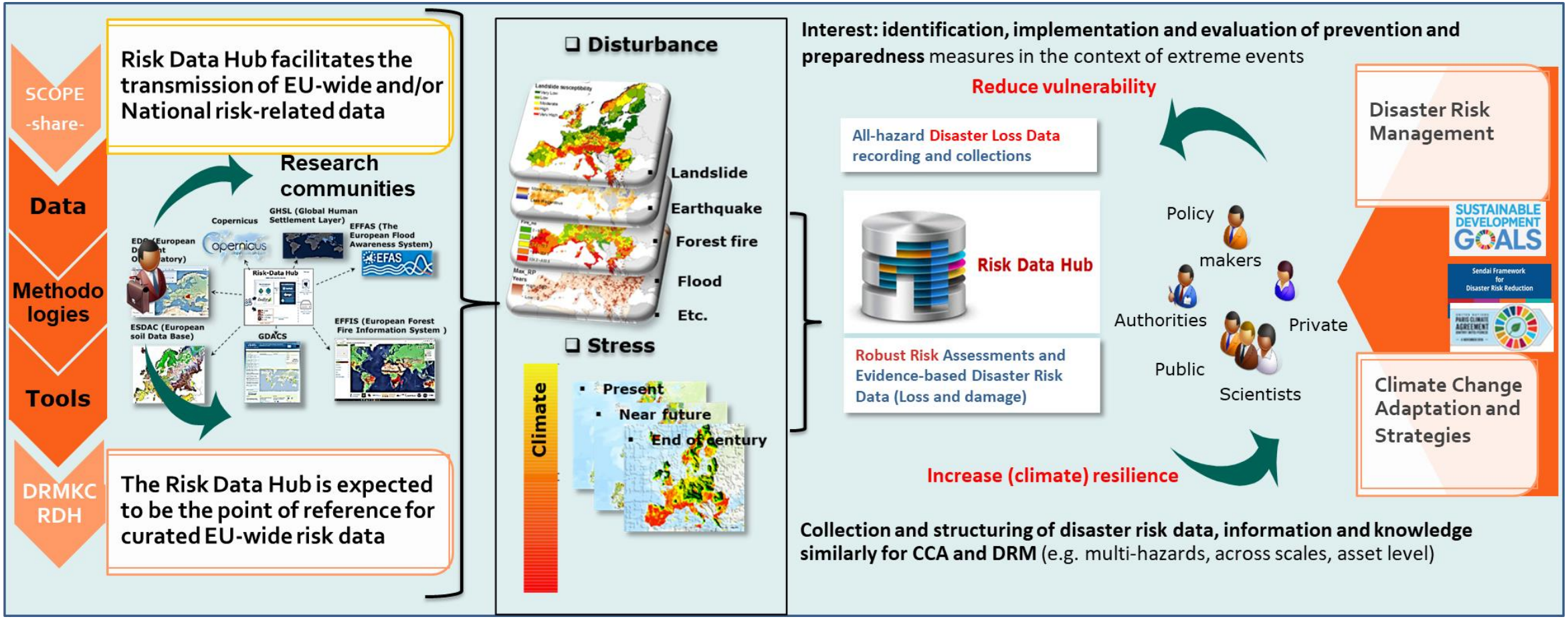
The DRMKC Risk Data Hub

Disaster Risk Management Training online series 2022

05 October 2022

Dr. Andrea Salvi (JRC.E1)
Dr. Tiberiu Antofie (JRC.E1)

RDH – The vision



European Commission

RDH Modules

Modular – and yet complementary – structure:

- to serve different ends
- to support different stakeholders.

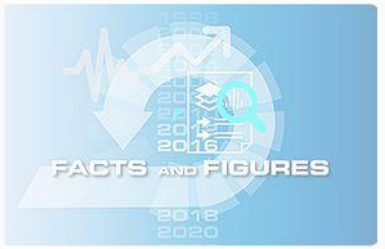
Risk Data Hub is a GIS web platform of European wide risk data and methodologies for Disaster Risk Assessment.

Risk Analysis

Risk analysis in Map Viewer

Disaster Loss Data

Impacts from past events in Map Viewer



Facts and Figures - Coming soon!

Cross-hazard comparative view of both past and future impacts

DRM Data from other projects

Results of DRM related projects: PESETA IV

Learning Space

Documentation and methodological notes on the DRMKC RDH

User Corner

Restricted area dedicated to authorized user for managing their own data

European Commission

RDH Modules

To reflect the different needs of users, the platform is composed of six main modules:

- **The Risk analysis data portal**: an application to improve the access to and sharing of curated European-wide risk data;
- **The Disaster Loss data portal**: a collection of European wide historical loss and damage data from open sources;
- **DRM data from other projects:** this module hosts outcomes from various DRM projects (E.g. Horizon 2020, FP7 etc.) which are supporting DRM related actions.
- **Learning Space**: a learning and training section aims at illustrating how to use the platform and its tools.
- **The User Corner panel**: addressed to national authorities. It serves as a solution for accessing, storing and managing disaster risk data. Access to data is restricted so that each user has its own private workspace.
- **Facts and Figures (Coming soon!):** allow users to generate ad-hoc reports on specific areas, hazards and/or assets making use of RDH data at different level of aggregation. It also offers regular interactive reports on DRM related topics.

European Commission

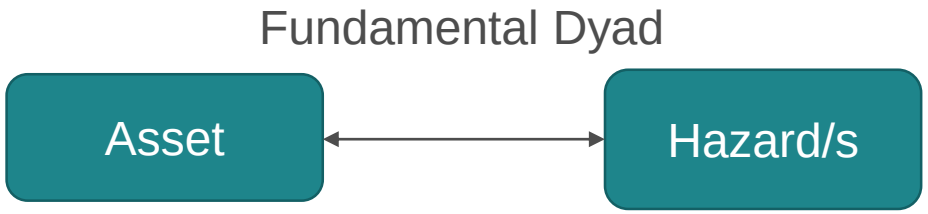
General Concepts

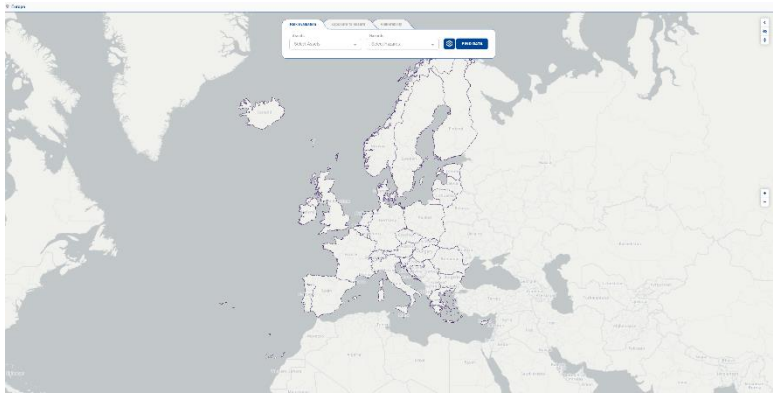
- The visualization and analysis of RDH data rest upon a fundamental combination constituted by:
  - (i) one or more hazard/s onto
  - (ii) one or more assets

Users are also able to select specific spatial aggregation and temporal time-frames to estimate risk and its components and to visualize past losses and damage.

- All metrics are displayed **as a normalized indicator from 0 (min) to 10 (max)**.
- We support: three levels of spatial aggregation (GISCO admin boundaries):
  - Country,
  - NUTS-2 (Region)
  - NUTS-3 (Province)
  - LAU (Local Administrative Units)

- The different time intervals are: **1, 2, 5, 10, 15, 25 years.**





Country

NUTS-2

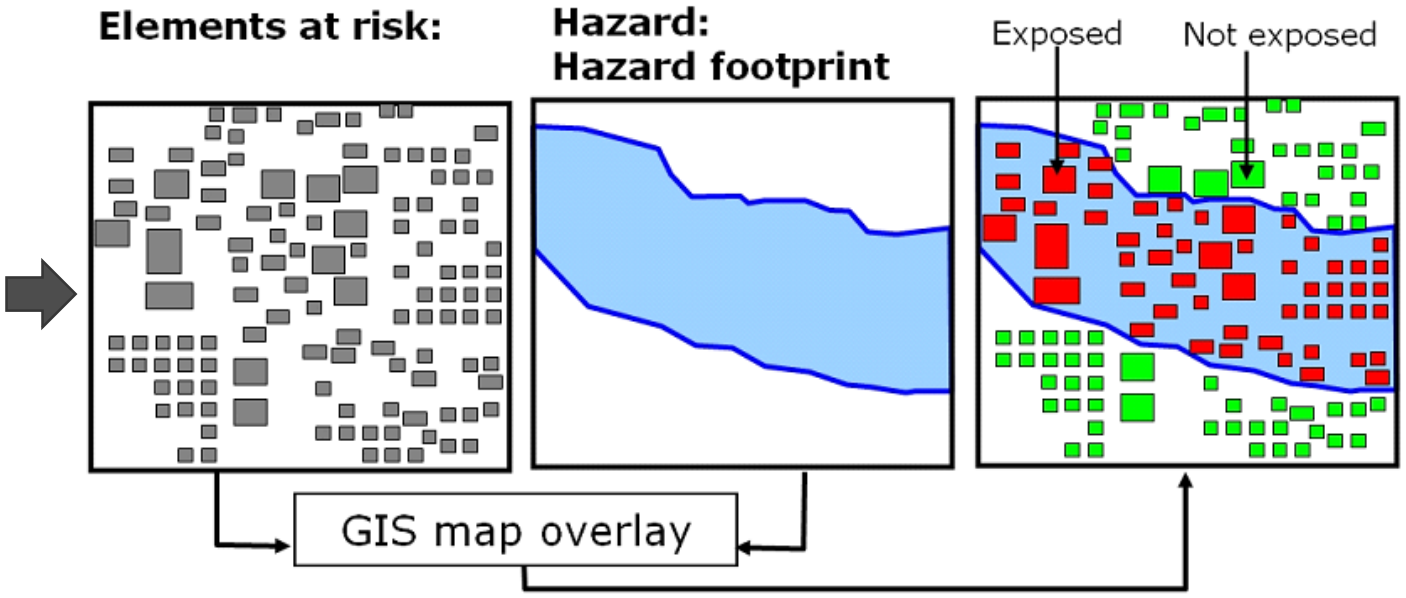
NUTS-3

European Commission

Risk Analysis Module: Exposure

- Disaster risk assessment is set on **identifying the geographically** located **causal factors** of disasters

- The spatial extent of hazardous events' metrics, such as severities, frequencies or intensities is intersected (overlapped) with assets layers.
- The presence of the assets in the '**footprint' of the hazard** is considered exposure
- We further aggregate the exposure within administrative units using the European administrative boundaries (Eurostat/GISCO)
- The quantified presence of exposure to hazards is aggregated at different administrative levels: Country, regions (NUTS2), provinces (NUTS3) and LAU (Local Administrative Units) level.



Graphic representation of the quantification of exposed assets (Adapted: C. van Westen, 2012).

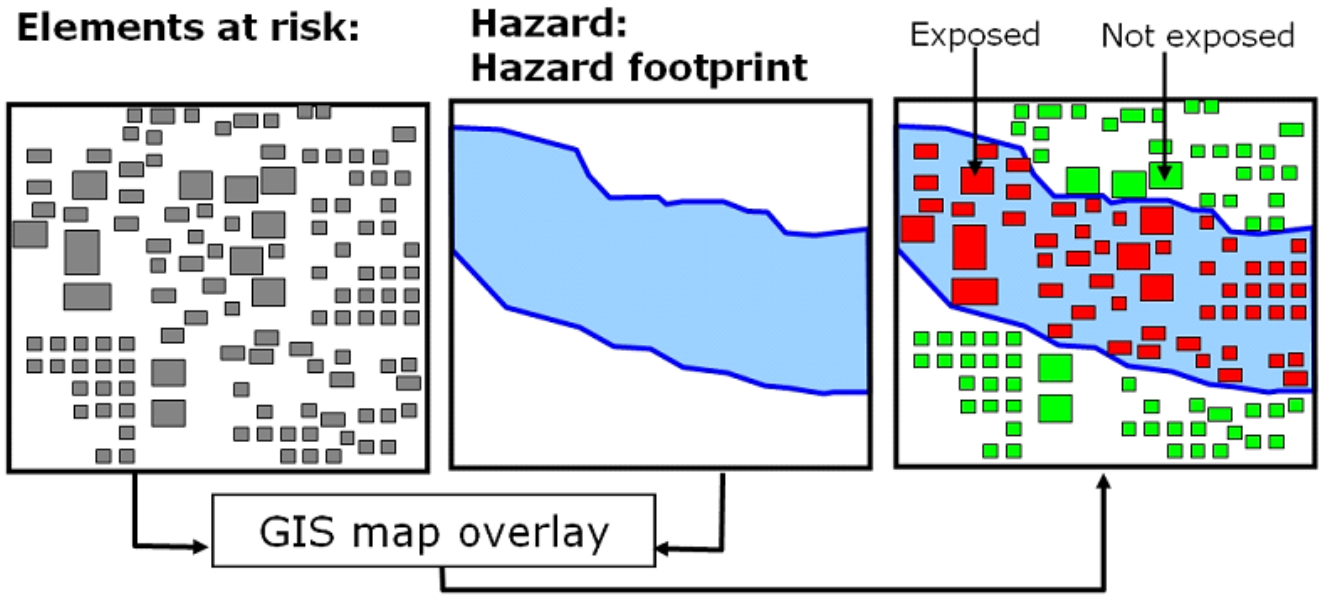
- In a nutshell: in RDH is defined as a matrix of an amount and a probability expressed on the spatial relation (overlapping) between the *Asset* and the Hazard (potentially damaging physical event, phenomenon or human activity)

European Commission

Risk Analysis Module: Exposure

• Available Exposure Layers

- **Population** (GHSL): *GHS_POP_SOURCE_EUROPE_R2016A_3035_100_v1_0*
- Population (rural, urban, city centers)
- **Buildings** (ESM): *ESM2016_100m (city-centers, urban, rural)*
- Building's typology (CORINE - residential, commercial/industrial) and on degree of urbanization (GHSL - rural, urban, city centers)
- **Critical services** (JRC-HARCI): *Harmonized infrastructure layers 1km*
- Electricity line
- Roads, Railways
- Education facilities
- Gas pipelines
- **Environmental**
- World Database on Protected Areas (WDPA)
- CORINE land cover (agriculture, forest, pasture, arable land, permanent crops)
- World heritage sites

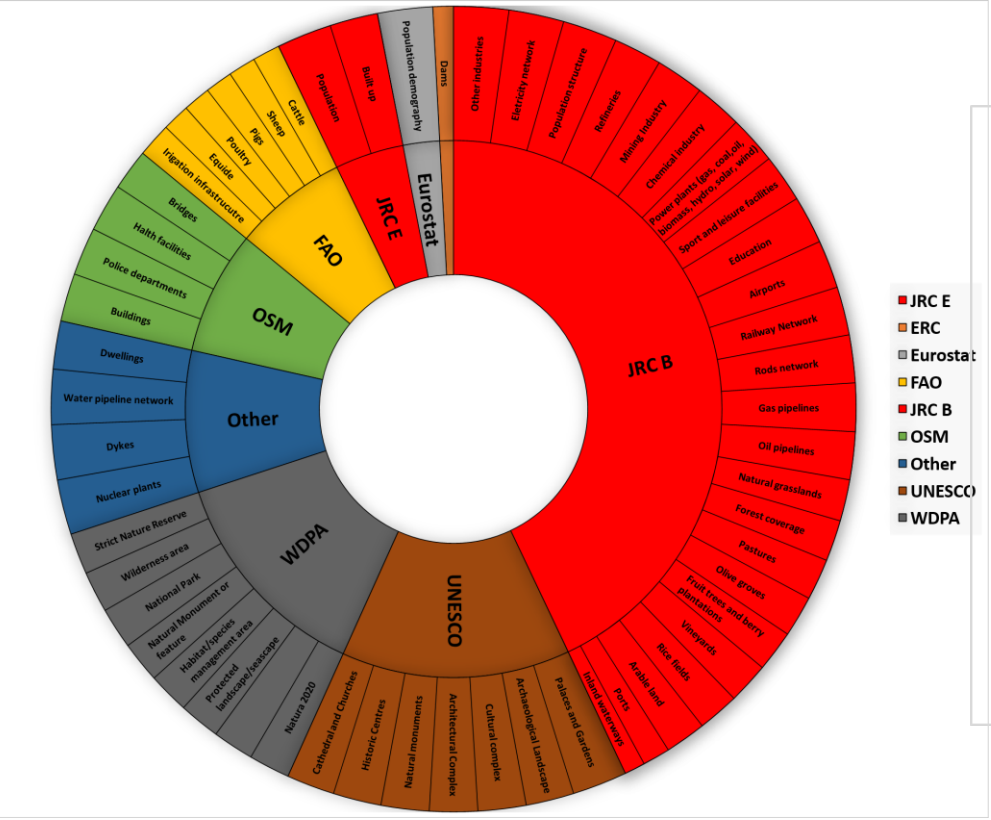


Graphic representation of the quantification of exposed assets (Adapted: C. van Westen, 2012).

