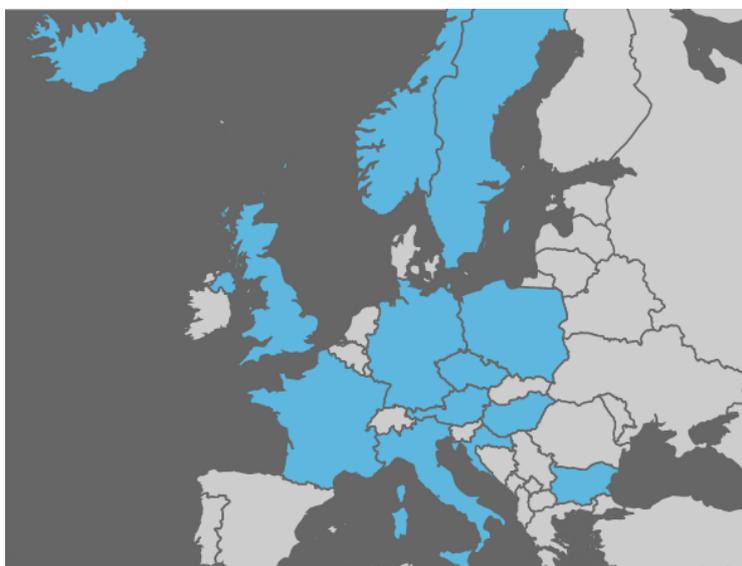


Figure 1: Coverage of MATRIX interactions with National Platforms, civil protection and other authorities across Europe.

