European Commission

THE DISASTER RISK MANAGEMENT KNOWLEDGE CENTRE – RISK DATA HUB

Vision Paper & Roadmap

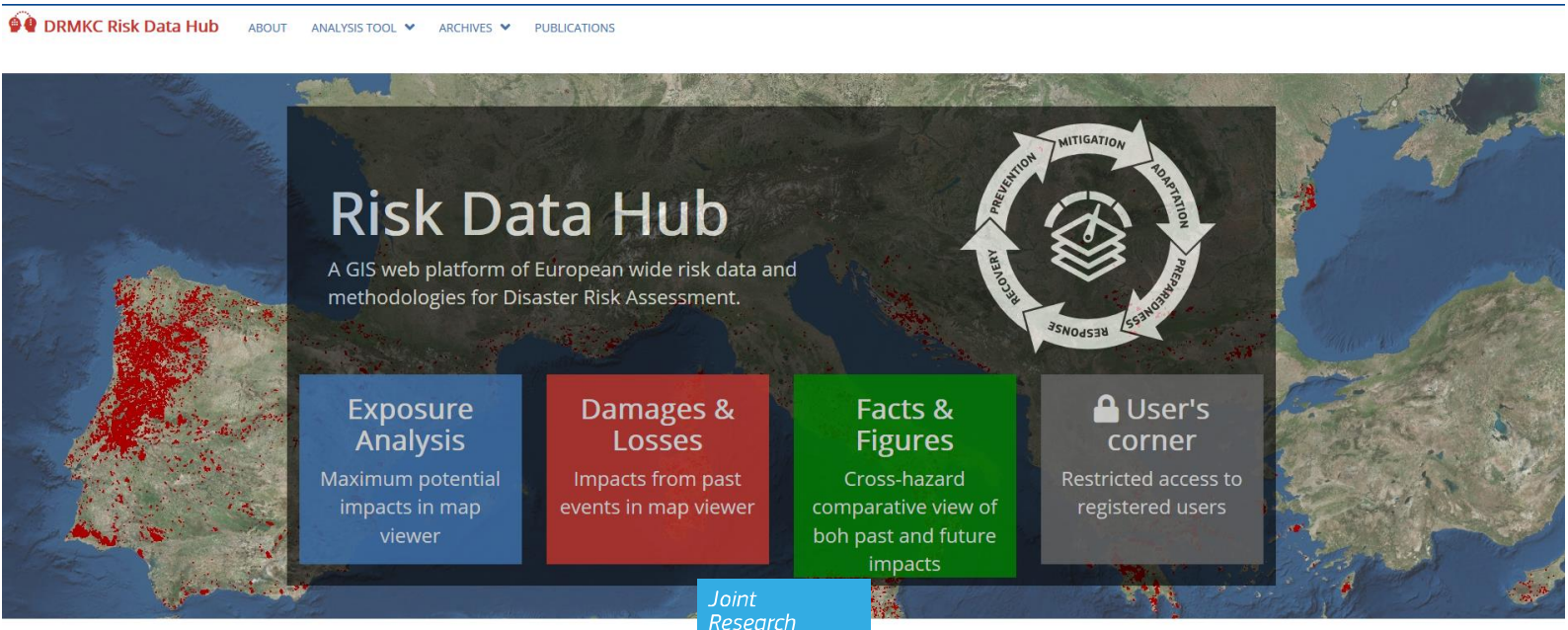
Montserrat Marin Ferrer,

Tiberiu Antofie,

Gustav Eklund,

Stefano Luoni

2019



Contact information
Name: Montserrat Marin Ferrer
Address: Via E.Fermi 2749, I-21027 Ispra (VA) Italy, TP 266
Email: montserrat.marin-ferrer@ec.europa.eu
Tel.: +39 0332 78 5810

EU Science Hub
https://ec.europa.eu/jrc

JRC119384

Ispra: European Commission, 2019

How to cite this report: Marin Ferrer M., Antofie T., Eklund G., Luoni S., *THE DISASTER RISK MANAGEMENT KNOWLEDGE CENTRE – RISK DATA HUB: Vision Paper & roadmap,* European Commission, Ispra, 2019, JRC119384.