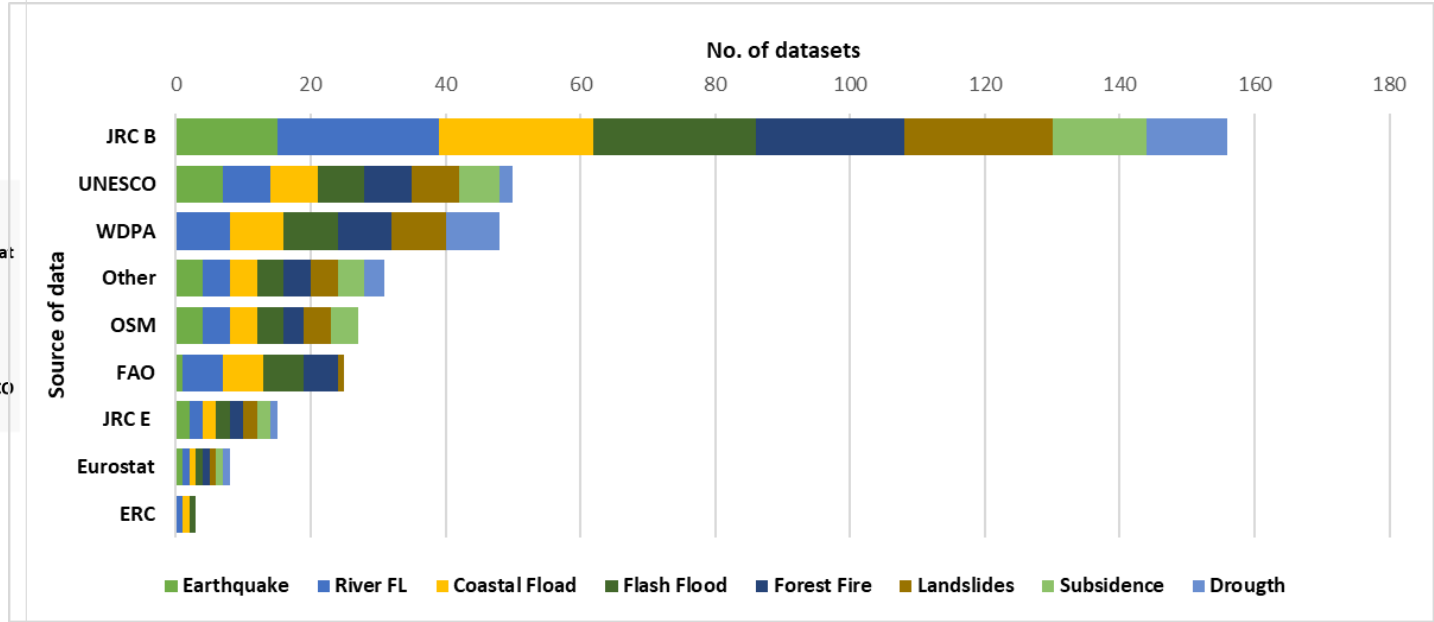
European Commission

Risk Analysis Module: Exposure

- Available Exposure Layers



- **Aggregated assets (sum of datasets) per hazard and source**



European Commission

Risk Analysis Module: Exposure

- **Available Hazards**

Component	Probability	Description	Data source
River flood	T = (10,50, 100, 200, 500)	Areal extent/intensities of the river flood (m)	EFAS
Landslide	T = (2, 5, 10, 20, 50, 100, 200, 500)	ELSUS_v2 - (200 m) and GPCC - (5km resolution) - with the return periods T = (2, 5, 10, 20, 50, 100, 200, 500).	ESDAC, GPCC
Coastal inundation	T = (10,50, 100, 200, 500)	Areal extent/intensities of coastal inundation as extreme total water level (TWL) result of the contributions from the mean sea level (MSL), the tide and the combined effect of waves and storm surge.	Vousdoukas, et al., 2016
Earthquake	T = (250,475, 975, 1500)	Areal extent of PGA >= 0.18 (g) , equivalent of 'Moderate', 'Moderate to heavy' 'Heavy'', ''Very heavy' potential damage level of USG Intensity Scale	GAR
Subsidence	Soils with clay content greater than 35%.	Areal Extent of fine and very fine soil texture (particle < 2 mm size) and with clay content greater than 35%.	ESDAC, IPL project
Forest fire	Wildland–Urban Interface area (WUI)	WUI areas within 10 km limit range from the historical burned areas (2000-2016)	CORINE/EFFIS based

- EFAS (European Flood Awareness System): https://data.jrc.ec.europa.eu/dataset/1d128b6c-a4ee-4858-9e34-6210707f3c81
- ESDAC: ELSUS_v2: https://esdac.jrc.ec.europa.eu/content/european-landslide-susceptibility-map-elsus-v2.
- GPCC: https://climatedataguide.ucar.edu/climate-data/gpcc-global-precipitation-climatology-centre.
- Vousdoukas, M. I., Voukouvalas, E., Mentaschi, L., Dottori, F., Giardino, A., Bouziotas, D., Bianchi, A., Salamon, P., and Feyen, L.: Developments in large-scale coastal flood hazard mapping, Nat. Hazards Earth Syst. Sci., 16, 1841-1853, https://doi.org/10.5194/nhess-16-1841-2016, 2016
- GAR: https://risk.preventionweb.net/
- EFFIS: https://effis.jrc.ec.europa.eu/

Risk Analysis Module: Exposure

- **Available Hazards**

Natural Hazard	
Categories	Subcategories
Geophysical	Earthquake*
	Landslide*
	Volcano**
	Tsunami
Hydrological	River Flood*
	Coastal flood*
	Avalanche
	Flash flood**
Meteorological	Cold wave**
	Heat wave**
	Hail
	Lightning
	Windstorm**
	Extreme weather (hot days, cold days, tropical nights, torrential rain)
Climatological	Drought**
	Wildfire*
	Subsidence*
Biological	Epidemics / Pandemics
	Insect infestation
	Animal and plant diseases

Man Made/Technological	
Categories	Subcategories
Technological hazard	Marine pollution**
	Air pollution
	Waste disposal
	Industrial accidents
	Nuclear**
	Structural collapse
	Power outage**
	Hazardous materials
	Transportation
Malicious	Crime
	Civil Disturbance
	Terrorism
	Cybercrime
Transportation	Road accidents
	Railway accidents
	Railway accidents

- EFAS (European Flood Awareness System): https://data.jrc.ec.europa.eu/dataset/1d128b6c-a4ee-4858-9e34-6210707f3c81
- ESDAC: ELSUS_v2: https://esdac.jrc.ec.europa.eu/content/european-landslide-susceptibility-map-elsus-v2.
- GPCC: https://climatedataguide.ucar.edu/climate-data/gpcc-global-precipitation-climatology-centre.
- Vousdoukas, M. I., Voukouvalas, E., Mentaschi, L., Dottori, F., Giardino, A., Bouziotas, D., Bianchi, A., Salamon, P., and Feyen, L.: Developments in large-scale coastal flood hazard mapping, Nat. Hazards Earth Syst. Sci., 16, 1841-1853, https://doi.org/10.5194/nhess-16-1841-2016, 2016
- GAR: https://risk.preventionweb.net/
- EFFIS: https://effis.jrc.ec.europa.eu/

Risk Analysis Module: Exposure

- How it works

1. Hazard layer

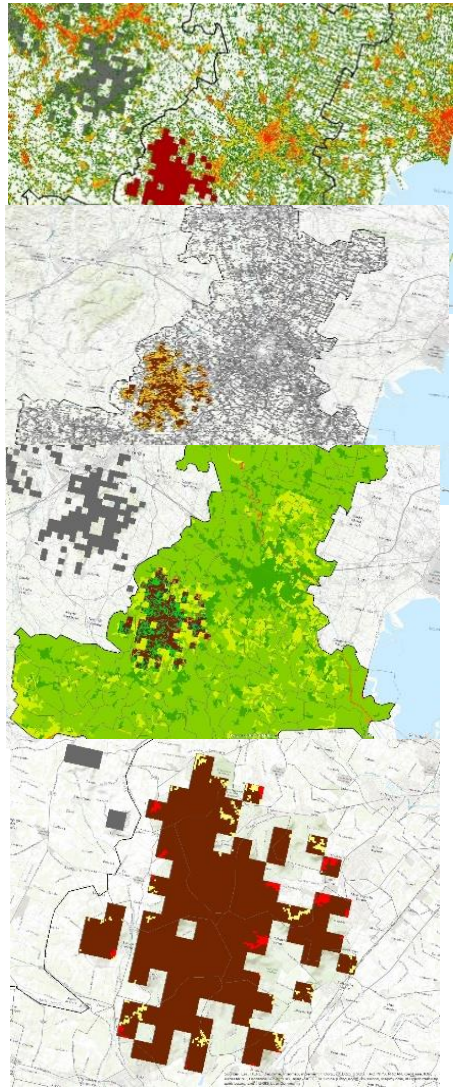
2. Asset_hazard overlay

3. Asset masked

4. Asset layer type

Residential

Commercial



Landslide (susceptibility) 200m

➢ Analysis performed on:

- various probabilistic hazard layers (e.g. Return periods 10, 50, 100, 200, 500)
- As areal extent and hazard intensities (e.g. <1m, 2m, 4m, 6m)
- Aggregations on LAU, NUTS2, NUTS3, Country level but also on urbanization levels (City centers, Urban, Rural)

European Commission

Risk Analysis Module: Exposure

- **Multihazard**

➢ On the RDH is possible for the selections of
- multiple assets paired with one hazard (**many to one**),
- single asset paired with multiple hazards (**one to many**)
- multiple assets paired with multiple-hazards (**many to many, if assets belong to the same macrocategory**).

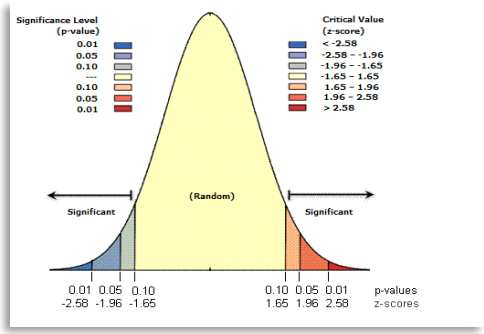
Applied within assets categories selections of both hazards and assets.

1. Exposure

	A	B	C	D	E
1	ADMIN_code	UM	Years	Exposure	Exc_probabilit
2	AT11	km2	2	0.162543	0.19
3	AT12	km2	5	0.367616	0.40951
4	AT13	km2	10	0.630698	0.65132156
5	AT14	km2	15	0.824689	0.794108868
6	AT11	km2	25	1.090134	0.928210201
7					

2. Single hazard hotspot

- as z-score (standard deviations), p-value (probability)

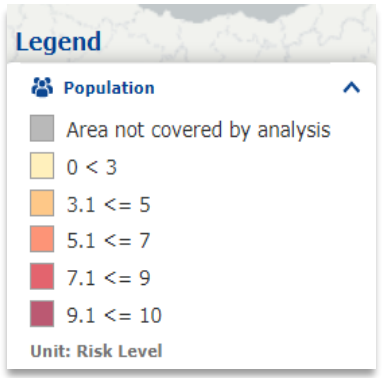


3. Hotspots combined

- **Combining z-score from independent tests (**Stouffer method):

$$Z_S = \frac{\sum_{i=1}^{k} Z_i}{\sqrt{k}}$$

4. Normalisation



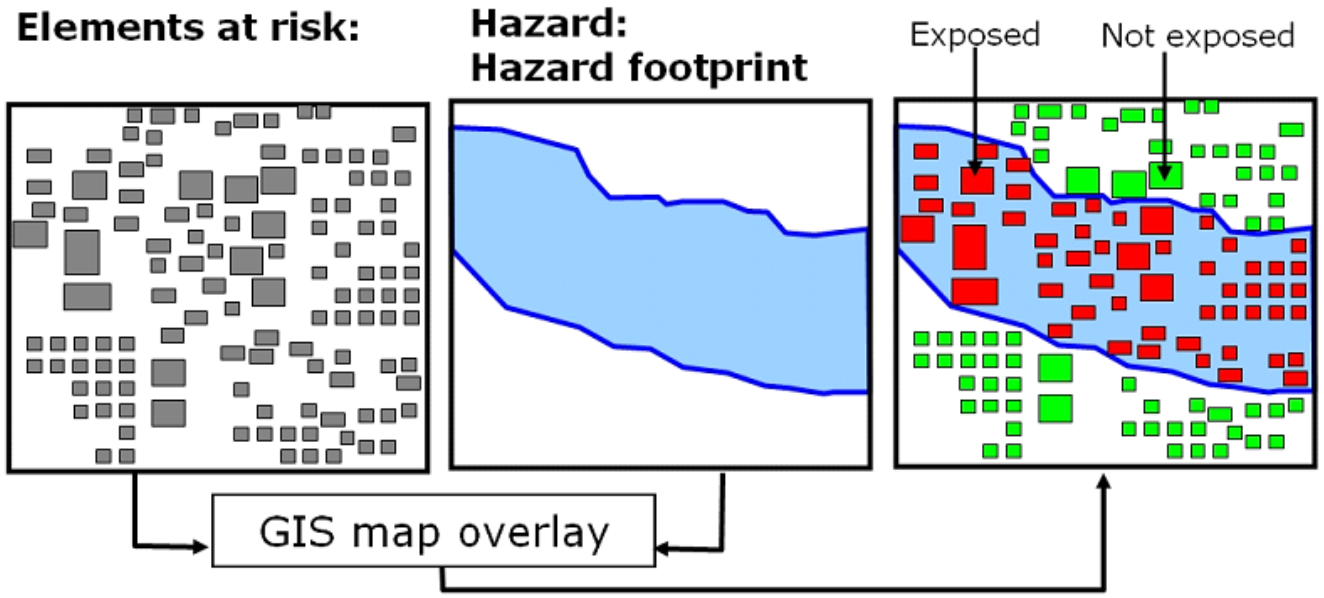
European Commission

Risk Analysis Module: Exposure

- Disaster risk assessment is set on **identifying the geographically** located **causal factors** of disasters

- Particularly relevant for location-sensitive hazards (e.g. floods)
- How to go about for hazards that are less dependent about exposure?

- **Attribute of exposure: Vulnerability**



Graphic representation of the quantification of exposed assets (Adapted: C. van Westen, 2012).

Risk Analysis Module: Vulnerability

Multi-hazard Vulnerability Composite Indicator

Hazard Independent Index

- Focuses on four dimensions:
  - Social
  - Economic
  - Political
  - Enviromental
- Systemic features of an area/community

Hazard Dependent Index

- Based on:
  - the relation between the metric of the hazard and the characteristic of exposure
  - Other metrics such as past events

Risk Analysis Module: Vulnerability

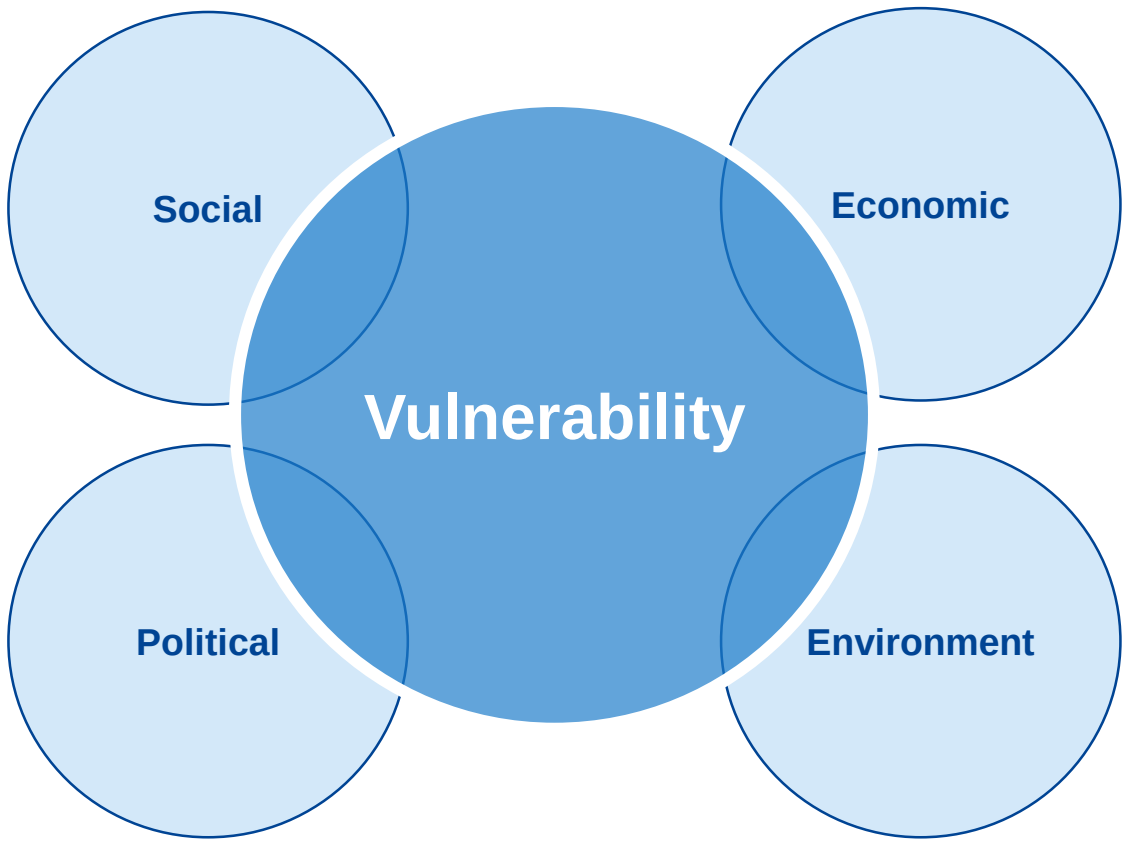
Hazard dependent component: it is the physical dimension, it is asset-specific and can be defined through three main sub-components that are *structural*, *exposure-based* and *hazard-based*.