Key interactions with National Platforms for DRR

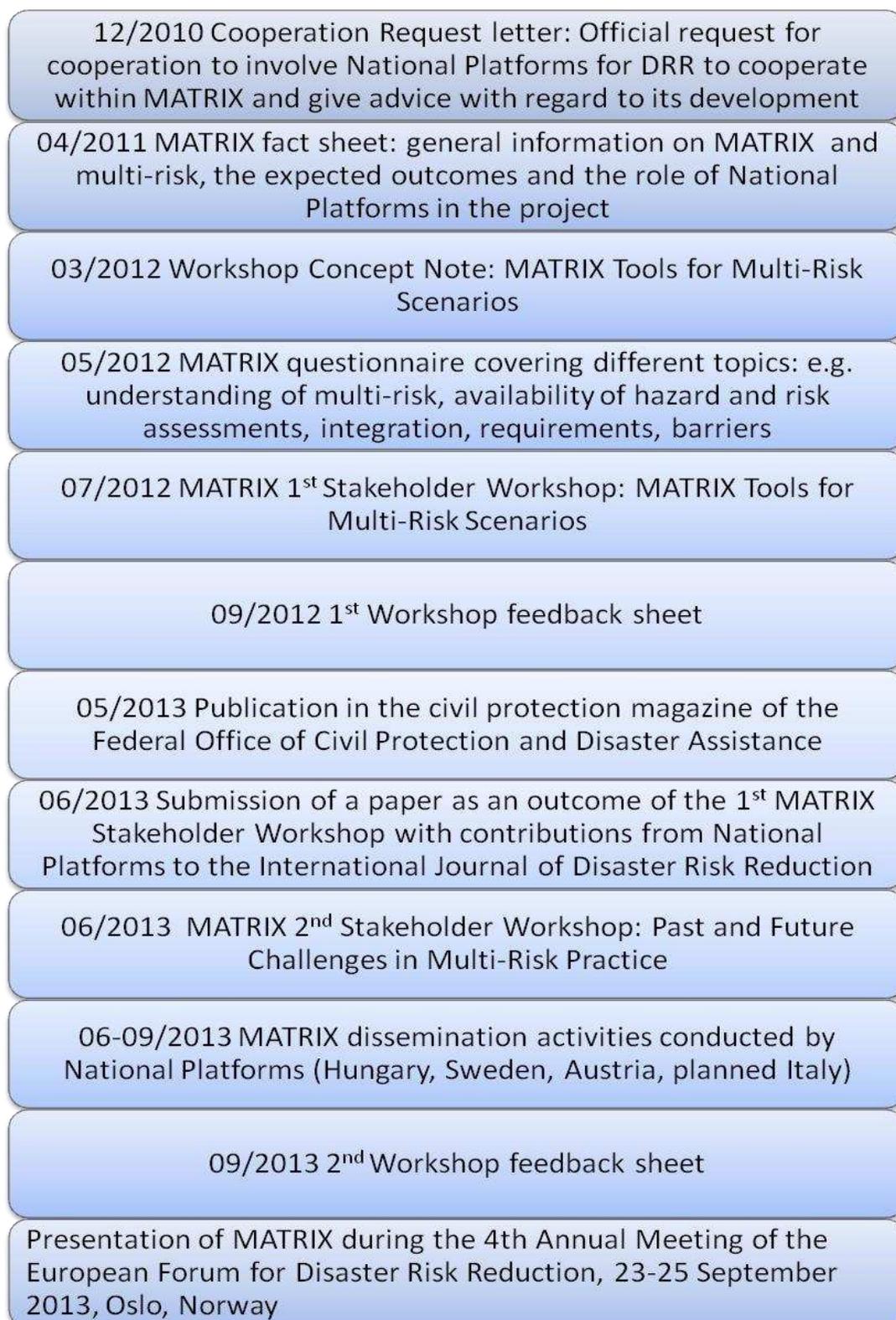


Figure 2: Key interactions with National Platforms for Disaster Risk Reduction during the MATRIX project

2. MATRIX and National Platforms – Assessment of major interactions

Knowledge and understanding of multi-risk

MATRIX changed the perception and understanding of multi-risk at different levels within these organisations.

It should be noted that multi-risk is a relatively new field in decision making processes and that there are only some preliminary, but not systematic multi-risk approaches among the involved Cooperation Partners. During an initial survey, stakeholders only mentioned a few cases where hazard interactions are considered, for example within the context of the impacts of hazards on critical infrastructures (see deliverable D8.11 “Contacts to National Platforms IV”).

Activities like the MATRIX fact sheet and the subsequent workshops enhanced the understanding of multi-risk among the Cooperation Partner, including the NPDRR, Civil Protection Authorities, UN-ISDR, EC, CoE and the above mentioned private companies. The activities clarified that the term multi-risk is dealing with hazard dynamics and interactions, including cascading and conjoint events and time-dependent vulnerability. This concept was new to various representatives and the interactions contributed to an improved and wider understanding of the term multi-risk.

Recognised potentials and limitations of the multi-risk approach in risk governance

The multi-risk approach was recognised as being helpful for risk governance, with the stakeholders understanding that the concept has the potential to improve the cooperation between different administrative levels in assessing hazards and risks, in sharing data and information and harmonisation of data. Generally, the MATRIX dissemination activities and the MATRIX IT framework (see deliverables D7.1 “MATRIX common IT platform” and D7.2 “Implementation of the Virtual City”) contributed to raising the political awareness among different European countries.

As multi-risk is not the current practice of Civil Protection Authorities and is not integrated into the decision making processes and legal frameworks, some stakeholders pointed out that they cannot formally deal with multi-risk since they are obliged to follow the regulatory frameworks of the central government. This is linked to the fact that many countries have just recently started to assess single risks. It was also suggested by some stakeholders that profound knowledge of single risks needed to be established before multi-risk can be tackled.

Generally the usefulness of the multi-risk concept is to a certain extent limited for decision making processes due to the very low probability of occurrence of cascading and conjoint events in Europe. It was stated that it is hard to arouse public attention to very low probability events. Considering these limitations, it was seen that a requirement would be to define plausible multi-risk scenarios that would be useful within the disaster management context.