Authors

Montserrat Marin Ferrer, European Commission, Joint Research Centre (JRC), Ispra, Italy

Tiberiu Antofie, European Commission, Joint Research Centre (JRC), Ispra, Italy

Gustav Eklund, European Commission, Joint Research Centre (JRC), Ispra, Italy

Stefano Luoni, Unisystems Sral, External consultant of the European Commission.

Abstract

The DRMKC Risk Data Hub aims to offer a common sharing point for policymakers, practitioners and scientists and it is known that each community will approach the web-based platform having different questions and scopes. Working together with the different user-communities in the frame of the collaborative approach offered by the DRMKC we count on facilitating the translation of research results into useful and used inputs for risk reduction. This vision document provides an overview of the main objectives of the new GIS-based platform and its related roadmap describes the main steps to reach them.

Table of Contents

DISASTER RISK MANAGEMENT KNOWLEDGE CENTRE – RISK DATA HUB VISION PAPER

1. Background

The **Disaster Risk Management Knowledge Centre** (DRMKC)[1] was launched by the Commission in September 2015, in the aftermath of the signature of the Sendai Framework for Disaster Risk Reduction (SFDRR), the Paris Agreement and the establishment of the Agenda for Sustainable Development (SDGs). The main scope was to reinforce the mission of providing **scientific evidences for more efficient policies** in the complex and multidisciplinary field of Disaster Risk Management.

The new Commission has placed the **Green Deal** at the heart of the priorities for Europe. The Green Deal reinforces the strong commitment of Europe to lead the mission to meet the ambitious Paris Agreement goals and the 2030 targets.

From the understanding of the impacts of occurred events to the calibration and validation of forecasting models (risk models) till the evaluation of progresses in reducing disaster risk**. Post-event damage and loss data have an intrinsic key role** in all the phases of the Disaster Risk Management. The DRMKC Risk Data Hub is aiming at supporting this **collective effort towards a more resilient future**.

The DRMKC Risk Data Hub aims to offer a **common sharing point for policymakers, practitioners and scientists** and it is known that each community will approach the web-based platform having different questions and scopes. Working together with the different user-communities in the frame of the collaborative approach offered by the DRMKC we count on facilitating the translation of research results into useful and used inputs for risk reduction.

The concept of the **GIS-based platform Risk Data Hub**, currently under development by the DRMKC, was the result of a Needs and Gaps assessment performed in 2016, during the preparation of the European Commission Staff Working Document - ***Overview of Natural and Man-made Disaster Risks the European Union may face***[2]. The existing gap between the data and knowledge available at the scientific community and their accessibility and usability by and Decision Makers, including the Civil Protection community, was one evident outcome of the overview of the 31 summaries of the National Risk Assessment submitted to European Commission by the Participant States of the Union of Civil Protection Mechanism.

The role of **Europe in the World will be stronger**. Europe will reaffirm it based on our genuine multilateralism and by working hand-in-hand with our close neighbour and our most natural partners. Collaboration is key to meet this Commission priority and to ensure an integrated, comprehensive and coordinated approach to face the new era of natural and man-made risks.

[1] https://drmkc.jrc.ec.europa.eu/
[2] https://ec.europa.eu/echo/sites/echo-site/files/swd_2017_176_overview_of_risks_2.pdf

2. Objectives of the DRMKC Risk Data Hub GIS-based platform

The DRMKC Risk Data Hub has three main objectives that are fully aligned with current priorities for a sustainable growth and development:

- To learn from the **past** to be better prepared for the **future.**
- To exploit **research** results for better Disaster Risk Management **policies**.
- To facilitate the link between the **Local** and the **International** dimensions.

