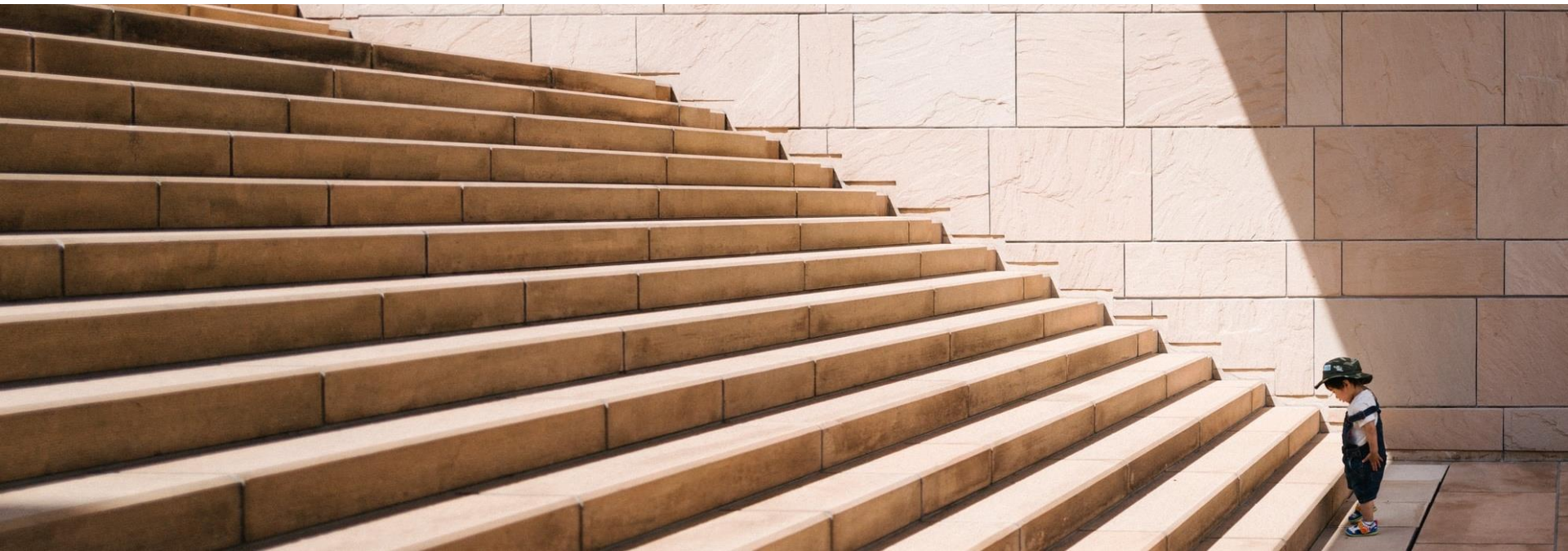# The European Commission's science and knowledge service