MATRIX as a starting points for considering multi-risk in education, research and practice

The MATRIX interactions with Cooperation Partners initiated different discussions and progress in considering multi-risk in education and practice. It seems that stakeholders are

adopting the concept of multi-risk to a certain extent and that MATRIX generally raised the awareness of the importance of multi-risk among the Cooperation Partners:

1. The Center for Climate and Safety of the University of Karlstad, Sweden, now places greater emphasis on multi-risk in their teaching.
2. The MATRIX CITY was regarded as an important step for a generic multi-risk assessment with very good educational potential by displaying differences when hazard interactions are or are not considered for different scenarios. Such feedback was received during the 12th PPRD South “Prevention and preparedness” workshop for staff-level officials - “Multi-hazard risk assessment in urban environment”, the 1st and 2nd MATRIX Stakeholder Workshop and the MATRIX General Assembly meetings.
3. After the 1st MATRIX Stakeholder Workshop, a presentation of the Risk Matrix Decision Support Tool was given at the premises of The Federal Office of Civil Protection and Disaster Assistance (BBK). Feedback was received on the applicability and requirements from the perspective of BBK, as they are interested in the development of a multi-criteria decision support system. Further discussions are planned for the end of 2013/beginning of 2014.
4. The MATRIX workshops not only conveyed MATRIX results, but also gave the opportunity to the stakeholders to present and discuss their hazard and risk assessment approaches and experience with multi-risk and risk assessment. Some of the presented case studies during the 2nd MATRIX Stakeholder Workshop were very helpful in showing how the consideration of hazard interactions can lead to improved disaster management and decision making (e.g., the case study of the Blayais nuclear power plant and flooding). The stakeholder case studies showed that multi-type hazard and risk assessment are helpful in order to retrieve more realistic scenarios, to be able to set appropriate design criteria for protecting infrastructures and to provide more appropriate warnings.
5. MATRIX contributed to applying a multi-risk approach in research (e.g., analyse of drainage basin in Lake Vänern, Sweden).

Lessons Learned for MATRIX IT framework

The MATRIX project adopted some concepts from the Cooperation Partners for its generic IT framework.

Cooperation Partners proposed during the 1st MATRIX Stakeholder Workshop to integrate multi-type events into the risk matrix approach as proposed by the EC³, which MATRIX has followed. Improvements to the IT framework were made to the communication interface of MATRIX CITY and Virtual City, again based on feedback. The main change was to use the risk matrix instead of loss curves to describe how risk changes when interactions are considered. Presenting multi-risk scenarios in a risk matrix is an easy way to communicate, for example, how risk migrates to higher levels when multi-type events are considered (see Figure 3).

³ SEC(2010) 1626 final: Commission Staff Working Paper – Risk Assessment Mapping Guidelines for Disaster Management

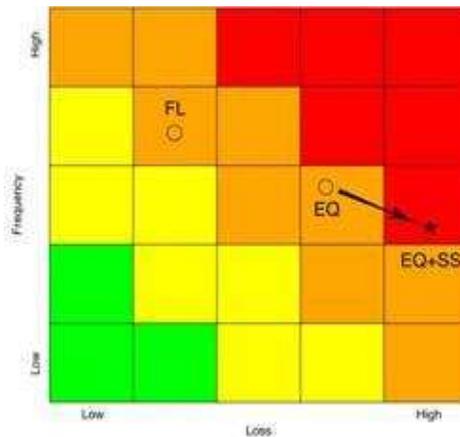


Figure 3: In this example earthquakes are considered independently and as a cascading event. When hazard interactions are considered and the earthquake results in a tsunami, the overall risk moves to a higher risk level

With regards to the MATRIX CITY, the main gap remains in testing the IT framework with real test cases. This would allow stakeholders to assess if and how multi-risk approaches can be applied in practice in the future and if the approach is beneficial to decision making processes. Having the possibility to test MATRIX CITY would allow more intensive interactions in terms of the IT framework.