The successful implementation of any of these three objectives relies on the **collaboration** across sectors, institutions and disciplines, which is the essence and at the same time the driving force of a **Knowledge Centre**. Based on collaborative processes the DRMKC develops collective knowledge what allows the identification of the existing gaps, stimulating more focused R&I programs.

The co-development of knowledge and tools ensures a soft harmonisation of methods and favours ownership by the actors involved in the collaborative processes. The DRMKC Risk Data Hub offers this **opportunity for co-development**. The GIS-based platform currently counts on the feedback received from different actors (scientists, policy-makers, local and national authorities involved in DRR activities) which is providing elements that are defining its development **based on real specific needs**.

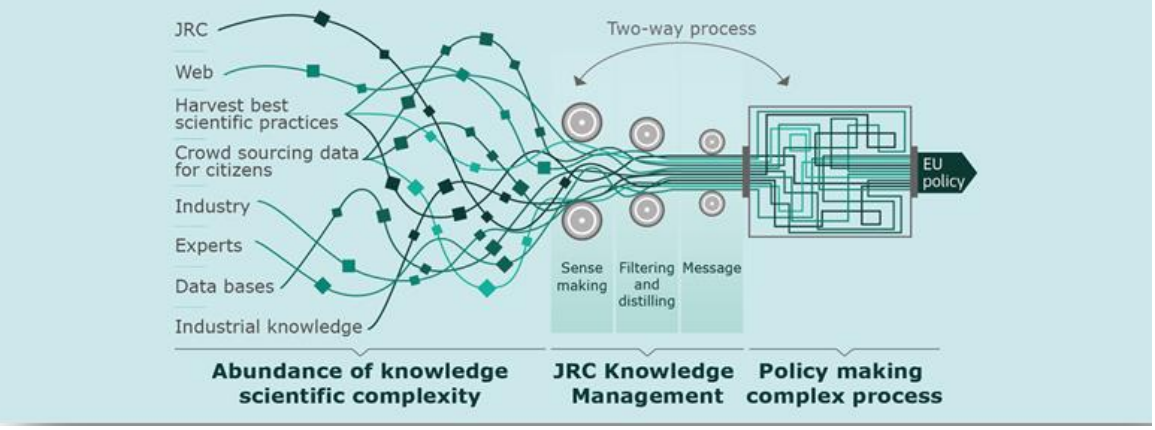


Figure 1 - The aim of the knowledge centres is to collect, check, structure and make easily accessible and comparable all the relevant data, knowledge and intelligence in a specific policy field.

2.1. Objective 1: To learn from the past to be better prepared for the future.

The Global agreements of 2015 and the most recent EU legislations call for the **systematic collection of information regarding the losses** (or near missed) due to disastrous events, in order to analyse trends and to monitor the positive effect of the implementation of Disaster Risk Reduction actions while allowing sound cost-evaluation analysis. The damage and loss data (DLD) allows the identification of one of the components of the vulnerability – the **empirical vulnerability** – due to the identification of the areas being the most affected by the different hazards.

Identification of vulnerabilities is the first step towards the reduction of the **Risk.** The latest UNISDR's definition of disaster risk is 'the potential loss of life, injury, destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity'[3].

[3] https://drmkc.jrc.ec.europa.eu/portals/0/Knowledge/ScienceforDRM/ch02/ch02_intro.pdf

Disaster risk is not just about the likelihood and severity of the hazard event but also about what is exposed to that hazard and how vulnerable that expo-sure is. Following the Sendai disaster risk definition, we may consider risk to comprise of three elements:

- **Hazard:** the adverse event causing the loss.
- **Exposure:** the property, people, plant or environment that are threatened by the event.
- **Vulnerability**: how the exposure at risk is vulnerable to an adverse event of that kind.

The structured and systematic collection of Damages and Loss Data allows the correlation of losses to the trigger factor (hazard) and to the vulnerabilities detected in the exposed elements. This information provides evidences to support the elaboration of risk reduction plans following the identified priorities for action.