**Disaster Risk Management Knowledge Centre**

**Joint Research Centre**

# The European Commission's science and knowledge service



Disaster Risk Management Knowledge Centre
Joint Research Centre

# Society is facing many challenges

# The need for evidence to inform policy

# The role of Science in the European Commission

# The EC political leadership

**Ursula von der Leyen**
President

**Frans Timmermans**
Executive Vice-President
*European Green Deal*

**Margrethe Vestager**
Executive Vice-President
*A Europe Fit for the Digital Age*

**Valdis Dombrovskis**
Executive Vice-President
*An Economy that Works for People*

**Josep Borrell Fontelles**
High Representative/ Vice-President
*A Stronger Europe in the World*

**Maroš Šefčovič**
Vice-President
*Interinstitutional Relations and Foresight*

**Věra Jourová**
Vice-President
*Values and Transparency*

**Dubravka Šuica**
Vice-President
*Democracy and Demography*

**Margaritis Schinas**
Vice-President
*Promoting our European Way of Life*

**Johannes Hahn**
Commissioner
*Budget and Administration*

**Phil Hogan**
Commissioner
*Trade*

**Mariya Gabriel**
Commissioner
*Innovation, Research, Culture, Education and Youth*

**Nicolas Schmit**
Commissioner
*Jobs and Social Rights*

**Paolo Gentiloni**
Commissioner
*Economy*

**Janusz Wojciechowski**
Commissioner
*Agriculture*

**Thierry Breton**
Commissioner
*Internal Market*

**Elisa Ferreira**
Commissioner
*Cohesion and Reforms*

**Stella Kyriakides**
Commissioner
*Health and Food Safety*

**Didier Reynders**
Commissioner
*Justice*

**Helena Dalli**
Commissioner
*Equality*

**Ylva Johansson**
Commissioner
*Home Affairs*

**Janez Lenarčič**
Commissioner
*Crisis Management*

**Adina Vălean**
Commissioner
*Transport and Youth*

**Olivér Várhelyi**
Commissioner
*Neighbourhood and Enlargement*

**Jutta Urpilainen**
Commissioner
*International Partnerships*

**Kadri Simson**
Commissioner
*Energy*

**Virginijus Sinkevičius**
Commissioner
*Environment, Oceans and Fisheries*

**#Eustrivesformore**
**#vdLcommission**

European Commission

# The JRC within the Commission



**27 COMMISSION MEMBERS**

Ursula von der Leyen
President

Mariya Gabriel
Innovation, Research, Culture, Education and Youth

Stephen Quest
Director-General, Joint Research Centre

Strategy & Coordination

Knowledge Production

Knowledge Management

Support

European Commission

# JRC sites

Headquarters in **Brussels** and research facilities located in **5 Member States:**

- Belgium (Geel)

- Germany (Karlsruhe)

- Italy (Ispra)
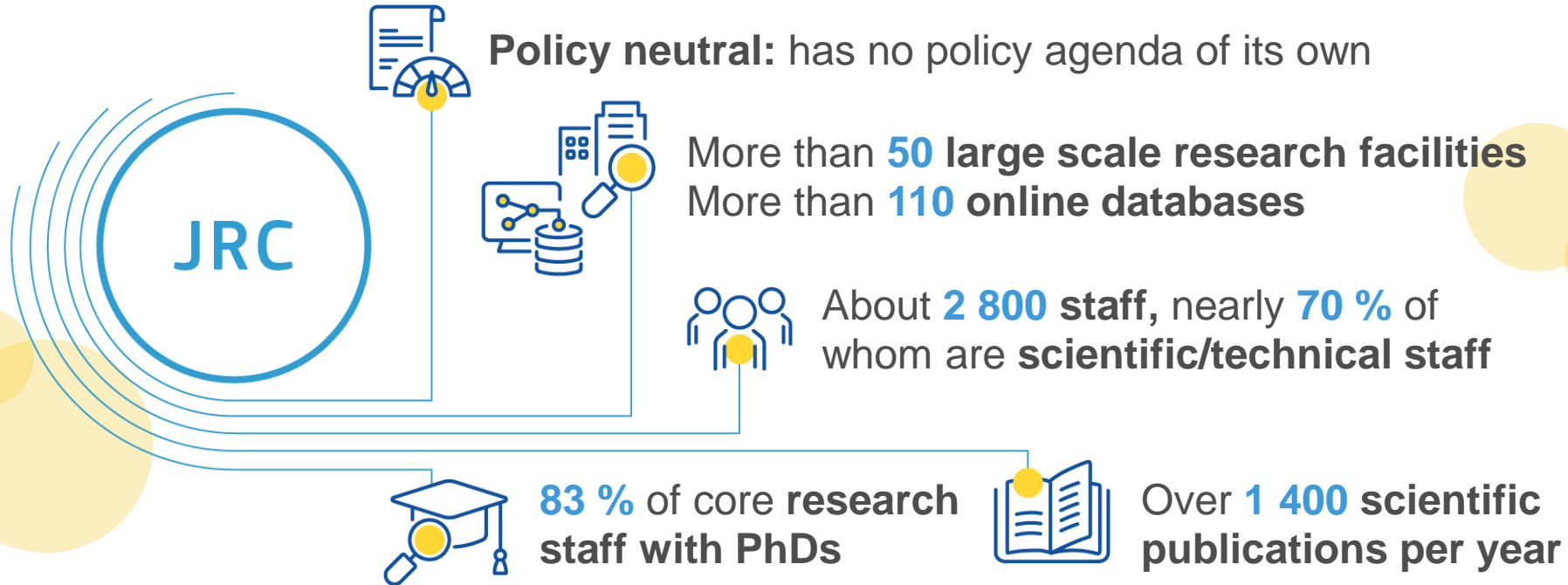
- The Netherlands (Petten)