Research demands

In MATRIX, National Platforms were able to express their priorities for research themes with regards to the tools and methodologies being developed. The following ideas for research were expressed:

1. Probabilities for conjoint and cascading are required. Without this information, it is not possible to decide if it is worth preparing for a certain cascading or conjoint event.
2. The development of multi-risk scenarios is crucial and helpful for multi-risk assessment in practice. The scenarios can be fed with knowledge, data and information from different disciplines and agencies. The expertise of different parties can thus be combined.
3. An appropriate methodology for communicating risk and multi-risk results to the local levels (local officers) is required. This methodology needs to make sure that data and the results are interpreted and understood correctly by officers at the local levels.
4. Multi-risk need to consider Na-Tech events.
5. Hazard and risk harmonisation are required in order to achieve hazard and risk comparability see deliverable D2.3 “Harmonisation strategy”.
6. The limitations of the generic IT framework are also related to a general lack of information about the probabilities of cascading and conjoint events. The MATRIX IT framework requires inputs like possible cascading events and their probability of occurrence. However, this information is often lacking. Hence, there are barriers in

terms of information availability for the application of the multi-risk approach and the quantification of hazard interactions.

7. The understanding of the terms hazard and risk differs among stakeholders. It was stated by some stakeholders that hazard maps can be used for planning and prevention, whereas risk maps are valuable for awareness rising. There is a need to better understand when stakeholders require hazard assessments and in which context risk assessments are more useful.
8. It should be demonstrated, in a quantitative and not only qualitative way, when multi-type methods provide better (or worse) results compared with single-type hazards and risks.
9. The results of the questionnaire which was discussed during the 1st MATRIX Stakeholder Workshop indicate that the majority of National Platforms use scenario analysis as well as probabilistic methods (see Figure 4). Cascading phenomena need to be addressed therefore by a combined approach using scenarios and probabilistic methods. As National Platforms obviously use probabilistic information, they need to also deal with uncertainties. This includes the challenge to develop methods to communicate uncertainties to local stakeholders.
10. Communicating probabilities and magnitudes to decision makers remains a difficult task. Contrary to this, loss assessments can be communicated more easily to stakeholders. Receiving information on time is critical for Civil Protection Authorities; hence loss assessments need to be available in near real time.

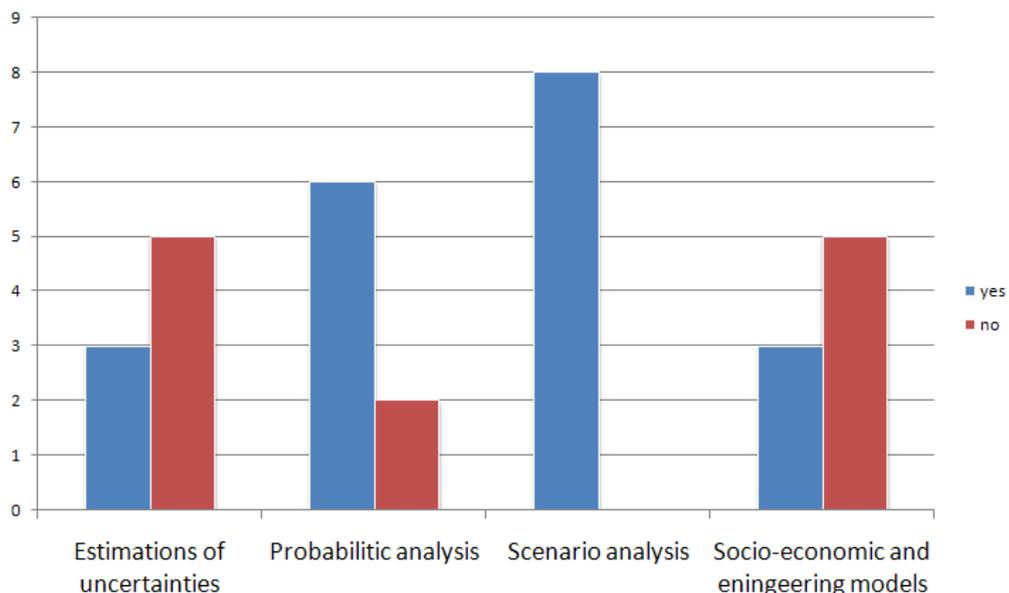


Fig. 4: Methods used by National Platforms.