Hazard independent component: based on socio-economic, political and environmental factors, it describes the vulnerability of the communities independently from their exposure to different kinds of hazards.

European Commission

Risk Analysis Module: Vulnerability

Multi-dimensional



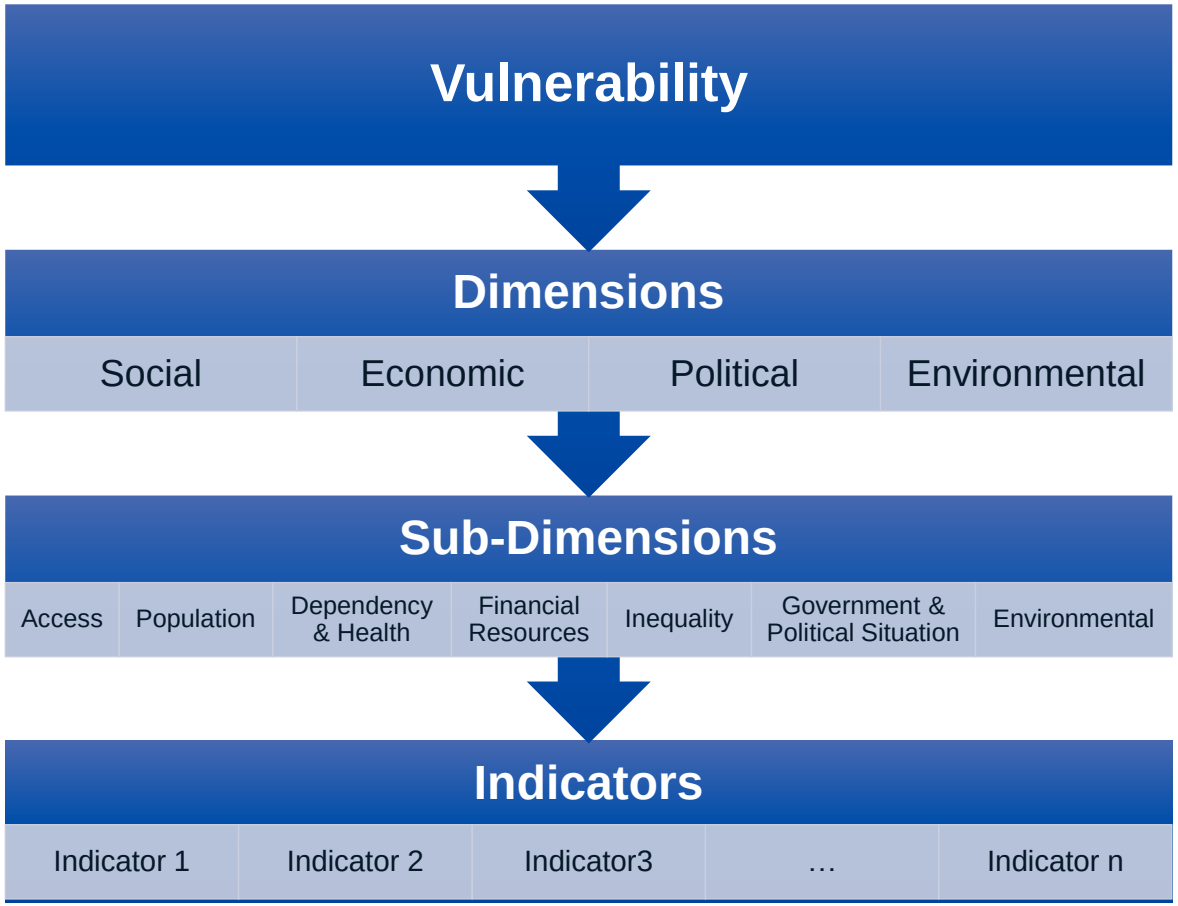
Vulnerability is influenced by different components and their interlinkages:

- **Social:** condition and processes of individuals and the entire population.
- **Economic:** resources of individuals, the population and the government.
- **Political:** quality of government and their actions.
- **Environmental:** status of the ecosystems and their ecological aspects.

European Commission

Risk Analysis Module: Vulnerability

Multi-dimensional



Additionally, below the four main dimensions there are seven sub-dimensions:

- Access;
- Population;
- Dependency & Health;
- Financial Resources;
- Inequality;
- Government & Political Situation;
- Environmental.

Each sub-dimension provides a better description of the dimension to which it is related, by linking it to the indicators.

European Commission

Risk Analysis Module: Vulnerability

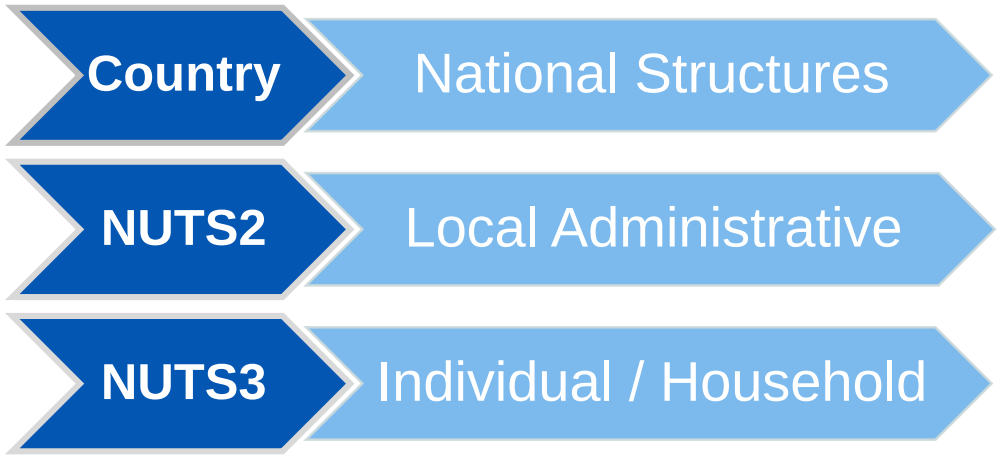
Multi-dimensional: Dimensions & Sub-dimensions

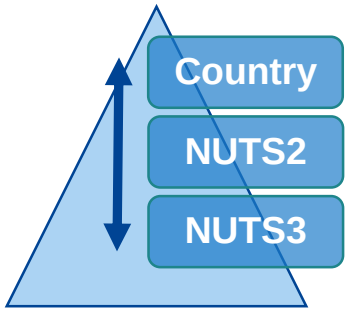
Dimensions and sub-dimensions are represented by a set of indicators for each level (based also on the data availability). Indicators are representative for a specific level and are chosen based on the literature review.

Dimension	Sub-dimension	Country Level Indicator	NUTS2 Level Indicator	NUTS3 level Indicator
Social	Population	Projected population change	-	Population density
				Net migration
	Population / Access (Social Participation)	Children at-risk-of-poverty	Participation in Social Networks	-
	Population / Access (Social Participation)	Disabled people with need for assistance	Information (Frequency of internet access: once a week (including every day))	-
	Population / Access (Social Participation)	Long-term care (health) expenditure	People at risk of poverty or social exclusion	-
	Dependency	Change in Age-dependency	-	Young dependency
				Old dependency
	Health	Self-reported unmet need for medical care Perceived Good Health	Life expectancy Hospital beds per 100'000 population	-
	Population (Education)	-	Primary and lower secondary education (levels 1 and 2)	-
			People with tertiary education (levels 5-8)	

Risk Analysis Module: Vulnerability

Multi-level





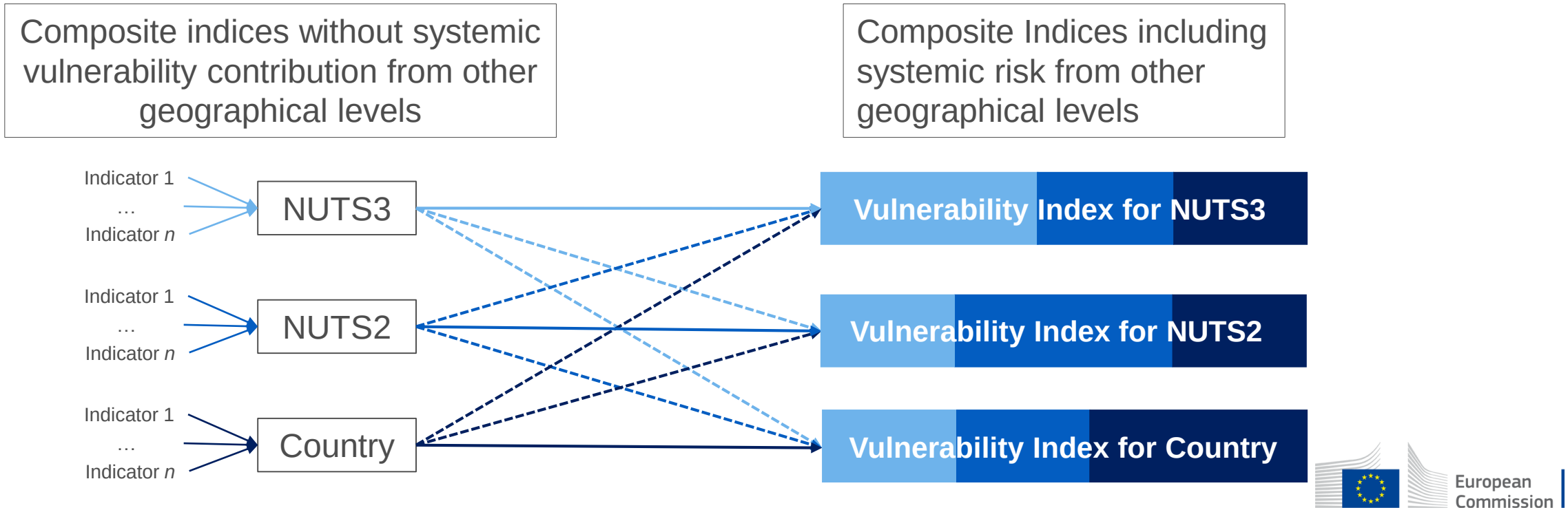
Vulnerability is tailored into levels for the integration into the RDH and is examined on three different levels: Country, NUTS2 & NUTS3.

Vulnerability is measured through a multi-level up and down aggregation. This is performed by aggregating each single level first, and then by gradually aggregating the levels together.

European Commission

Risk Analysis Module: Vulnerability

Multi-level, key concept: vulnerability of a country reflects the overall vulnerability of the communities; however local variations can affect the “global score”. In the same way, the local vulnerability should not ignore the global background to which it belongs.



European Commission

Risk Analysis Module: Vulnerability

The vulnerability index is composed of 43 indicators.

No. of indicators by data source:

- EUROSTAT: 34
- World Bank: 1
- UNESCO: 1
- Worldwide Governance Indicators: 2
- European Environment Agency: 1
- University of Gothenburg: 1
- World Resources Institute: 1
- Copernicus: 1

No. of indicators by geographic level:

- Country: 19
- NUTS2: 15
- NUTS3: 9

Note: the current implementation of the vulnerability on the RDH involves a set of 22 indicators overall, but there is an ongoing review to expand this set and improve the framework.

European Commission

Vulnerability: selected indicators (Country)

Scale	Dimension	Sub-dimension	Hazard-independent Indicator	Type	Vulnerability	Data Provider	Implemented
Country	Social	Population	Projected population change	Sensitivity	(+)	Eurostat	✓
Country	Social	Population (Social Participation)	Children at-risk-of-poverty	Sensitivity	(+)	Eurostat	✓
Country	Social	Population (Social Participation)	Disabled people with need for assistance	Sensitivity	(+)	Eurostat	✓
Country	Social	Population (Social Participation)	Long-term care (health) expenditure	Adapt. Capacity	(-)	Eurostat	✓
Country	Social	Dependency	Change in Age-dependency	Sensitivity	(+)	Eurostat	✓
Country	Social	Health	Self-reported unmet need for medical care	Sensitivity	(+)	Eurostat	✓
Country	Social	Health	Perceived Good Health	Sensitivity	(-)	Eurostat	✓
Country	Economic	Financial resources	Gross National Saving	Adapt. Capacity	(-)	WBG	✓
Country	Economic	Financial resources	GDP per capita	Adapt. Capacity	(-)	Eurostat	✓
Country	Economic	Inequality	Income Inequality	Sensitivity	(+)	Eurostat	✓
Country	Economic	Environmental	Cultural heritage	Sensitivity	(+)	Unesco	✓
Country	Political	Government	Governmental efficiency	Adapt. Capacity	(-)	WGI	✓
Country	Political	Political situation	Political Stability	Sensitivity	(-)	WGI	✓
Country	Political	Government (Strategy)	National Adaptation Strategies	Adapt. Capacity	(-)	ClimateAdapt	✓
Country	Environment	Environmental / Government	Environmental protection expenditure	Adapt. Capacity	(-)	Eurostat	
Country	Environment	Environmental / Government	Climate related economic losses	Adapt. Capacity	(+)	Eurostat / EAA	
Country	Environment	Environmental / Government	Production, value added and exports in the environmental goods and services sector	Adapt. Capacity	(-)	Eurostat	
Country	Environment	Environmental	Common farmland bird index	Sensitivity	(-)	Eurostat	
Country	Environment	Environmental	Natura 2000 protected areas	Sensitivity	(-)	Eurostat	✓

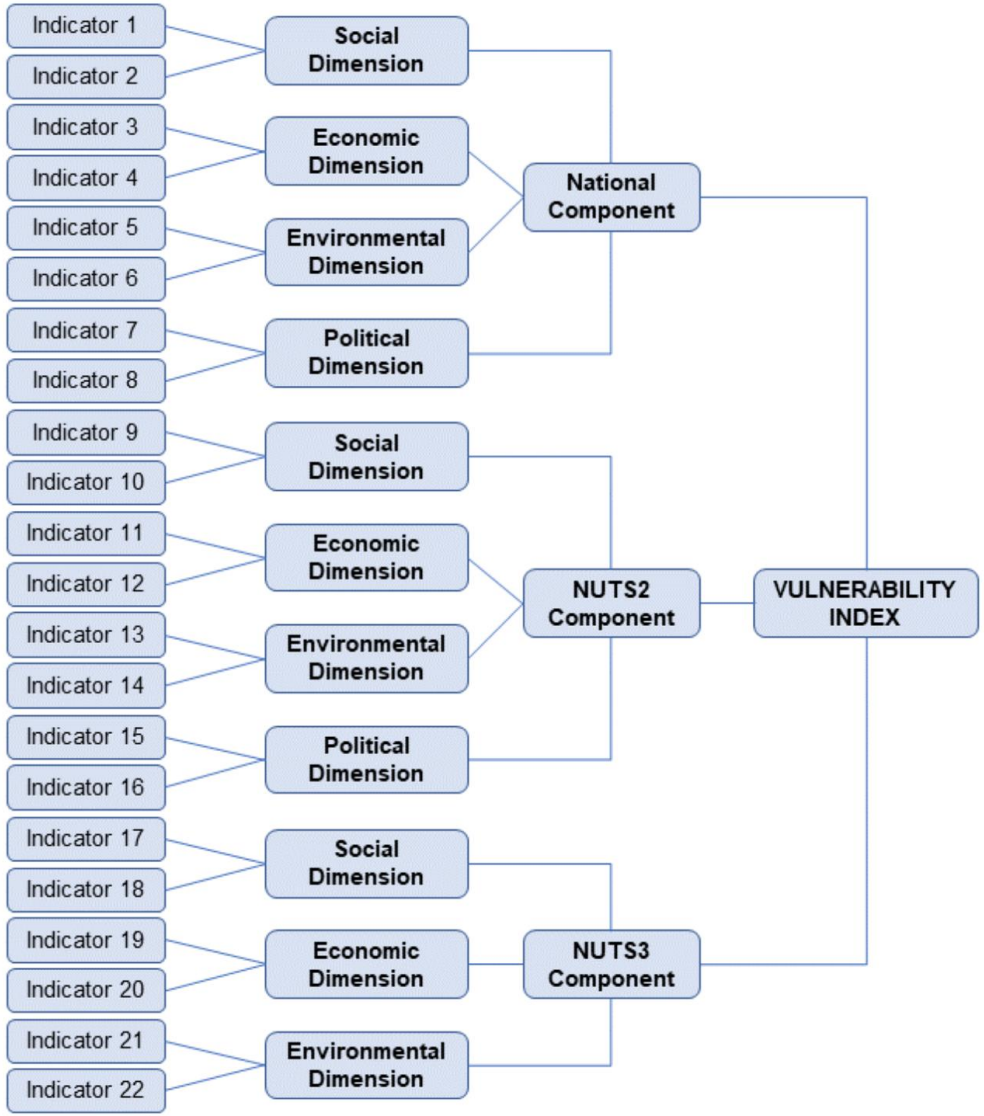
Vulnerability: selected indicators (NUTS2)

Scale	Dimension	Sub-dimension	Hazard-independent Indicator	Type	Vulnerability	Data Provider	Implemented
NUTS2	Social	Health	Life expectancy	Sensitivity	(-)	Eurostat	✓
NUTS2	Social	Health / Access	Hospital beds per 100'000 population	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Social	Access (Social Participation)	Participation in Social Networks	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Social	Access (Social Participation)	Information (Frequency of internet access: once a week (including every day))	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Social	Access (Social Participation)	People at risk of poverty or social exclusion	Sensitivity	(+)	Eurostat	✓
NUTS2	Social	Population (Education)	Primary and lower secondary education (levels 1 and 2)	Sensitivity	(+)	Eurostat	
NUTS2	Social	Population (Education)	People with tertiary education (levels 5-8)	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Economic	Financial resources	Severe material deprivation rate	Sensitivity	(+)	Eurostat	✓
NUTS2	Economic	Financial resources	Household income	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Economic	Access	Motorways	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Economic	Access	Railways	Adapt. Capacity	(-)	Eurostat	
NUTS2	Economic	Inequality (Employment)	Employment rate	Adapt. Capacity	(-)	Eurostat	✓
NUTS2	Political	Government	Regional Quality of Government index	Sensitivity	(-)	QoG	✓
NUTS2	Environment	Environmental	Urban area classified as green space	Sensitivity	(-)	CORINE	
NUTS2	Environment	Environmental	Urban land cover	Sensitivity	(+)	CORINE	

Vulnerability: selected indicators (NUTS3)

Scale	Dimension	Sub-dimension	Hazard-independent Indicator	Type	Vulnerability	Data Provider	Implemented
NUTS3	Social	Population	Population density	Sensitivity	(+)	Eurostat	✓
NUTS3	Social	Population	Net migration	Sensitivity	(+)	Eurostat	✓
NUTS3	Social	Dependency	Young dependency	Sensitivity	(+)	Eurostat	✓
NUTS3	Social	Dependency	Old dependency	Sensitivity	(+)	Eurostat	✓
NUTS3	Economic	Financial resources	NUTS3 GDP per capita vs country average	Adapt. Capacity	(-)	Eurostat	
NUTS3	Economic	Financial resources	Gross Value Added (at basic prices)	Adapt. Capacity	(-)	Eurostat	
NUTS3	Economic	Access	Power plants per 100'000 inhabitants	Adapt. Capacity	(-)	WRI	
NUTS3	Economic	Access	Patent applications to the EPO	Adapt. Capacity	(-)	Eurostat	
NUTS3	Environment	Environmental	Soil erosion	Sensitivity	(+)	Eurostat	

Vulnerability: Indicator and weights



Within this vulnerability framework all the dimensions have the same weight at each level and all the indicators within a dimension have equal weights.