The DRMKC Risk Data Hub has been developed following the conclusions of the discussions held with the experts of the **technical Working Group on Damages and Loss Data**[4]. The DLD database included into the Risk Data Hub is both **INSPIRE**[5] and Sendai compliant and has been based on the analysis of a number of existing national databases, most of them devoted to collect data regarding one single hazard[6].

The DRMKC Risk Data Hub database has been designed to collect data from **natural, technological and malicious hazards (or threats).** Currently the Risk Data Hub covers the following hazards: floods (river flood, costal flood, flash flood), forest fire, earthquake, landslide and subsidence. Data regarding droughts, oil spill and radiological dispersion will be available soon. To have a more detailed information regarding the timeline for the inclusion of each hazard, please, consult Annex1.

The platform allows the introduction of data at any geographical scale (local, subnational, national level) that can be then aggregated to provide national and European figures following harmonised methodologies. It is of paramount relevance to foster the collection of disaggregated data to be able to **identify vulnerabilities and to conceive ad-hoc risk reduction actions**. The national overview becomes fundamental for the establishment of the priorities for action, for the sound elaboration of national risk assessments and, obviously, to report to Sendai Monitoring.

The current data available through the DRMKC Risk Data Hub is the result of the not-exhaustive collection and curated aggregation of data available in several open source databases, namely: EM-DAT[7], DFO[8], HANZE[9], EMSR[10], EFFIS[11], NCEI/WDS[12], GLC[13], EDII[14], EMM[15], CEDRE[16], MARS[17] and more. See **figure 2** for additional information regarding the distribution by data-source and by hazard of the damage and loss data currently included at the Risk Data Hub database.

The aim is to provide some preliminary figures based on the **robust structure of the database and on the methodology developed by the DRMKC to facilitate harmonised analysis of Damages and Loss data for Risk Reduction**.

---

[4] https://drmkc.jrc.ec.europa.eu/partnership/Science-Policy-Interface/Disaster-Loss-and-Damage-Working-Group
[5] https://inspire.ec.europa.eu/
[6] https://drmkc.jrc.ec.europa.eu/partnership/Scientific-Partnerships/Risk-Data-Hub
[7] EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be
[8] DFO: Dartmouth Flood Observatory, https://floodobservatory.colorado.edu/
[9] HANZE: The Historical Analysis of Natural Hazards in Europe, https://data.4tu.nl/repository/collection:HANZE
[10] EMSR: Copernicus Emergency Management Service, https://emergency.copernicus.eu/
[11] EFFIS: The European Forest Fire Information System https://effis.jrc.ec.europa.eu/
[12] NCEI/WDS: National Geophysical Data Center Global Significant Earthquake Database (NGDC/WDS): Significant Earthquake Database, doi:10.7289/V5TD9V7K ; Global Historical Tsunami Database doi:10.7289/V5PN93H7 ; Global Significant Volcanic Eruptions Database doi:10.7289/V5JW8BSH ; National Geophysical Data Center, NOAA.
[13] GLC: Global Landslide Catalog , https://data.nasa.gov/Earth-Science/Global-Landslide-Catalog-Export/dd9e-wu2v
[14] EDII: European Drought Impact Report Inventory, http://www.geo.uio.no/edc/droughtdb/index.php
[15] EMM: European Media Monitor, http://labs.emm4u.eu/events.html
[16] CEDRE: Center of Documentation, Research and Experimentation of Accidental Water Pollution, Brest, France. www.cedre.fr
[17] MARS: Major Accident Reporting System for submitting accident reports to the European Commission according to the criteria of the Seveso II Directive 96/82/EC. http://eMARS.jrc.ec.europa.eu