Furthermore, complex multi-risk scenarios were stated to be useful, but should be able to generate reliable and transparent information, be well documented, and be cost-free for the Civil Protection Community.

Importance of MATRIX for the National Platforms work

The discussions with the stakeholder indicated that interactions with MATRIX were important for their work. The following key points can be mentioned:

1. Multi-risk is able to be a driver for an integrated approach for territorial planning and the involvement of local stakeholders.
2. Applying multi-risk can lead to increased knowledge and beneficial effects on society, expanding upon the risk assessment portfolio.
3. The potential was recognized that multi-risk may be more cost effective than single risk assessment.
4. It was recognized that multi-risk can lead to an improved harmonisation of methodologies and databases.
5. Interacting with MATRIX raised the political awareness of multi-risk events and provided motivation for putting forward discussions with respect to the concept of multi-risk, push discussions to establish a knowledge base on multi-type risk in Europe, and to experiment with new tools like MATRIX-CITY.

3. Conclusions

The interactions with the Cooperation Partners show a significant interest in these groups to actively participate and contribute to applied science within the context of hazard and risk assessment, including multi-risk. This is not only reflected by the fact that out of 15 selected European countries, 13 contributed, in one way or another, to MATRIX, but also by their active and voluntary participation in the project: the answering of extensive questionnaires and feedback sheets, their own contributions to and participation in the end-user workshops and the MATRIX project meetings, the publishing of MATRIX dissemination material in their own magazines and homepages, the production of a joint paper with MATRIX (Kommendantova et al., 2013), and the consideration of stakeholders from the private sector at national levels. The feedback provided evidence that not only is there a wide interest in the MATRIX IT-tools, but also in the methodologies being developed and the general multi-hazard and risk concept.

MATRIX was used by the Cooperation Partners to exchange information e.g., interactions between the Federal Office for Civil Protection and Disaster Assistance (BBK) and the National Directorate General for Disaster Management (NDGDM) of Germany.

The Cooperation Partners expressed their interest in being involved in follow-up multi-risk projects at their proposal stage in order to better integrate the user requirements into the development of the tools and to enhance the applicability of the expected research products. Such an approach would benefit from the possibility of actively contributing to the outcomes. This is in line with the future Horizon 2020 framework, and at the same time it is something that can be taken into account in any activities that follow MATRIX.

The interactions show that in many cases, National Platforms comprise pools of practitioners and researchers. This makes them very valuable partners for further discussion in terms of future multi-risk research. In most cases, National Platforms are part of the government and are linked to decision-making levels. Interactions with National Platforms have the potential to put multi-risk higher on the political agenda. The interactions so far have raised the awareness of stakeholders about the importance of multi-risk. National Platforms are linked to the UN-ISDR. The presentation during the EFDRR in 2013 supported the international visibility of MATRIX and the topic of multi-risk among various National Platforms. Furthermore a scientific paper jointly developed with the MATRIX WP6 was submitted to the call of the UN-ISDR for the Global Assessment Report 2015 (Scolobig et al., 2013). Therefore, there is the opportunity that multi-risk will receive a prominent place in a follow-up program of the Hyogo Framework for Action.

Appendix I

2nd MATRIX Stakeholder Workshop, 27/28 June 2013, Königswinter

Synthesis of the feedback sheet

1. Quality of presentations and discussions.

Did the presentations and discussions convey new findings and insights to you?