	Country	NUTS2	NUTS3	
Social	$^1/_4$	$^1/_4$	$^1/_3$	**27.8%**
Economic	$^1/_4$	$^1/_4$	$^1/_3$	**27.8%**
Political	$^1/_4$	$^1/_4$		**16.7%**
Environmental	$^1/_4$	$^1/_4$	$^1/_3$	**27.8%**
	1	**1**	**1**	

European Commission

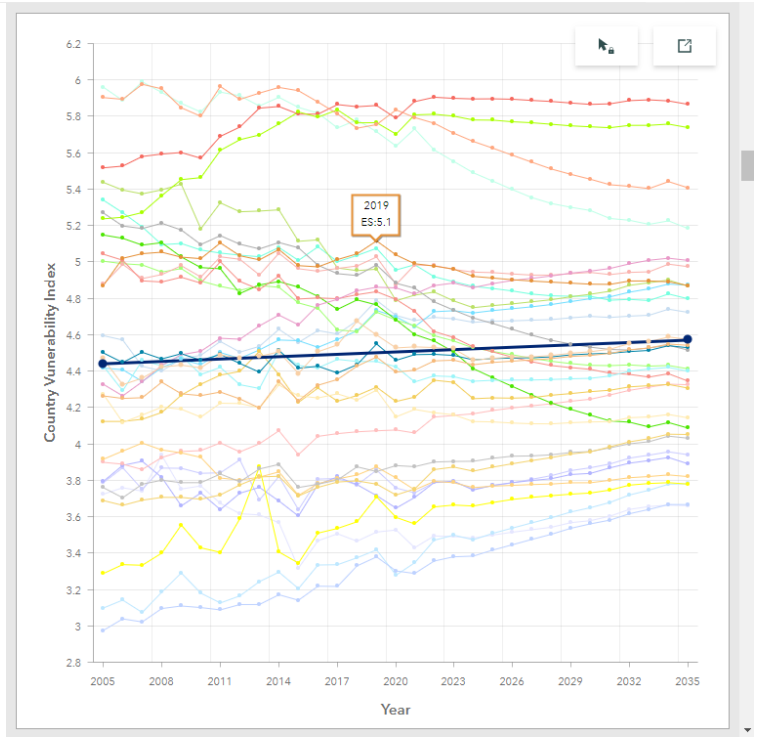
Vulnerability: what's coming?

Overall vulnerability trend across Europe

Looking at the evolution of the vulnerability over time between 2005 and 2035, we observe a slight increase of the index highlighted by the map here displayed.

This map shows the relative vulnerability of the countries divided into five classes (from "Very Low" to "Very High") across the time frame analyzed with periods of five years. Classes are defined based on the top and the bottom values of vulnerability recorded within the whole period of time.

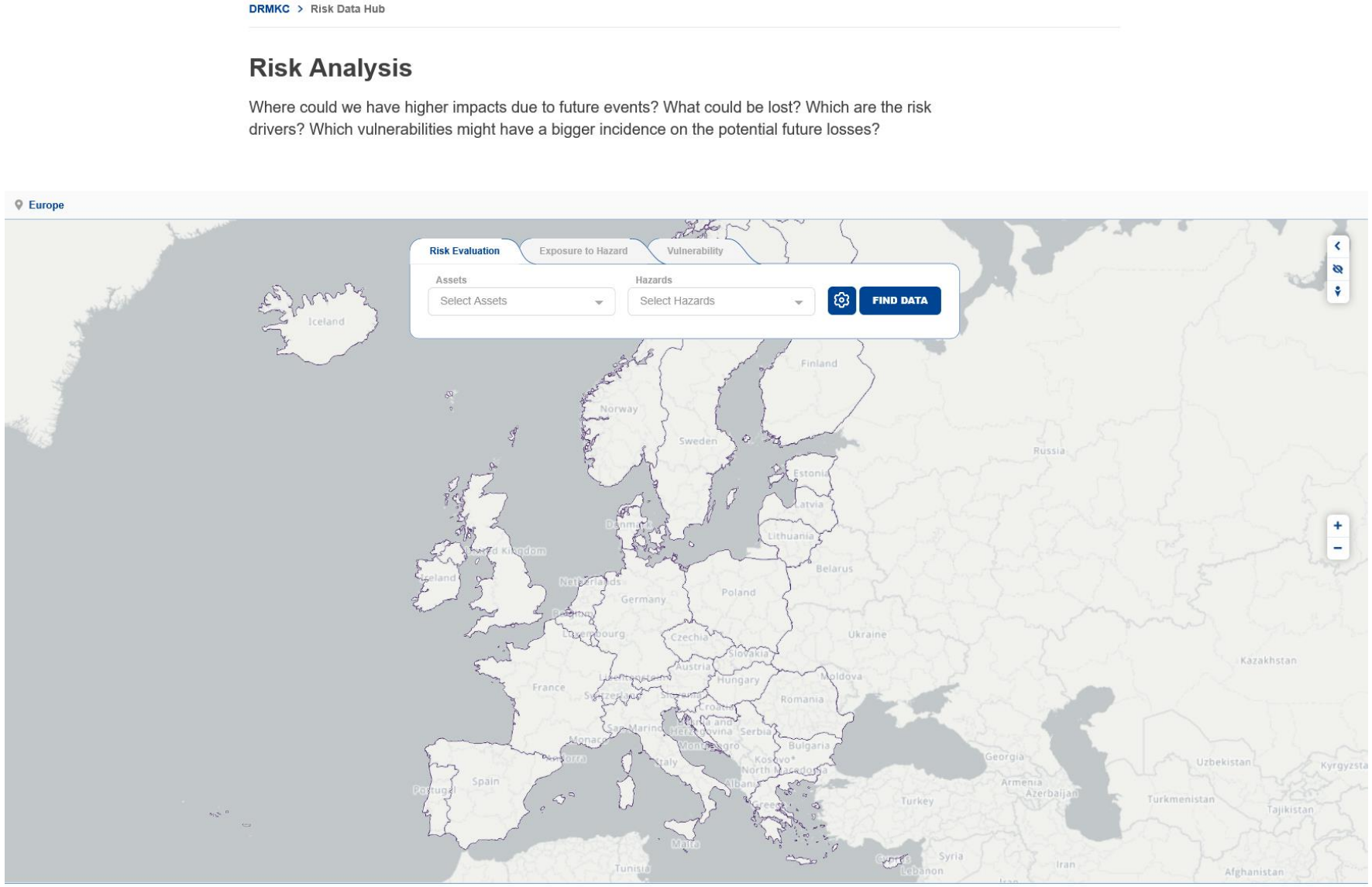
The animation clearly points out how countries turn to darker shades as time passes. By 2035 none of the countries are in the lower class and about *2/3* of them fall in the upper classes.



	2005	2020	2035
Min Value	2.97	3.28	3.66
Max Value	5.96	5.84	5.87
Mean Index	4.48	4.47	4.49
Max - Min	2.99	2.56	2.21
% Difference of Min Value (from 2005)	-	10.24	23.06
% Difference of Max Value (from 2005)	-	-2.10	-1.59

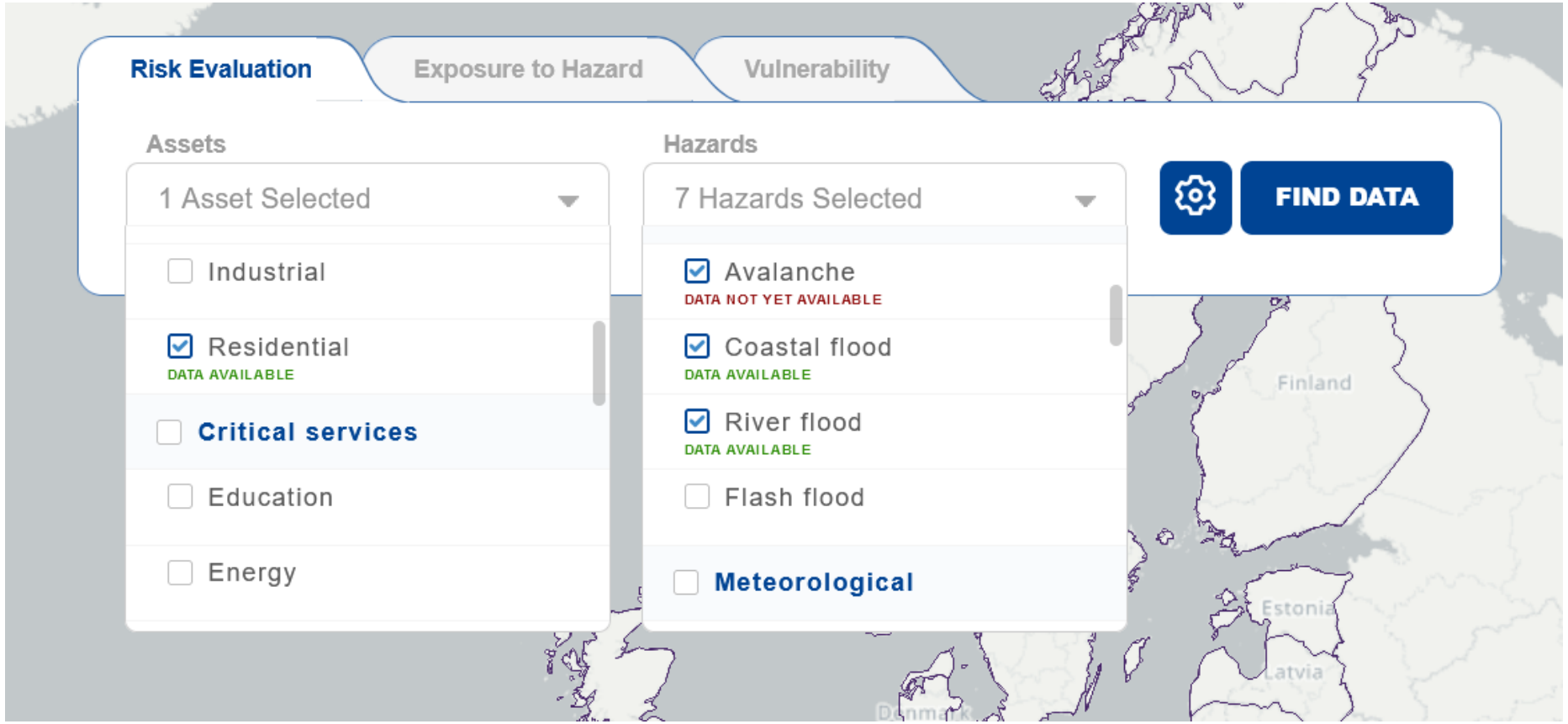
European Commission

Risk Analysis Module in practice!



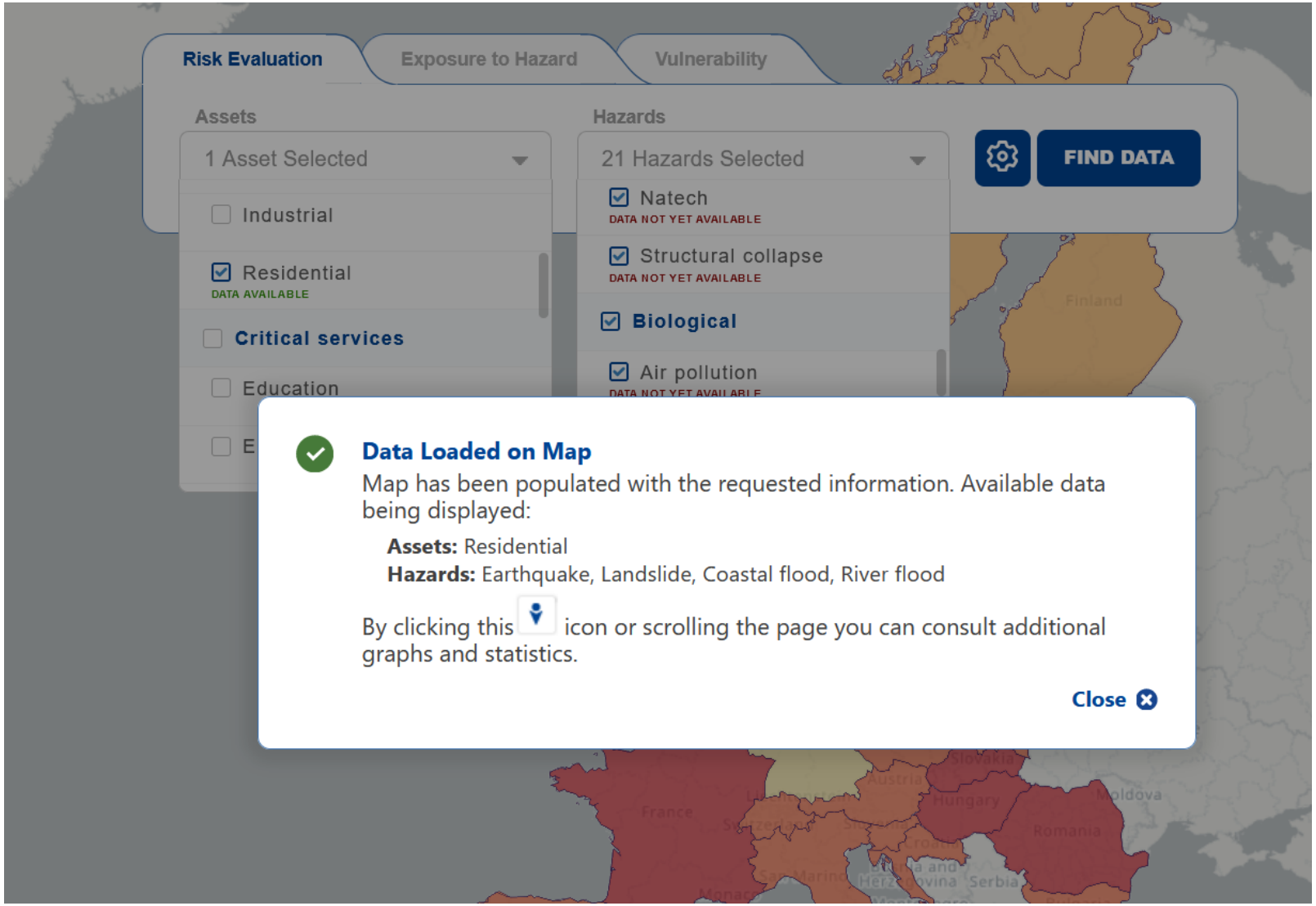
European Commission

Risk Analysis Module in practice!



European Commission

Risk Analysis Module in practice!



European Commission

Risk Analysis Module: Risk Estimation

There are two main approaches defining risk:

- Probabilistic Approach:
  - Risk is defined as the likelihood (i.e., probability) of sustaining a certain level of loss during a given time period.
  - Risk = Probability of an event occurring * impact of the event
- Deterministic Approach:
  - The geographical distribution of the severity of loss due to the occurrence of a postulated event (i.e., Scenario).