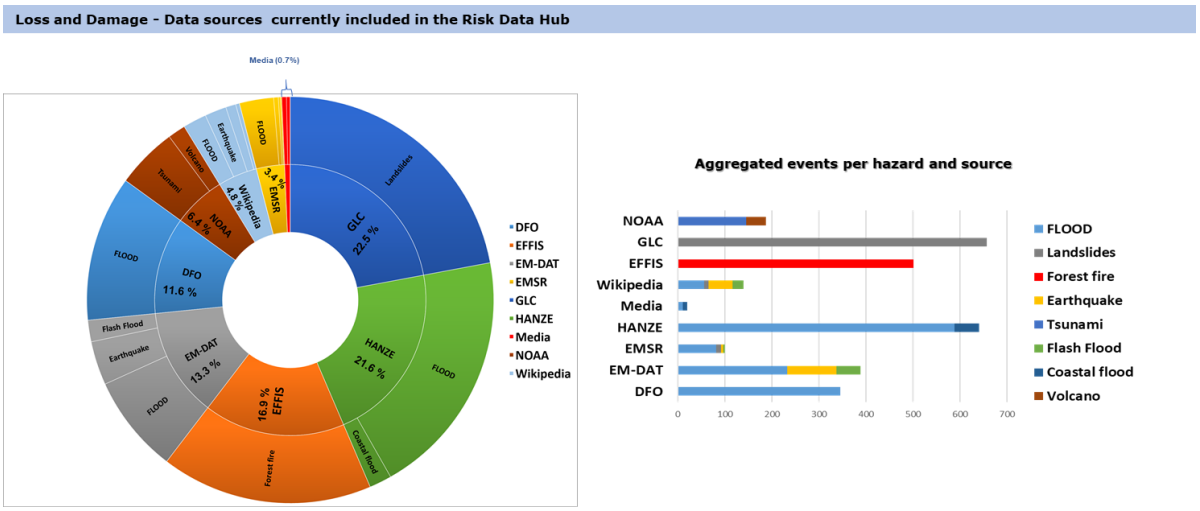


Figure 2 – Distribution by data-sources and by hazard of the damages and loss data currently included at the Risk Data Hub database.

The DRMKC Risk Data Hub provides a common and secure environment in which different local and national authorities involved in the collection of loss and damage data caused by any kind of hazard can share their individual findings (data) and can benefit from the joint result: **from collaboration to joint solutions for risk reduction.**

Any data introduced by different authorities involved in risk management activities will be analysed and aggregated in full autonomy following the pre-defined methodologies implemented in the Web GIS-based platform and will provide them with holistic and harmonised (comparable) results.

2.2. Objective 2: To exploit research results for better disaster risk management policies.

One of the mandates of the Knowledge Centres launched by the Commission is **to make sense of the abundance of data, information and knowledge** available to provide concrete and clear evidences for policymaking. The research programs at any level, from the local up to the international, produce a large amount of results from which it is necessary to establish mechanisms to better capitalise from them[18].

The DRMKC Risk Data Hub includes a space where **risk related data produced by different sectorial scientific communities and research projects can be accessed**. Those layers of information currently are mostly hazard and exposure layers but the DRMKC is currently working on the development of a comprehensive frame for vulnerability. This component of the risk is very complex since is hazard, sector and scale (local, subnational or national) dependent. See **figure 3** for more detailed information regarding the data sources for exposure layer and by hazard. For what regards hazard layers, 100% of the layers currently included in the Risk Data Hub are produced by JRC.

The **vulnerability frame** will include social, political, economic, physical and environmental dimensions that will be combined with the empirical vulnerability extracted from the passed losses and damages suffered in the area. The vulnerability frame has already attracted a number of international partners interested in the joint development of this critical and essential component of the risk. See **figure 4** for a more detailed information regarding the different data sources currently mapped during the preparation of the vulnerability frame.