- Spain (Seville)



PETTEN

BRUSSELS

GEEL

SEVILLE
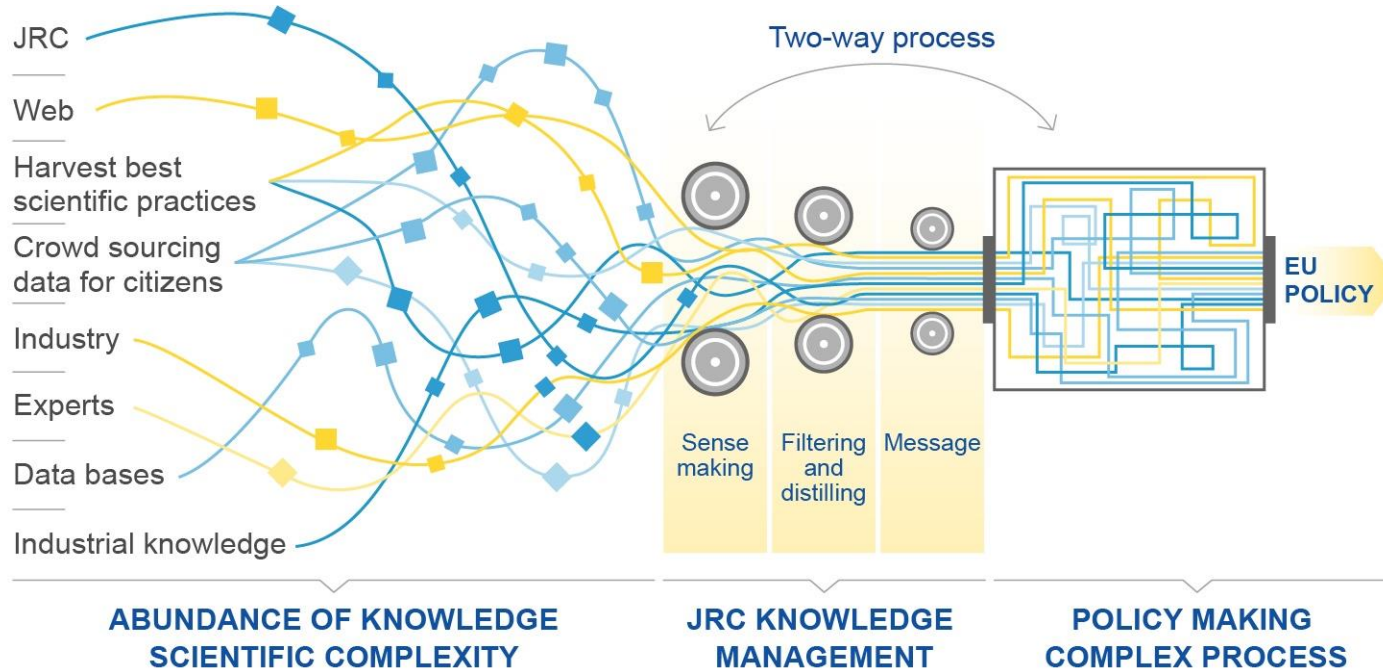
ISPRA

KARLSRUHE

European Commission

# JRC's Mission



*"As the science and knowledge service of the Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle"*