Risk Analysis Module: Risk Estimation

- Risk, in this context, is defined as the potential loss or damage of a system, society or community in a given period of **time (t),** determined probabilistically as a function of **hazard (H)**, **exposure (E)** and **vulnerability (V)**. This definition can be summarized in the following equation:

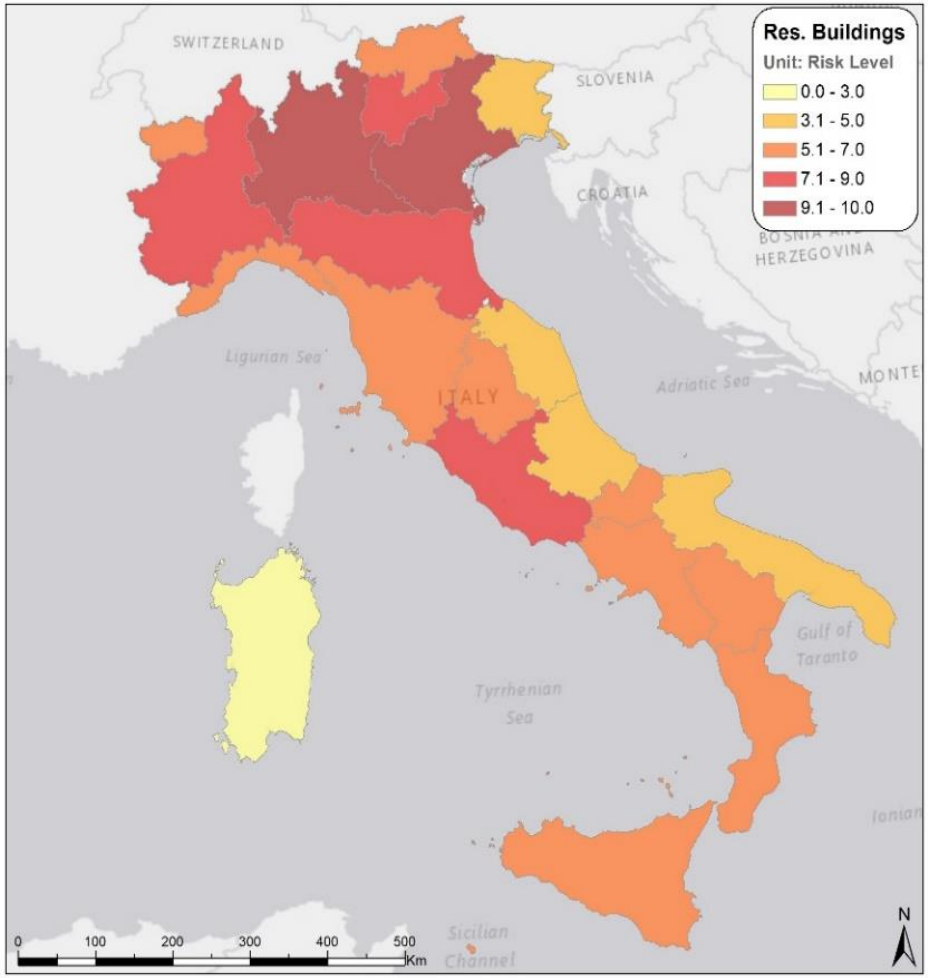
$$R = f(t, H, E, V).$$

Normalized Indicator 0 to 10

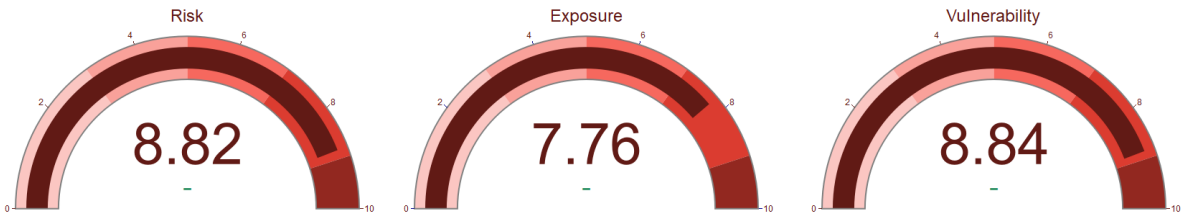
- RDH combines the exposure - assessed individually for different return periods – into an Expected Annual Exposure (EAE) or Expected Exposure for various other temporal intervals (2yrs, 5yrs, 10yrs, 15yrs and 25yrs).
- RDH combines the Expected exposure with Vulnerability indicators values (which acts like ratio values 0-1) arriving to potential impact and its probability (risk).
- The potential impacts values are further normalised (0-10) and presented on the map viewer.
- **Multihazard:** A multi-hazard selection on the map portal will trigger a running code which will combine the single hazard exposures (EAE) to a multi-hazard exposure. Further on the multi-hazard values the vulnerability indicators are introduced arriving to the multi-hazard potential impact and probabilities (risk).

European Commission

Risk Analysis Module: Risk Estimation



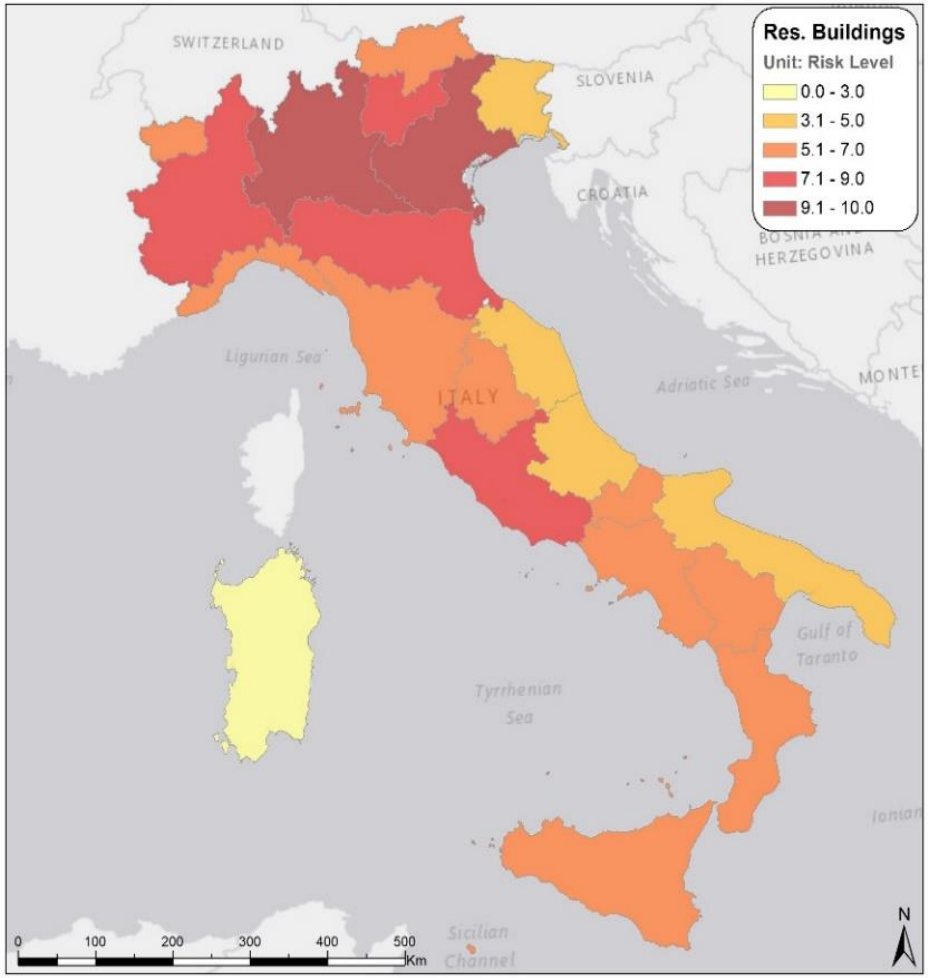
Estimated risk for residential buildings in Italy (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).



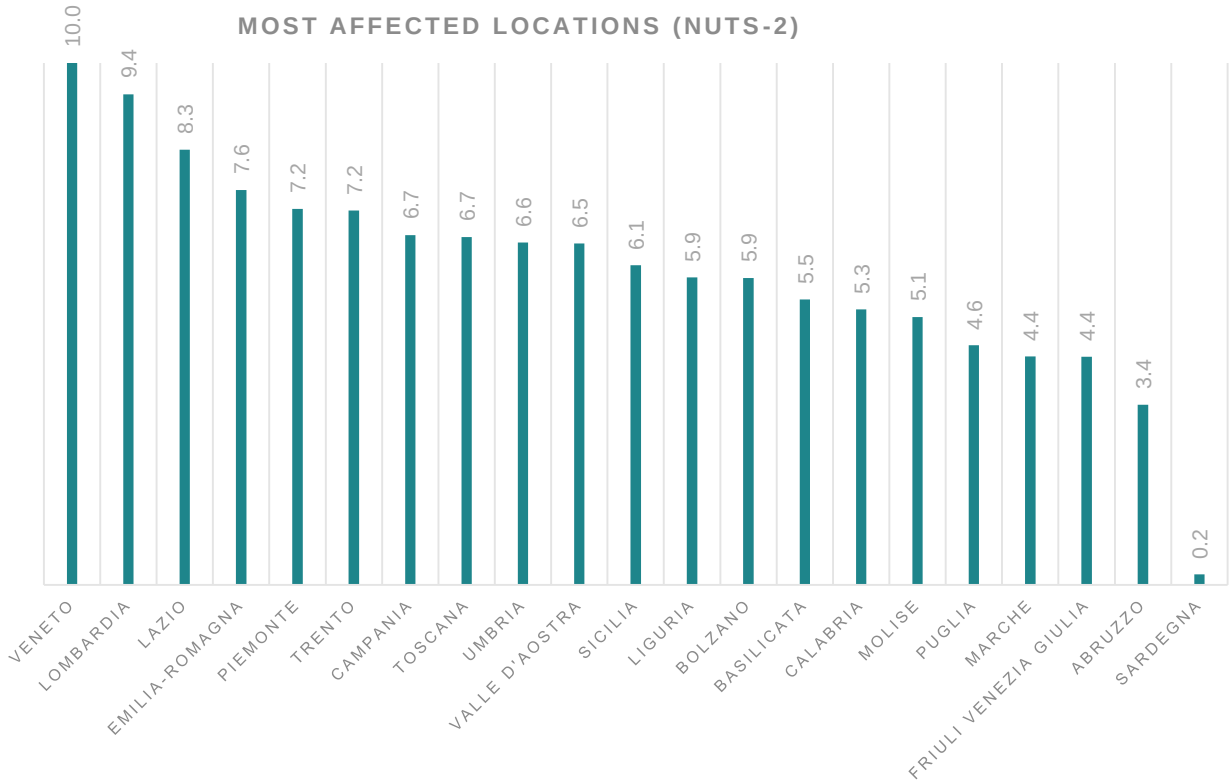
Estimated risk components for residential buildings in Italy (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).

European Commission

Risk Analysis Module: Risk Estimation



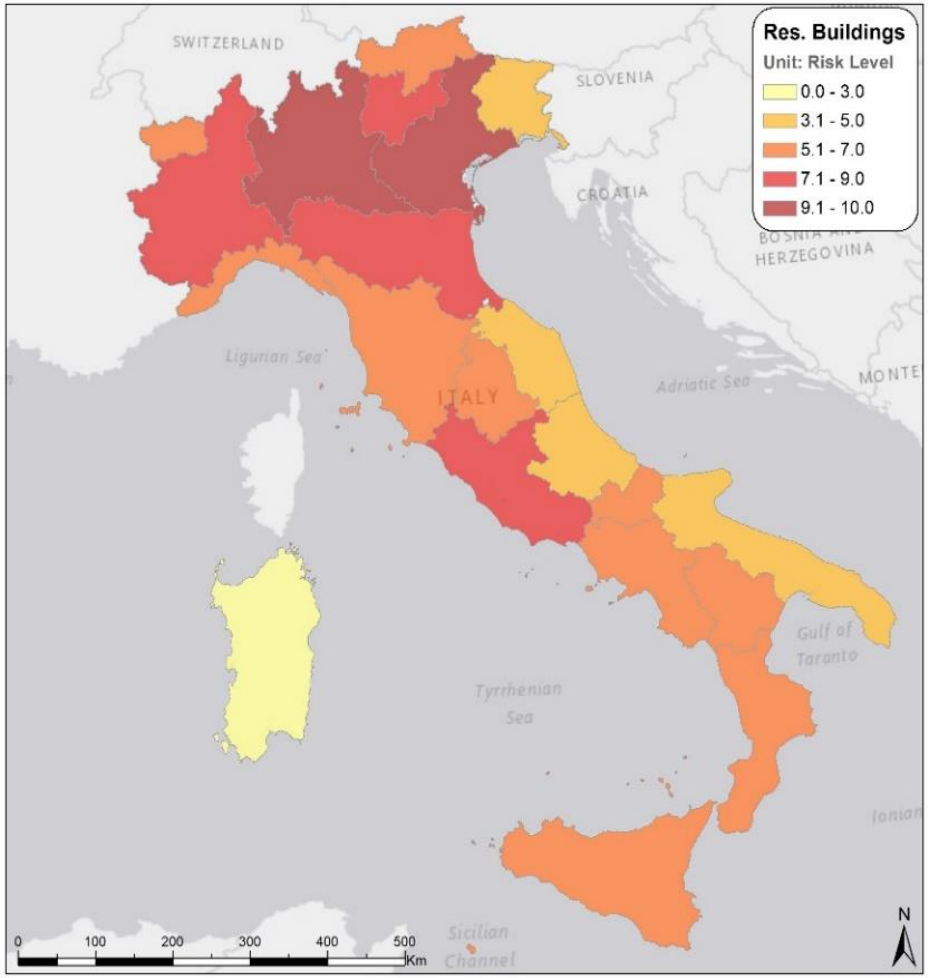
Estimated risk for residential buildings in Italy (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).



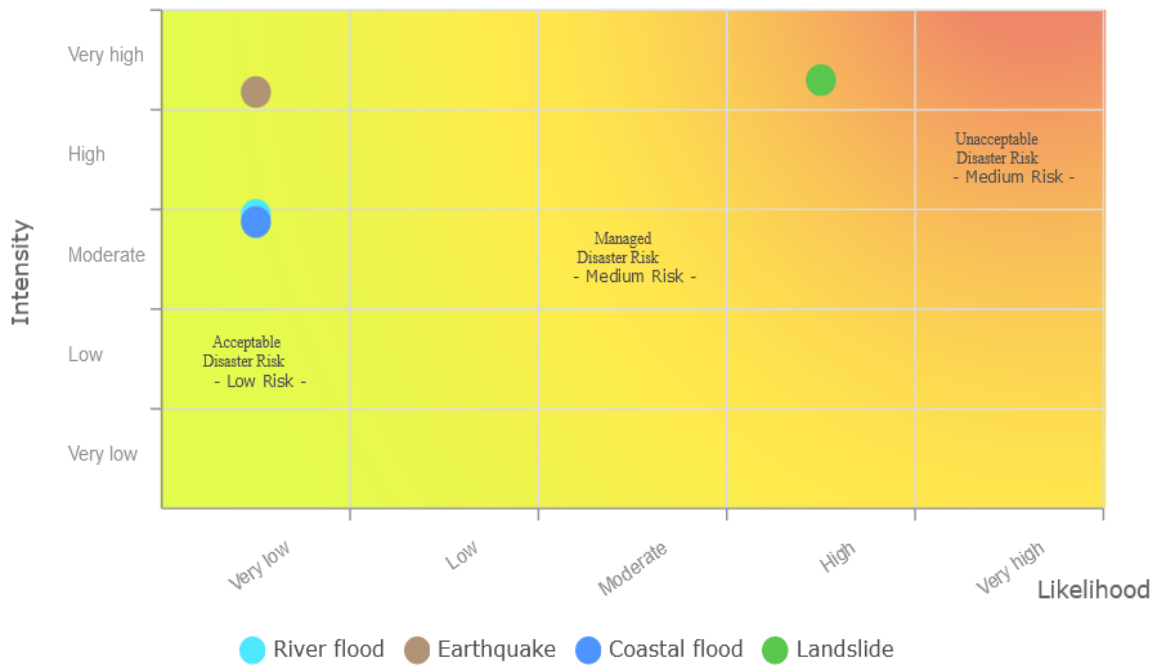
Ranking of Italian regions by risk for residential buildings (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).

European Commission

Risk Analysis Module: Risk Estimation



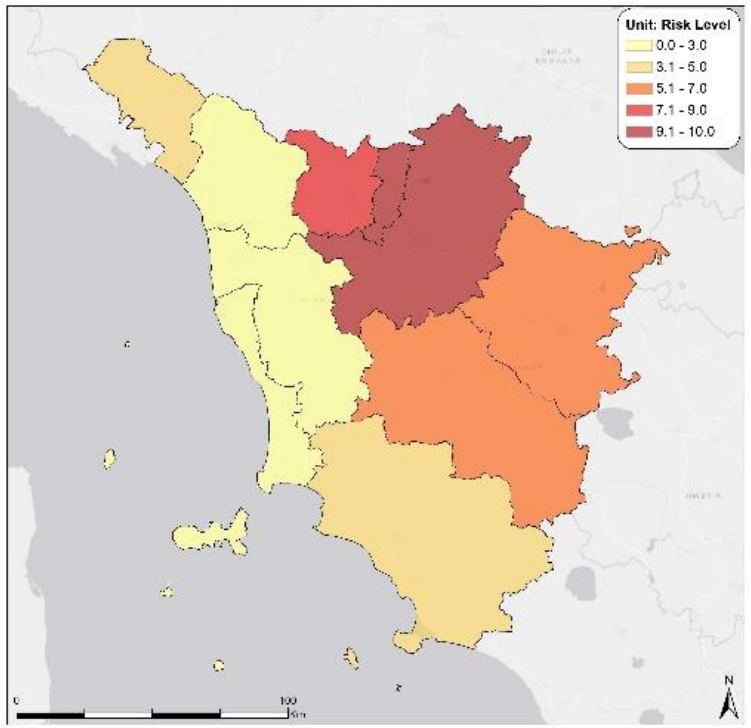
Estimated risk for residential buildings in Italy (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).