[18] https://drmkc.jrc.ec.europa.eu/knowledge/Gaps-Explorer

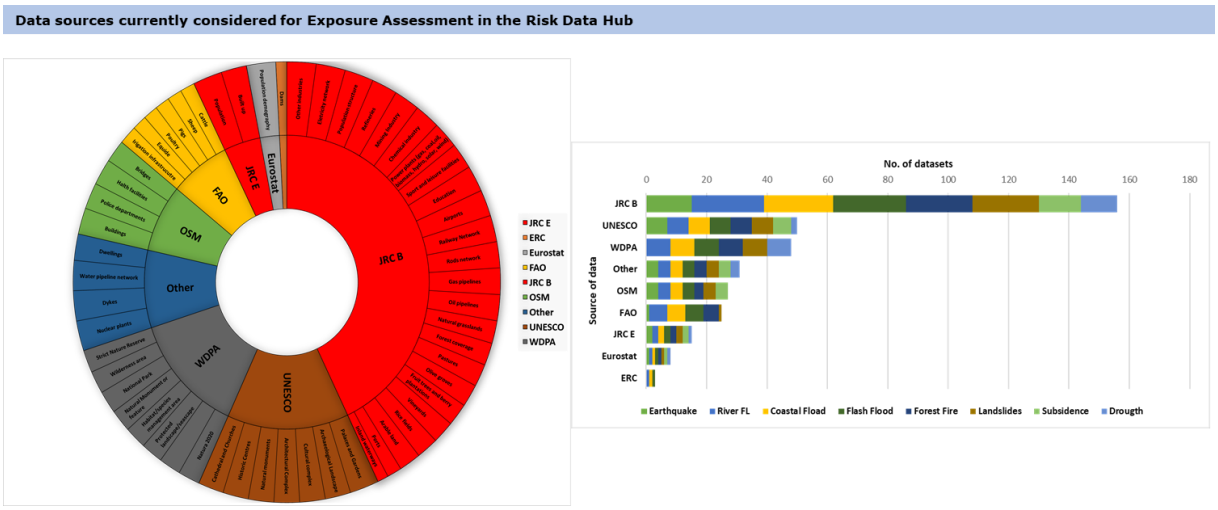


Figure 3 – Distribution by data-sources and by hazard of the exposure datasets currently included in the Risk Data Hub.

To monitor the **temporal evolution of vulnerabilities with regards the losses and damages** registered will allow the identification of the source of the increasing problem. E.g., if vulnerability is decreasing but, on the contrary, a significant increase of losses and damages is registered, it will be a clear indication that either the hazard, or the exposure, or a combination of both has increased. The evidences collected will help the identification of the source of the increase in losses and will support the elaboration **of ad-hoc corrective and/or adaptive actions for risk reduction.**

The visualisation of the **potential losses due to Climate Change** produced by the PESETA IV project under the three scenarios considered (increased of the temperature by 1.5°C, 2°C or 3°C) is one example of research results that will be available through the Risk Data Hub.

Following the mandate of the Knowledge Centres, the DMRKC is **collaborating with a number of research projects in the co-development of different functionalities of the platform**. This joint development allows the researchers to focus on the missing elements (gaps for development) while benefiting from the infrastructure already developed by the DMRKC. The DMRKC thus reduces the duplication of efforts and ensures the exploitation of the research program (the results remained available through the DRMKC Risk Data Hub). A **critical mass of experts** collaborating around the development of the different functionalities is a guarantee of efficiency and success.