Understanding Policy & Science

Interpersonal Skills

Synthesising Research

Managing Expert Communities

Communicating Scientific Knowledge

Advising Policymakers

Engaging with Citizens & Stakeholders

Monitoring & Evaluation

Better Evidence-Informed Policies

European Commission

# JRC role: facts and figures

**Policy neutral:** has no policy agenda of its own

More than **50 large scale research facilities**
More than **110 online databases**

About **2 800 staff,** nearly **70 %** of whom are **scientific/technical staff**

**83 %** of core **research staff with PhDs**

Over **1 400 scientific publications per year**

# Dealing with the information overload



JRC
Web
Harvest best scientific practices
Crowd sourcing data for citizens
Industry
Experts
Data bases
Industrial knowledge

Two-way process

Sense making
Filtering and distilling
Message

EU POLICY

**ABUNDANCE OF KNOWLEDGE SCIENTIFIC COMPLEXITY**

**JRC KNOWLEDGE MANAGEMENT**

**POLICY MAKING COMPLEX PROCESS**

European Commission

# JRC Strategy 2030 – KCs' role

In the scientific world, as the flood of knowledge increases, there is a greater need for systematic reviews and meta-analyses. DG JRC is now moving into this field by creating specific **Knowledge Centres** in certain areas. These will be virtual entities, **bringing together experts and knowledge from different locations inside and outside the Commission.**