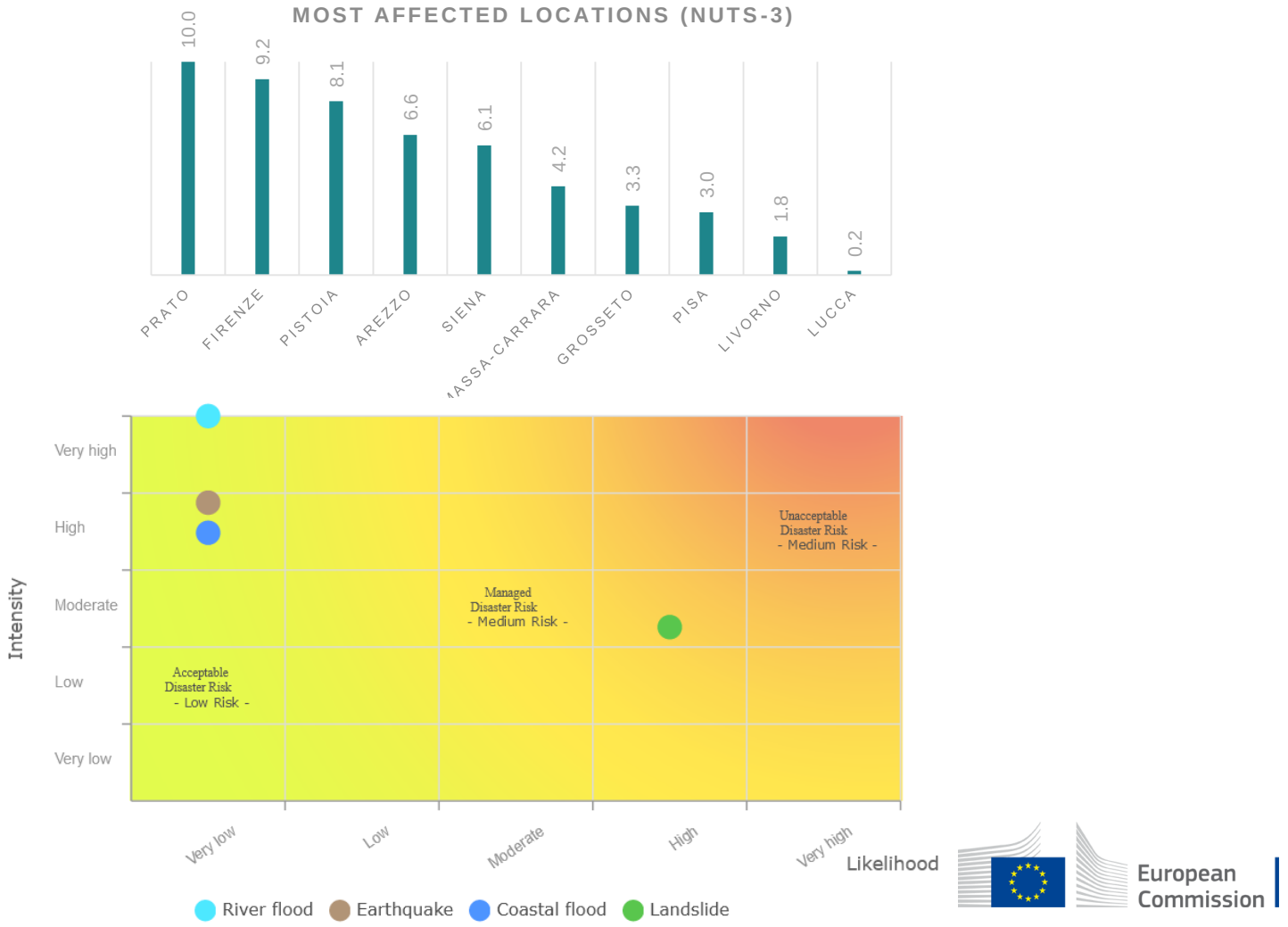
Risk Matrix for residential buildings in Italy (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).

European Commission

Risk Analysis Module



Estimated risk for residential buildings in Tuscany (selected timeframe: 2 years, hazards selected: earthquake, landslide, coastal flood and river flood).



European Commission

Risk Analysis: nitty-gritty details!

The input table below shows values for exposure of Commercial built-up taken from the Risk Data Hub for River Floods for different return periods:

Return Period, T (years)	Probability of exceedance, P_T	River Floods: Exposed area, E_T (km2)
500	0.002	720
200	0.005	670
100	0.01	628
50	0.02	581
10	0.1	434

For the event with the highest return period, i.e. T = 500 years, we assume that the **exceedance probability (P)** is equal to the **probability of occurrence (p)**. From that number it is possible to calculate all the individual probabilities associated to events with different return periods:

$$P_{T_{500}} = p_{500}$$

$$P_{T_{200}} = 1 - (1 - p_{500})(1 - p_{200})$$

$$p_{200} = \frac{P_{T_{200}} - 1}{(1 - p_{500})} + 1$$

$$P_{T_{100}} = 1 - (1 - p_{500})(1 - p_{200})(1 - p_{100})$$

$$p_{100} = \frac{P_{100} - 1}{(1 - p_{500})(1 - p_{200})} + 1$$

Etc.

European Commission

Risk Analysis: nitty-gritty details!

Return Period, T (years)	Probability of exceedance, P_T	Probability of occurrence, p_T
500	0.002	0.002
200	0.005	0.003
100	0.01	0.005
50	0.02	0.010
10	0.1	0.082

Using the values calculated for 1 year it is now possible to move on and **calculate the probabilities and overall average loss expected for different time periods: 2, 5, 10, 15 and 25 years**. The first step is to calculate the probabilities of occurrence for each event over a selected time interval, n years:

$$p_T(n) = 1 - (1 - p_T)^n$$

$$n = 2, 5, 10, 15, 25\ [years]$$

$$T = 500, 200, 100, 50, 10\ [years]$$

Risk Analysis: nitty-gritty details!

Return Period, T (years)	pT(1 year)	pT(2 years)	pT(5 years)	pT(10 years)	pT(15 years)	pT(25 years)
500	0.002	0.004	0.010	0.020	0.030	0.049
200	0.003	0.006	0.015	0.030	0.044	0.073
100	0.005	0.010	0.025	0.049	0.073	0.118
50	0.010	0.020	0.049	0.097	0.141	0.224
10	0.082	0.157	0.348	0.573	0.721	0.881

European Commission

Risk Analysis: nitty-gritty details!

The overall average expected losses and probabilities of exceedances are then expressed simply by:

$$U_1 = p_{500,1}E_{500} + p_{200,1}E_{200} + p_{100,1}E_{100} + p_{50,1}E_{50} + p_{10,1}E_{10}$$

$$P_{T_{10,1}} = 1 - (1 - p_{500,1})(1 - p_{200,1})(1 - p_{100,1})(1 - p_{50,1})(1 - p_{10,1})$$

$$U_2 = p_{500,2}E_{500} + p_{200,2}E_{200} + p_{100,2}E_{100} + p_{50,2}E_{50} + p_{10,2}E_{10}$$

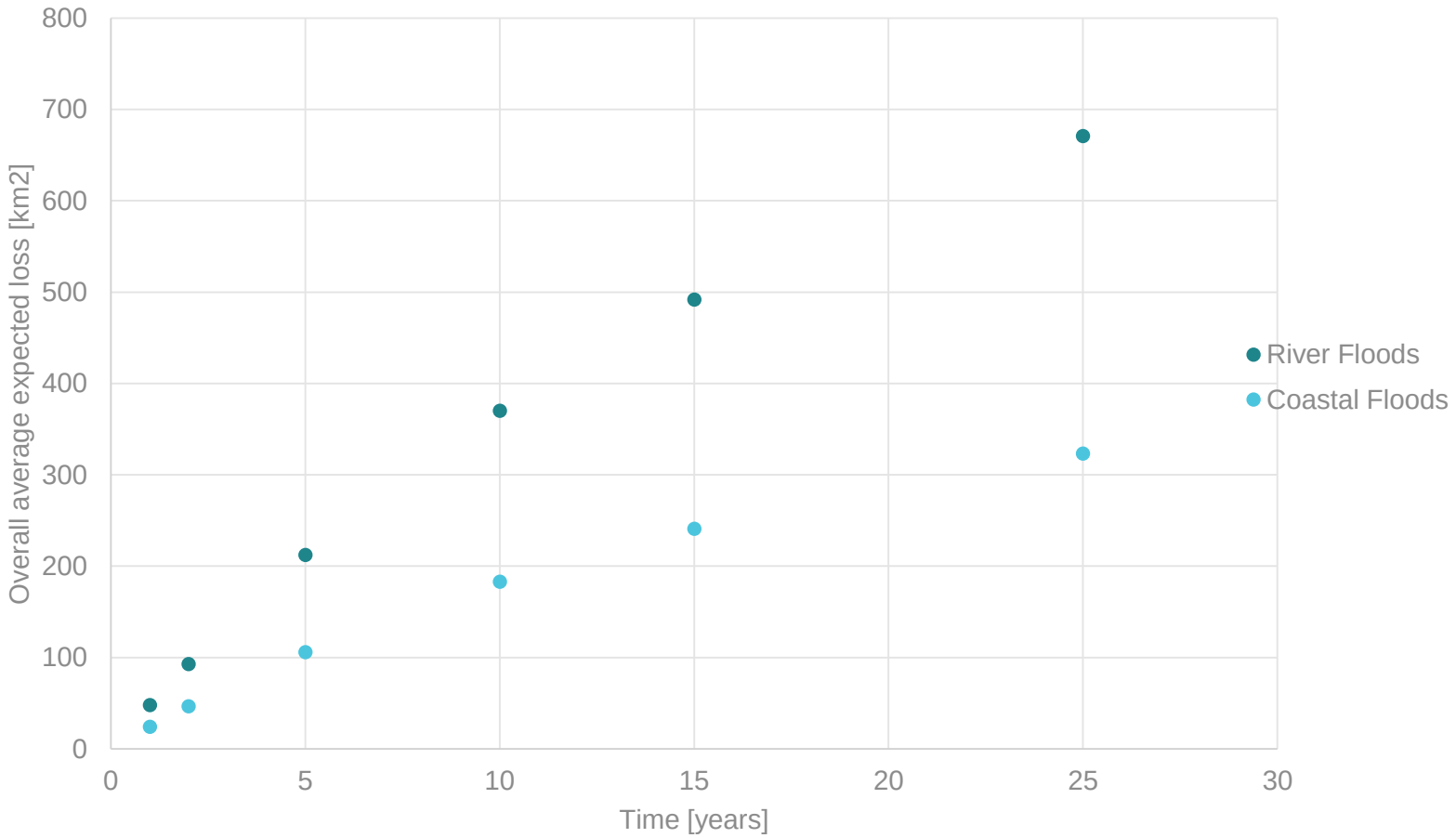
$$P_{T_{10,2}} = 1 - (1 - p_{500,2})(1 - p_{200,2})(1 - p_{100,2})(1 - p_{50,2})(1 - p_{10,2})$$

$$U_5 = p_{500,5}E_{500} + p_{200,5}E_{200} + p_{100,5}E_{100} + p_{50,5}E_{50} + p_{10,5}E_{10}$$

$$P_{T_{10,5}} = 1 - (1 - p_{500,5})(1 - p_{200,5})(1 - p_{100,5})(1 - p_{50,5})(1 - p_{10,5})$$

	Overall average loss (U)	Probability of exceedance (P_T)
1 year	47.9	0.10
2 years	92.8	0.19
5 years	212.0	0.41
10 years	369.9	0.65
15 years	491.7	0.79
25 years	670.6	0.93

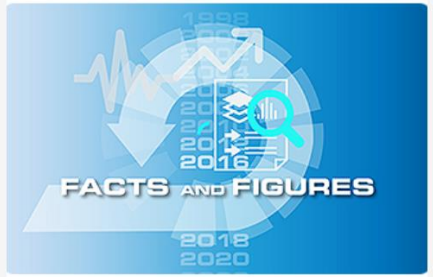
Risk Analysis: nitty-gritty details!



Now we can plot the probability of exceedance against the overall average expected loss for any given time period. Results are plotted in the exposure matrix (probability of exceedance and overall average expected loss).

European Commission

What else do we offer?



Facts and Figures (beta)

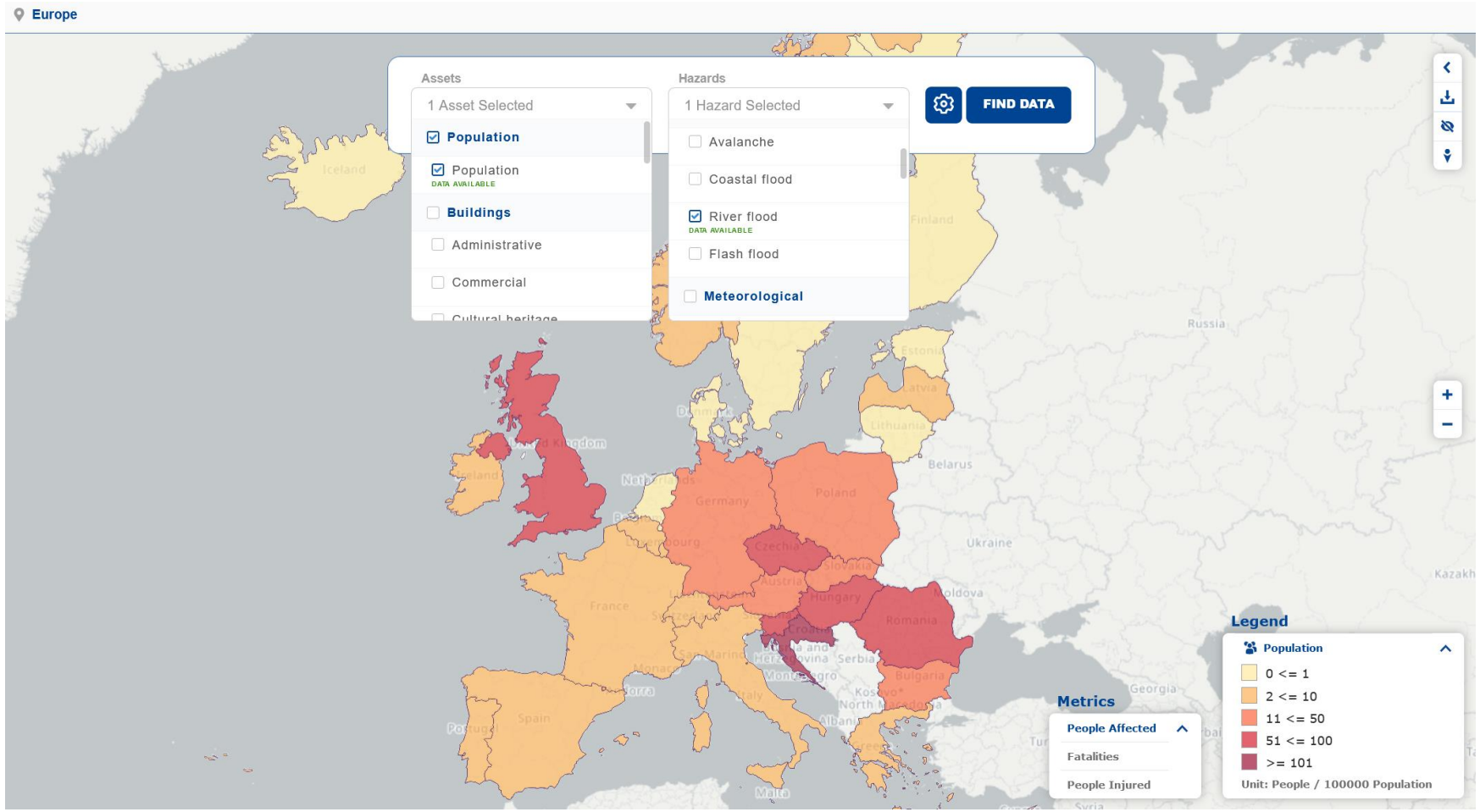
Cross-hazard comparative view of both past and future impacts

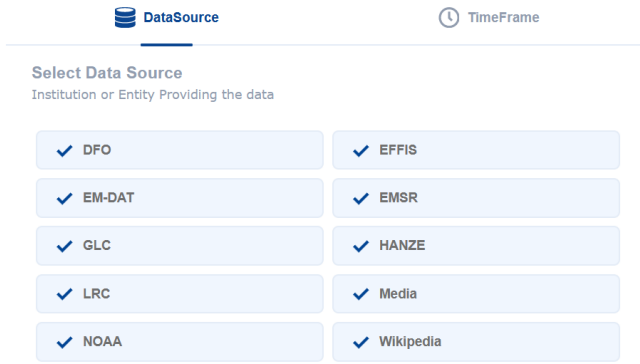
User Corner

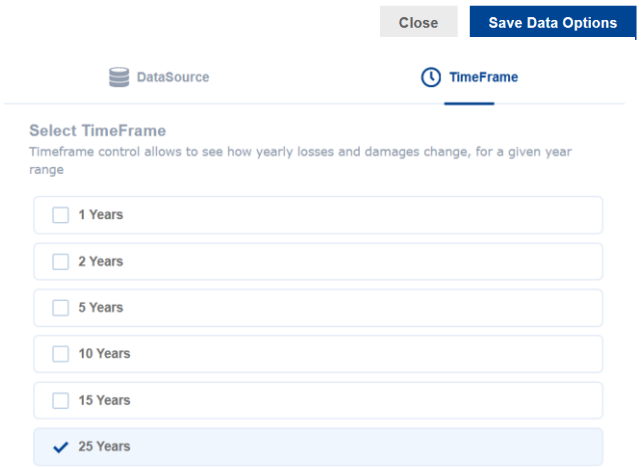
Restricted area dedicated to authorized user for managing their own data