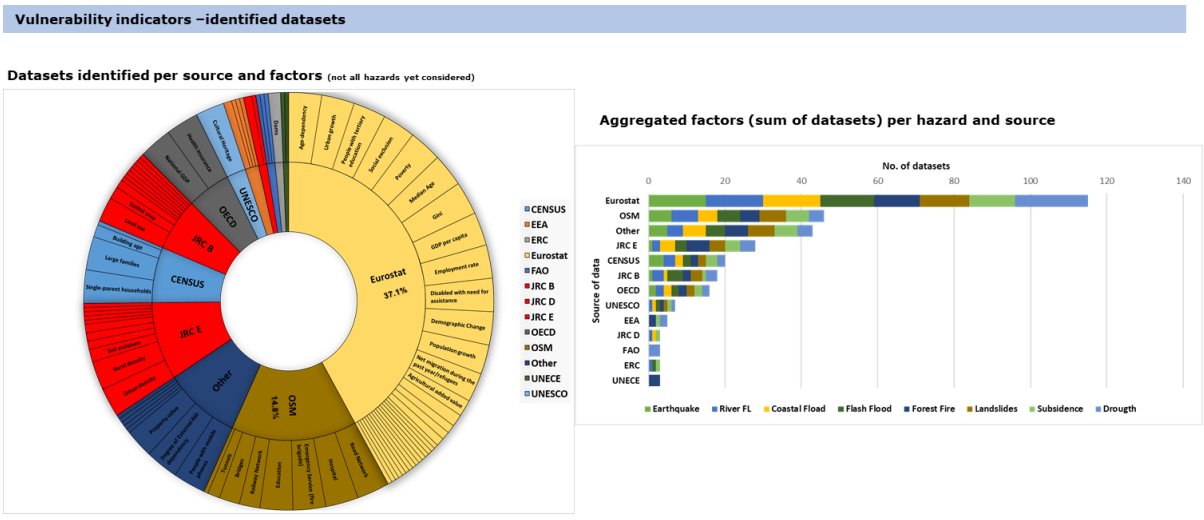


Figure 4 – Distribution by data-sources and by hazard of the vulnerability indicators currently mapped to be included in the Risk Data Hub.

2.3. Objective 3: To facilitate the link between the local and the international dimensions.

As already mentioned the DRMKC Risk Data Hub allows the introduction of data at any scale, from the local to the National and provides aggregated views per hazard. The ideal process for highly efficient risk management measures results from the combination of **bottom-up actions** with the **top-down** establishment of **evidence-based political priorities**. To facilitate and enable the connection between these two dimensions is one of the main objectives of the DRMKC Risk Data Hub.

The DMRKC Risk Data Hub is working to provide simplified views of the **risk assessment matrixes** in support to the implementation of the **Article 6 of the RescEU** legislation. The methodology currently under development foresees the selection of the hazard, the sector, the area (local, sub-national, national) and the time frame for which the risk assessment is calculated (2, 5, 10, 15 or 25 years). By using the **same methodology across spatial scales** the comparability is guaranteed for the selected period of time and hazard. To compare the risk caused by the different hazards will be possible since potential impacts will be calculated using the **same metric all across**: the indicators agreed at the **Sendai** FWDRR.

The DRMKC offers through the Risk Data Hub a way to reinforce links and coherence across policies by basing them on the same set of evidences, but this will be possible only if the **Member States are given with support** to test, co-develop and endorse this new tool.

How can the DRMKC Risk Data Hub **support linking different policies**? Through their common and objective ground: data. After one dramatic event there is the collection of losses to check for the eligibility for the potential activation of the **Solidarity Funds** request. The same tool where the losses and damages are recorded can facilitate the eligibility check by the Member State and the plausibility check to be done by Commission, speeding up the process and increasing its transparency.

These damages and losses data will then contribute to the assessment of the local empirical vulnerability and will contribute to the **local and national risk assessment processes**. The reporting to **Sendai Monitoring** will benefit from the same set of data and depending on the hazard there could be other specific legislations that would require the same data for the annual reporting (e.g. **flood directive, Seveso** directive)[19]. Local and National data will provide the evidences required to drive the preparation of better policies for Risk Management.