In summary the participants pointed out in their feedback that new insights were given by the workshop on the following topics: multi-risk governance, the implementation of a multi-risk approach, ways to improve the cooperation between different authorities, possible cascading events, risk-assessment regulations, challenges and the tools used by other EU countries and the MATRIX case studies. They stated that the workshop pointed to the importance and complexity of multi-risk issues and showed that a multitude of expertise is needed to assess multi-risk adequately.

Do you consider the contents, results and discussions of the workshop as being useful for the work carried out by your organization?

The analysis of the feedback sheets shows that the contents, results and discussions of the workshop were useful for the work of the organizations. The participants highlighted the following points as being helpful:

- Better understanding of multi-type events and loss assessments and increased knowledge about foreign national risk assessment legislations and the impact assessment methods of an insurance company.
- The workshop showed that it is important:
 - to improve the quality of information, data collection and accessibility and the scientific results in order to overcome the major sources of uncertainty in the probabilistic approach.
 - to improve upon the communication of scientific results and uncertainties to authorities at the local levels and to the public.
 - to provide an effective support for decision making actions carried out by Civil Protections and disaster management authorities.
- The workshop motivated the participants to use the multi-risk concept in further research and to put a greater focus on possible cascading hazards in future projects.
- Contacting experts working on the same field and establishing a network with MATRIX partners.

- However, from the perspective of one stakeholder, only practical work actually carried out with the MATRIX findings will show how well they can be included and implemented into current assessment procedures. Another stakeholder (UK Met Office) mentioned that changing the single-risk assessment approach to multi-risk requires a change at the central government level. multi-risk due to the guidance from Central Government.

2. Interaction (please score, 1= min impact , 5 = max impact):

Do you have the impression that the discussions will have an impact on the further research activities of MATRIX?

Score: 3,3

3. Organisational (please score, 1=bad and 5=very good):

- **Information: Was the information in preparation of the workshop helpful (e.g. Workshop Concept Note) in order to understand the workshop's objectives and your role in this context?** Score: 4,4
- Score logistics: 4,5
- Score time reserved for discussions: 4,5
- Score moderation: 4,5
- Score venue: 4,6

4. Outlook

Please specify why the workshop changed or didn't change your view on multi-risk?

- In the view of the participants, the workshop was able to provide an overview of the importance of the consideration and implementation of multi-type hazard and risk assessment in order to reduce vulnerability and disaster losses, as well to improve risk governance and cooperation between the relevant authorities. In particular, the case studies were useful for better understanding these points.
- To a certain extent, the workshop changed the understanding of multi-risk. Before the workshop, the concept of multi-risk was understood as outlined in the EC Risk Assessment and Mapping Guidelines as the total risk from several hazards. After the workshop, it was recognized as being a new concept where the risk arising from a single hazard can also initiate different

impacts and cause different consequences. Additionally, stakeholders recognized that research has just started on how to cope or take into account the concept of multi-risk, and that MATRIX leads the discussion/methodology on how to deal with multi-type hazards.

- Simultaneously, the multi-risk approach was evaluated as being difficult to quantify and at present with no real general concept.

5. Barriers and benefits to multi-risk governance

What are the main barriers for the effective implementation of multi-risk assessment within the existing institutional frameworks of your country?

Different types of **barriers** have been recognized in the institutional frameworks (see deliverable D6.3 “Social and institutional barriers to effective multi-hazard decision-making”):

- Lack of knowledge about multi-type events and multi-risk assessment, especially among various levels of authority (national, regional and local) and a lack of official national methodologies even for single risks. At least a basic evaluation of those (following a thorough risk analyses) on the political level is required. Also, access to data is challenging, as data are spread among many organisations with little collaboration.
- Administrative barriers: e.g., the main barrier in Iceland is that the responsibilities of governmental institutes have, in some cases of natural hazard, not been clarified. In some countries, the political awareness about the results and added value of preventive measures, risk and in particular multi-risk assessments, is limited. The same applied to the education/communication of the results and benefits of risk assessments to the general population and local authorities.
- Legislative barriers: e.g., main barriers derive first from the legal framework, which is mono-risk, and therefore does not encourage a synthetic view of all risks within a territory.
- Difficulty of obtaining deliverables and products produced during the various relevant EU projects.