European Commission

Losses and Damage Data





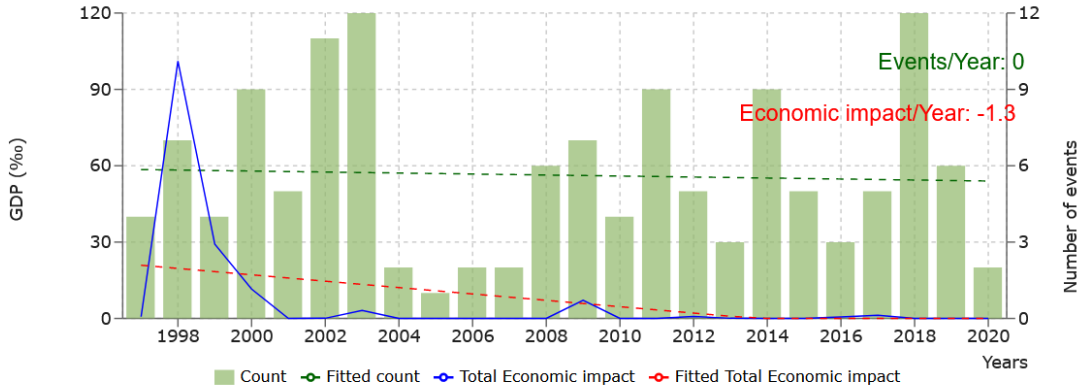


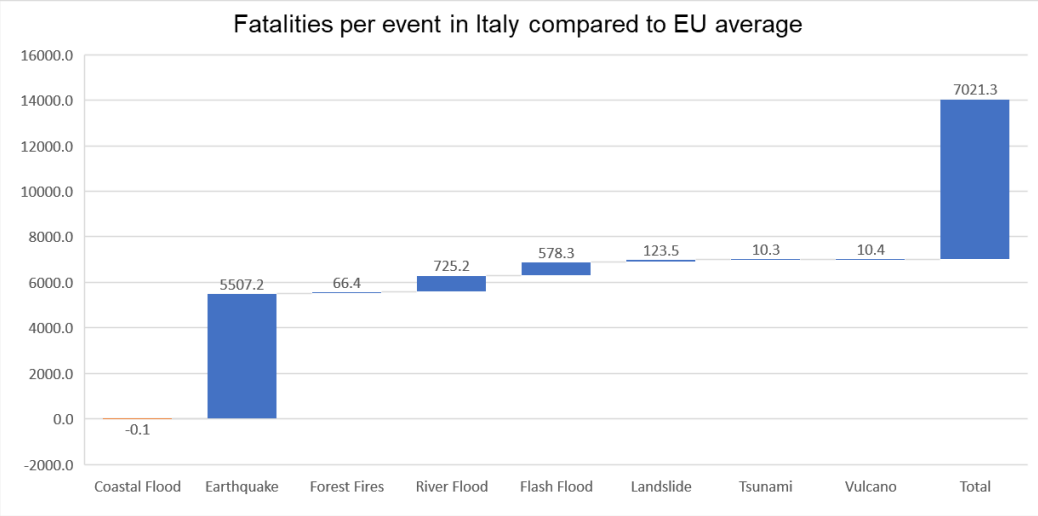
European Commission

Losses and Damage Data

Trends

Past trends and yearly rates of change

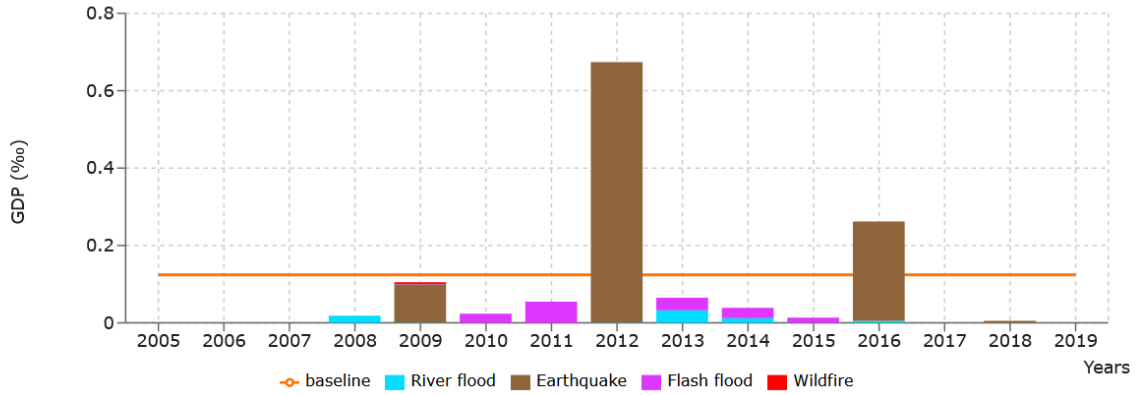




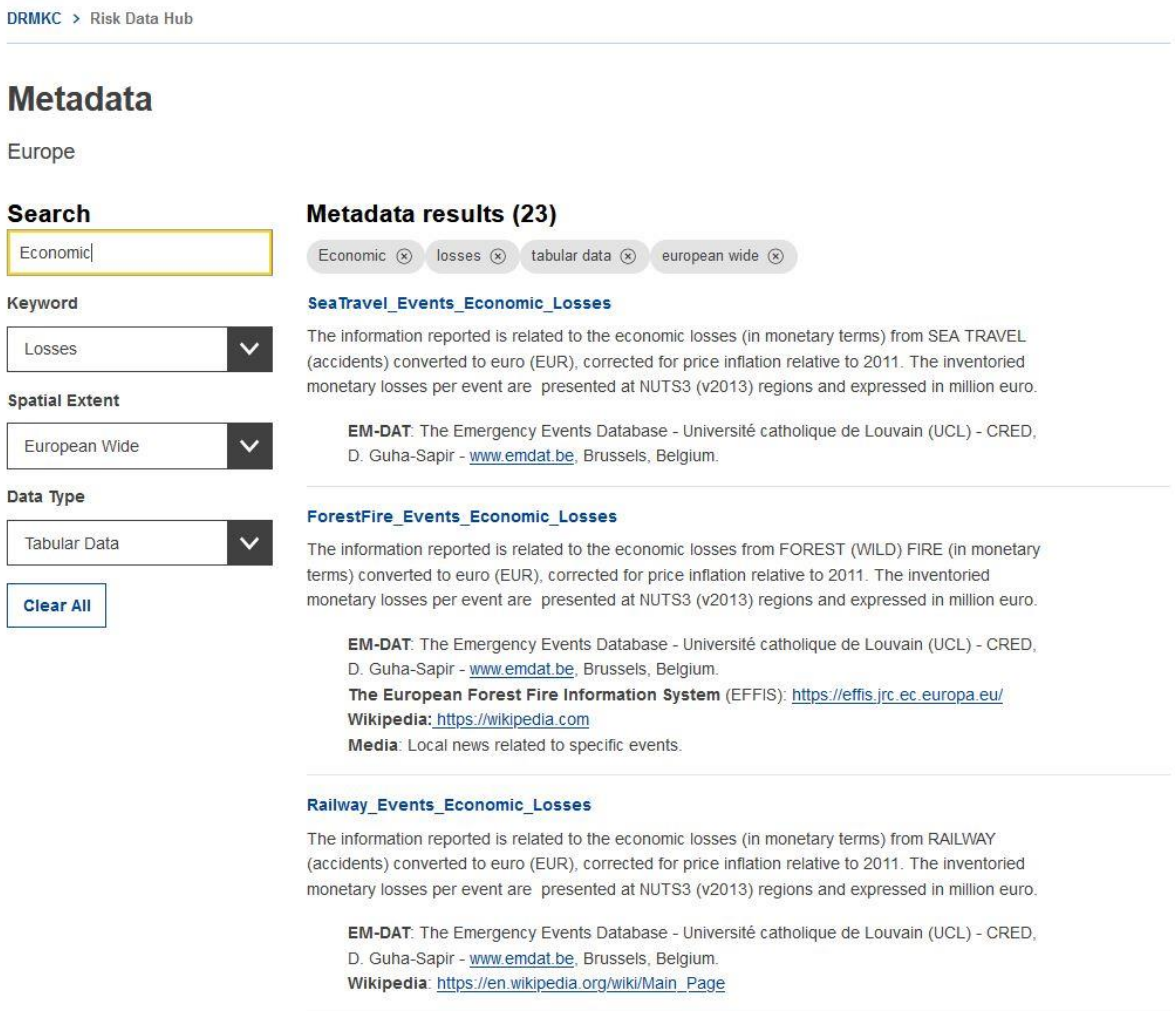
Sendai Indicator C-4

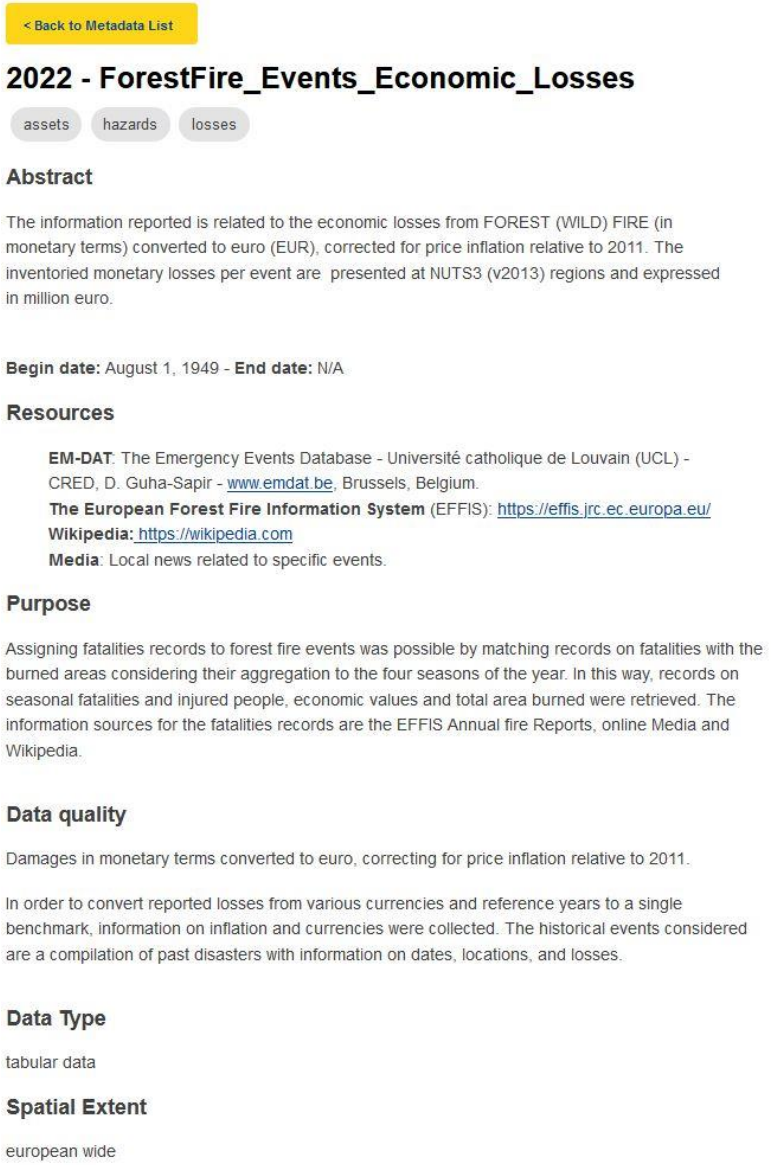
Direct economic loss in the housing sector attributed to disasters. Data would be disaggregated according to damaged and destroyed dwellings.

Reference Value for years 2005-2015 (baseline): 0.12417



Metadata

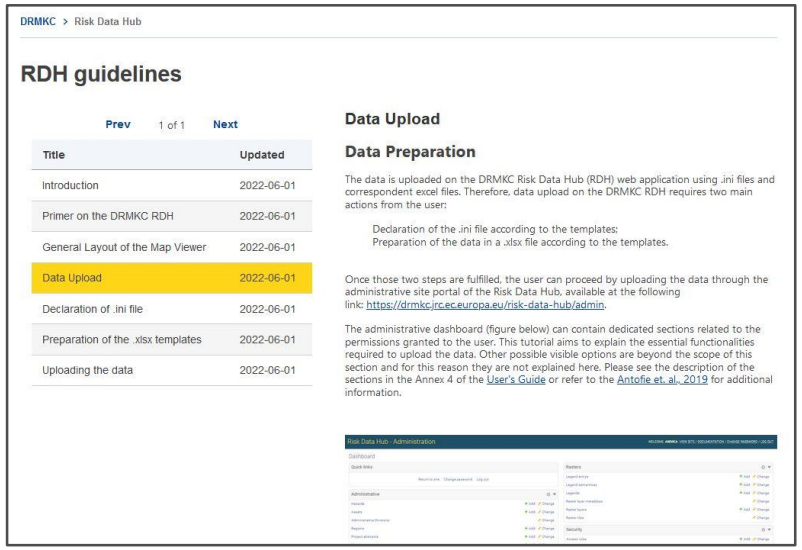


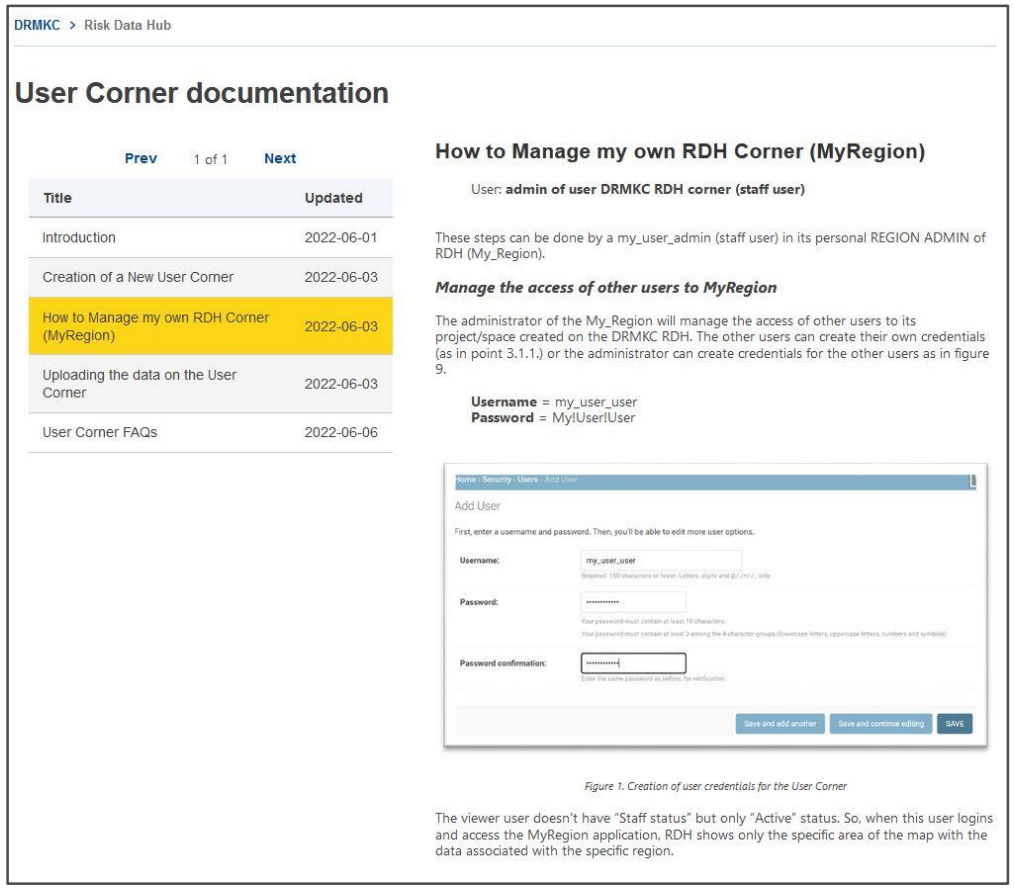


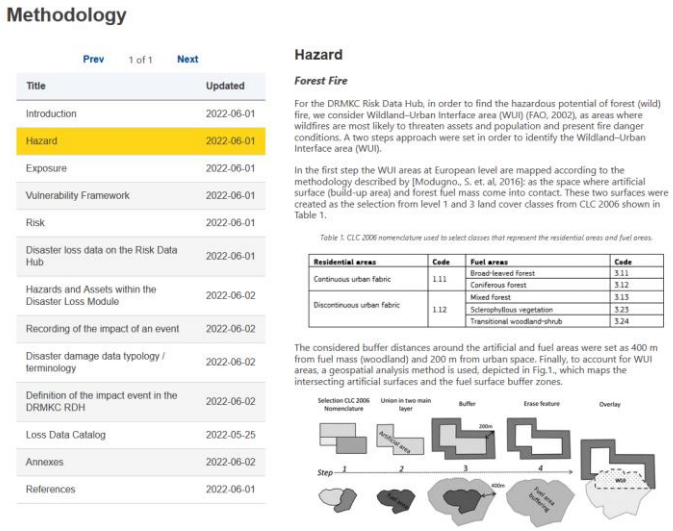
European Commission

Learning Space

Guidelines, User corner documentation, Methodologies







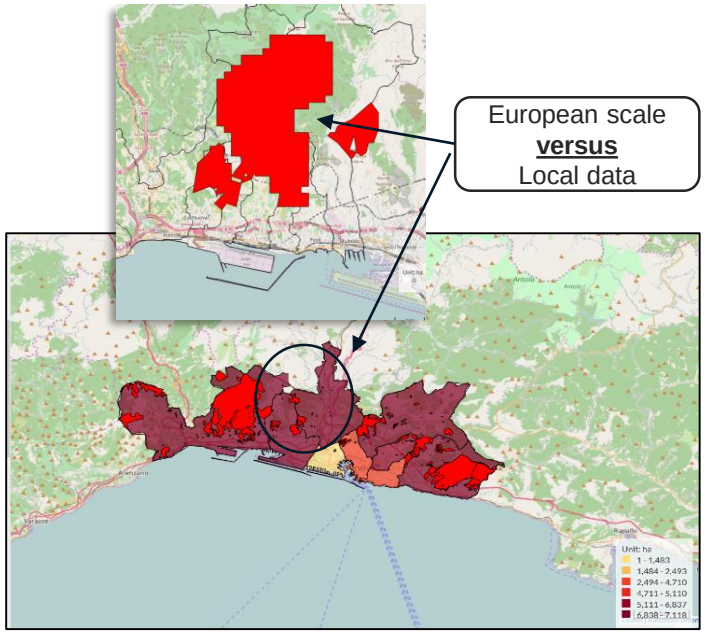
A living guide for training and learning!