3. Next steps in the development of the DRMKC Risk Data Hub

To reach these ambitious goals the DRMKC is working on the development of this new GIS-based collaborative platform which development started in December 2017. The roadmap (annex 1) illustrates the main steps ahead, namely:

1- **Development of the infrastructure**

   a. For losses and damages

   b. For risk assessment

   c. For the User's Corner

2- Support the preparation of multi-hazard **risk matrixes**

   a. At local scale

   b. At national scale

3- **European-wide data collection** for the testing of the developed methodologies

   a. Losses and damages (empirical vulnerability)

[19] https://publications.jrc.ec.europa.eu/repository/handle/JRC110366

b. Vulnerability indicators (social, political, economic, environmental and physical)

c. Research results on risk related data (hazard, exposure)

4- Development of the **vulnerability frame**

a. Per hazard

b. Per spatial scale

c. Per sector and dimension (social, economic, political, physical, environmental + empirical)

5- Development of the different methodologies for the **User's corner** (password protected)

a. For local/national authorities

b. For research projects under development.

Additional details regarding the activities foreseen under each one of these general chapters for development can be found on the **enclosed excel table (Annex 1).**

In parallel to the development of the different features of the DRMKC Risk Data Hub, the platform will be fully revised to improve its **user-experience** by working with experts in communication and graphic design and by following feedbacks received from users.

Offering a user-friendly platform is a key factor to achieve a wide endorsement and use. The analysis done by experts on graphic design and communication will allow the **simplification of the user interface** and will provide a **step-by-step approach** to those users interested in knowing additional details and information.

To facilitate the combination of having from one hand a **common platform for all users** and on the other hand the task of **offering adequate information for different communities**, the DRMKC Risk Data Hub offers different levels of detail for the results that are accessible through different entry points:

I. **Exposure (and risk)[20] analysis:** configurable map-views offering detailed view by hazard and by type of exposed element (population, critical infrastructures, buildings, …) that offers the possibility to perform different analysis changing the parameters regarding he scenario conditions (timeframe) – to be used by **experienced users mainly.**

II. **Damages and losses**: configurable map-views offering detailed views by hazard and by type of exposed element (population, critical infrastructures, buildings, …) that offers the possibility to visualise trends in damages and losses while facilitating the identification of empirical vulnerabilities – to be used by **experienced users mainly.**

III. **Facts and figures**: simplified graphs and tables to visualise damages and losses collected over the last decades per country, year and hazard following the indicators structure proposed by Sendai FWDRR.

a. **Further development:** The simplified comparative view of exposure (risk will be available once vulnerability layer will be available) across different hazards will be made available. The risk matrixes will be available for different timeframes ranging from the 2 to the 25 years to allow prioritization on the short, medium and long term.

IV. **User's corner**: Restricted user and password protected area customised for the different local and national authorities that are testing and using the platform. Another kind of user's corner are the ones dedicated to the research projects that are using the current infrastructure offered by the DRMKC and contributing to the development of new required features.

[20] Once the vulnerability layer will be available, the risk analysis will be possible. Currently the analysis offered are the combination of the exposure layer and the hazard layer – exposure assessment.

Information will become easier to access for generic public as well as for researchers. The user-friendliness study will make available simplified views to provide answers to some general questions, such as:

- Where is risk increasing?
- Why is risk increasing?
- Where do we loss more?
- Why are we losing more?

In recent decades, the systematic collection of both risk and post-disaster related data has rapidly become a crucial concern and the **new Commission** has highlighted this need by recognising the relevance of developing **evidence-based policies**.

Cities and regions are major enablers of **digital transformation** in Europe. The collection of post-event data is a common practice already in place for decades. What is needed now is to facilitate the storage and sharing of these data to enable having a common overview of the situation by bringing together local resources and mobilising the participation of stakeholders. Decision-makers in the public and private sectors and civil society, all need to understand the social and economic implications of advanced technologies and become leaders of the change they wish to see in their territories.

Annexes

Annex 1. Roadmap (see enclosed excel table)

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

- at the following standard number: +32 22999696, or

- by electronic mail via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications from EU Bookshop at: https://publications.europa.eu/en/publications. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).

The European Commission's science and knowledge service

Joint Research Centre

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub

ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

EU Science, Research and Innovation

EU Science Hub

Publications Office
of the European Union