What are the main benefits of the implementation of multi-risk assessment within the existing institutional frameworks of your country?

Different **benefits** have been recognized for the institutional frameworks. The following key points can be mentioned:

- The main benefits are to gain an overview and broaden the understanding of the effects on the society of multi-risk and what measures should be taken to minimize the vulnerability on the society.

- Better cooperation at each administrative level, including the implementation of the effective integration and harmonization of methodologies and databases for the assessment of different hazards and risks. Preventing sub-optimization and ineffective use of resources.
- The main benefits of the implementation of multi-risk would be an integrated approach of territory planning, motivating full implication of local authorities, experts and citizens.

What authorities should be in charge of the implementation of multi-risk assessment in your country?

→ National level

- National Protection and Rescue Directorate (Croatia)
- Central government (UK)
- The Swedish Civil Contingencies Agency (MSB), The Swedish Geotechnical Institute (SGI), The Swedish Environmental Protection Agency, The County Administration Boards (Sweden)
- In Iceland, it is the Icelandic Meteorological Office (IMO) who has the mandate by law to issue forecasts and warnings about natural hazards and to conduct risk assessments on behalf of the government. Therefore, IMO is the institute that is in charge of multi-risk assessment. This is done in collaboration with the Civil Protection Department of the National Police in Iceland. The risk assessment of volcanoes in Iceland, which is under development, has a multi-risk approach, and is the first of its' kind to be conducted in Iceland. (Iceland)

→ Regional level

- Municipality level risk assessment shall be implemented by the head of the local defence committee by law, who is the head of the Township Government Office (township is a district in the lower-middle administration system of Hungary, equalling more or less NUTS (Nomenclature of Territorial Units for Statistics) IV level) with an approval of the head of the local organisation of disaster management. (Hungary)
- The "Länder" (state) authorities (ministries and the respective authorities in their fields) as well as the "Bund" (federal) authorities, in close co-operation and in accordance with their respective jurisdiction and expertise. (Germany)

→ Local level:

→ Local authorities (mentioned twice), public and private sectors through public private partnerships. (Bulgaria, France)

→ **All levels:**

→ National and regional Civil Protections, Regional and Provincial Authorities, Majors of the municipalities.(Italy)

→ It would be on all levels, but government bodies (directorates) must have a leading role. The local responsibility is, however on the municipality level. (Norway - NGI)

6. Multi-risk and socio-economic vulnerability

Are there sub-groups of society in your country who are more vulnerable to multi-hazards compared to single-hazards due to their social and economic situation? If yes, what are the key vulnerabilities for them and how do you think their vulnerability could be reduced?

The vast majority of the stakeholders confirmed that there are certain sub-groups of society who are more vulnerable to hazards than others. (e.g., vulnerable groups as a result of poorly-built settlements in disaster prone areas). Simultaneously, they pointed out that in terms of vulnerability, there is no difference between single and multi-risk (e.g., in terms of vulnerability it would not make a difference if the group is hit by a flood or a flood combined with a volcanic eruption).

However, one stakeholder saw the special case of elderly people (who are more difficult to move) being evacuated or moving areas where multi-hazards effects can accumulate: coastal areas (wind and surges) and southern regions (heat waves, and consequent health risks). Reducing the vulnerability of these people relies mainly on education, with the responsible support of local authorities and stakeholders.

7. Comments

Stakeholder would very much appreciate to be updated about the results of the MATRIX project, most of all about the multi-risk assessment methodology being developed as a main output of the project.

In the view of one stakeholder, the project would have benefitted from the participation of representatives from various levels of government. For instance, it would have been very useful to hear the views of city officials from Naples and Cologne.