European Commission

User’s Corner

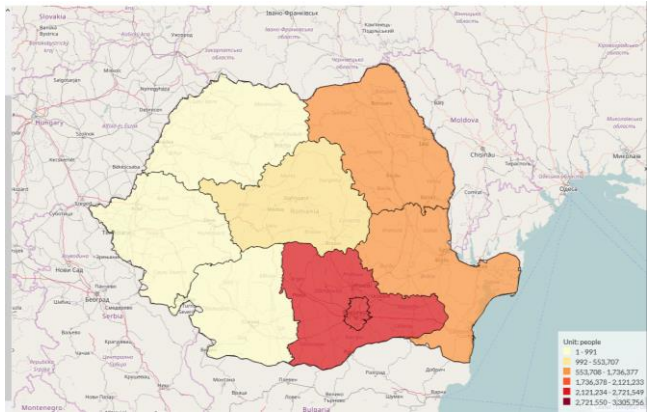
- A call for collaboration!

Genoa municipality



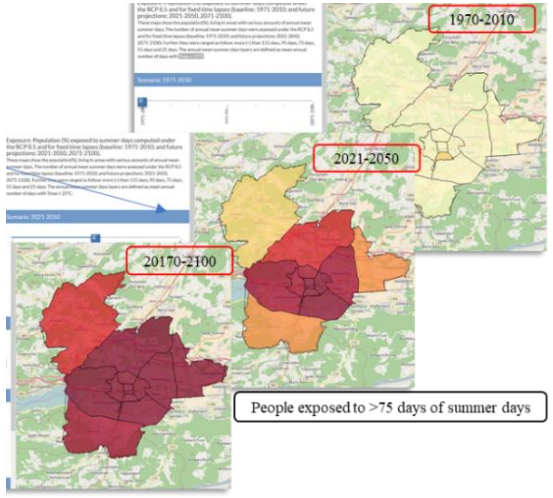
Romania

Department of Emergency Situation (authoritative) data collection

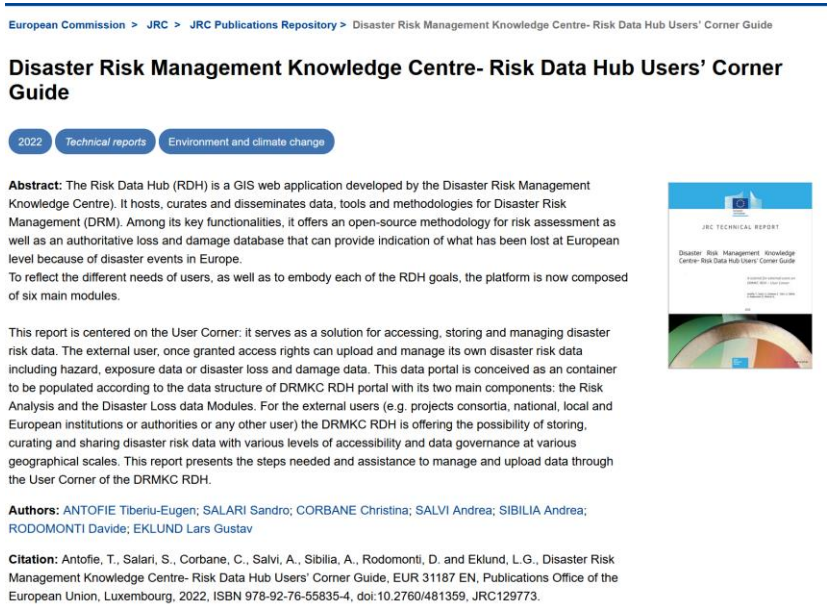


Austria

Analysis considering climate scenarios – **local** exposure **data**



Users' Corner



European Commission > JRC > JRC Publications Repository > Disaster Risk Management Knowledge Centre- Risk Data Hub Users' Corner Guide

Disaster Risk Management Knowledge Centre- Risk Data Hub Users' Corner Guide

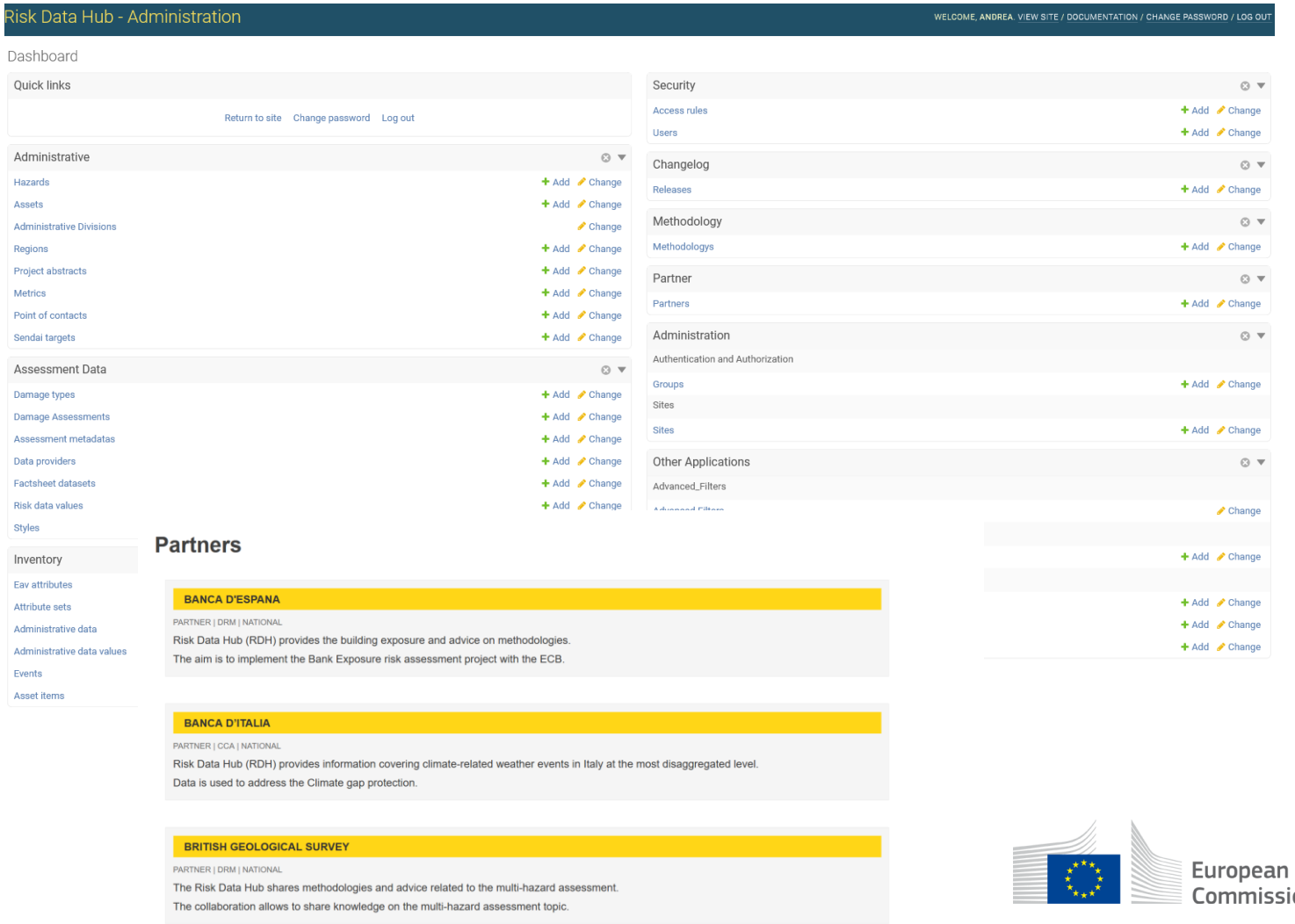
2022 | *Technical reports* | Environment and climate change

Abstract: The Risk Data Hub (RDH) is a GIS web application developed by the Disaster Risk Management Knowledge Centre). It hosts, curates and disseminates data, tools and methodologies for Disaster Risk Management (DRM). Among its key functionalities, it offers an open-source methodology for risk assessment as well as an authoritative loss and damage database that can provide indication of what has been lost at European level because of disaster events in Europe.
To reflect the different needs of users, as well as to embody each of the RDH goals, the platform is now composed of six main modules.

This report is centered on the User Corner: it serves as a solution for accessing, storing and managing disaster risk data. The external user, once granted access rights can upload and manage its own disaster risk data including hazard, exposure data or disaster loss and damage data. This data portal is conceived as an container to be populated according to the data structure of DRMKC RDH portal with its two main components: the Risk Analysis and the Disaster Loss data Modules. For the external users (e.g. projects consortia, national, local and European institutions or authorities or any other user) the DRMKC RDH is offering the possibility of storing, curating and sharing disaster risk data with various levels of accessibility and data governance at various geographical scales. This report presents the steps needed and assistance to manage and upload data through the User Corner of the DRMKC RDH.

Authors: ANTOFIE Tiberiu-Eugen; SALARI Sandro; CORBANE Christina; SALVI Andrea; SIBILIA Andrea; RODOMONTI Davide; EKLUND Lars Gustav

Citation: Antofie, T., Salari, S., Corbane, C., Salvi, A., Sibilia, A., Rodomonti, D. and Eklund, L.G., Disaster Risk Management Knowledge Centre- Risk Data Hub Users' Corner Guide, EUR 31187 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-55835-4, doi:10.2760/481359, JRC129773.

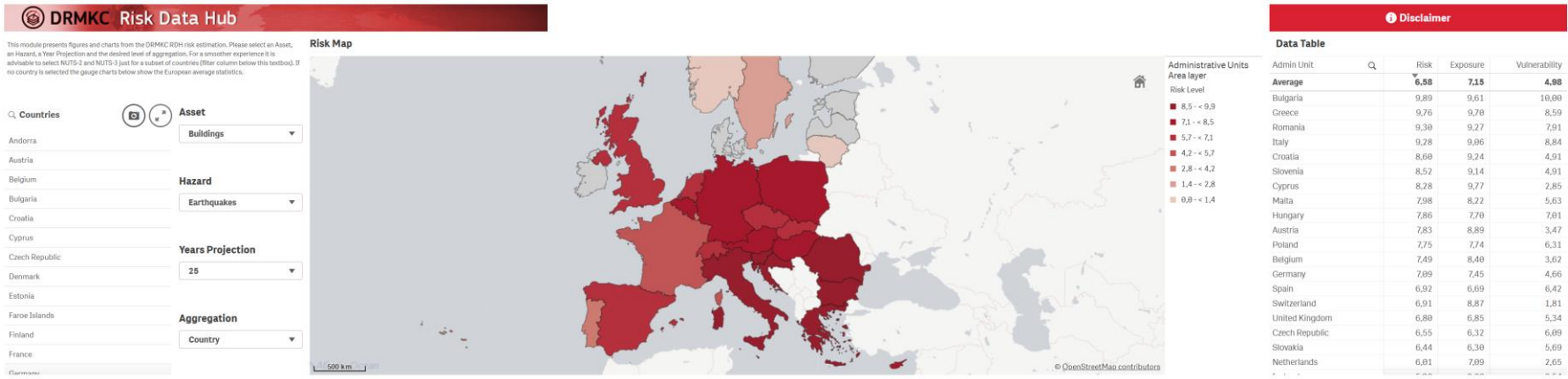


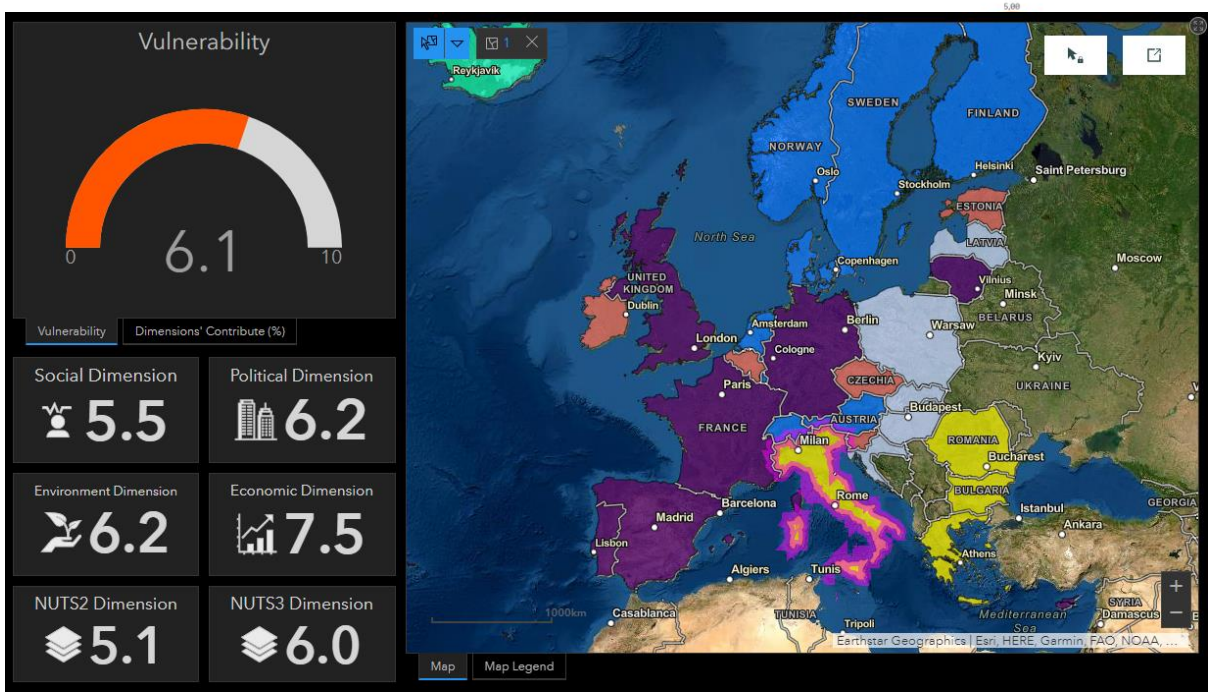
DRMKC RDH User Corner Guide:

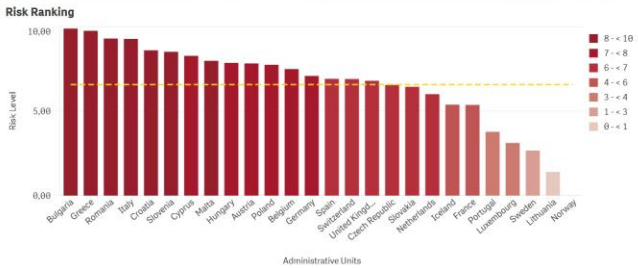
https://publications.jrc.ec.europa.eu/repository/handle/JRC129773

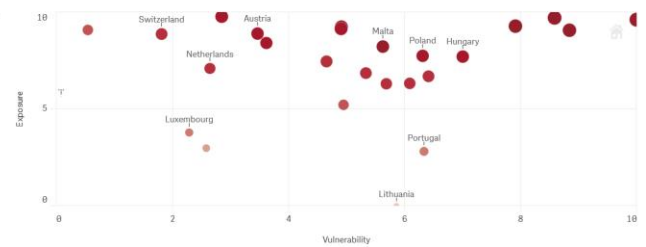
European Commission

Facts and Figures









European Commission

Thank you

DRMKC | https://drmkc.jrc.ec.europa.eu/

Risk Data Hub | https://drmkc.jrc.ec.europa.eu/risk-data-hub/

JRC-risk-data-hub@ec.europa.eu

JRC-risk-data-hub@ec.europa.eu
Tiberiu-Eugen.antofie@ec.europa.eu

European Commission