Their job will be **to inform policy makers**, in a transparent, tailored, concise and independent manner, about the status and findings of the latest scientific evidence. The Knowledge Centres will fully acknowledge scientific limits and uncertainties.
While knowledge is abundant, gaps do, of course, still exist. The Knowledge Centres will be able to **map these gaps**. They can then be filled by DG JRC, if it is best placed to do so. If this is not the case, the Knowledge Centre should be connected to the best available person or body, so that it 'knows who' as well as 'knows what', which is the essence of knowledge management.  As well as co-ordinating the supply of knowledge — **by consolidating knowledge from across the scientific community** — the Centres should also seek to coordinate the demand for knowledge – by **working with several different DGs** to coordinate their questions and avoid silos upstream.
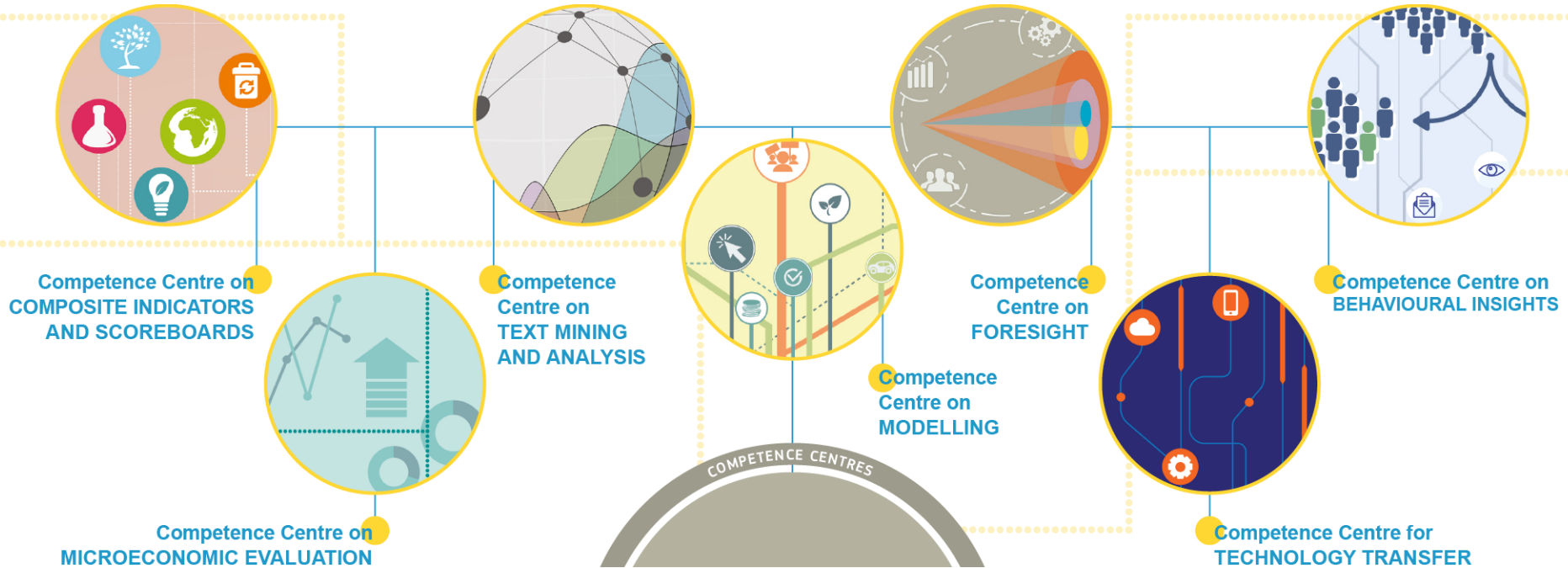
**Multi-dimensional resilience monitoring**, which captures threats and stresses, exposure, vulnerabilities, preparedness, response, adaptation and coping capabilities;
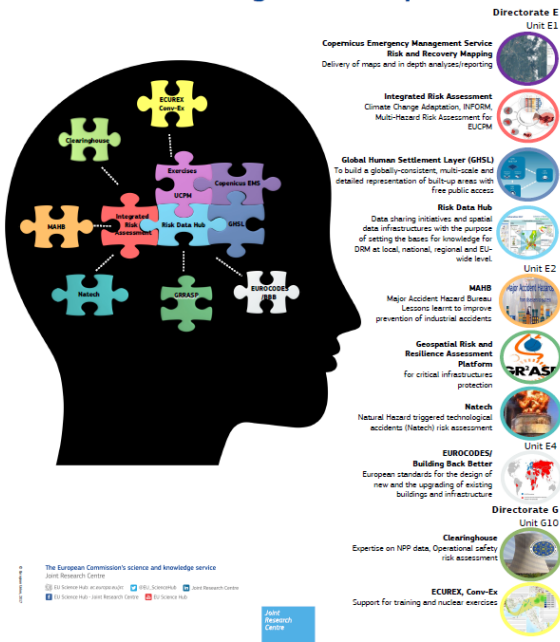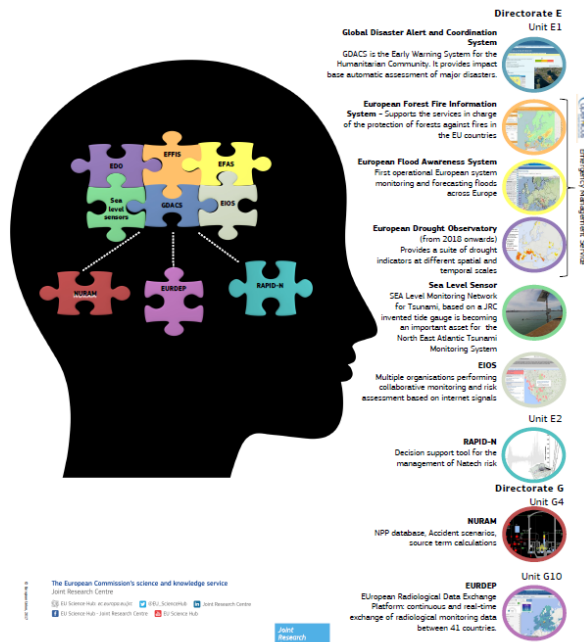
# Knowledge Centres



Knowledge Centre for **DISASTER RISK MANAGEMENT**

Knowledge Centre on **MIGRATION AND DEMOGRAPHY**

Knowledge Centre for **TERRITORIAL POLICIES**

Knowledge Centre for **BIOECONOMY**

Knowledge Centre for **FOOD FRAUD AND QUALITY**

Knowledge Centre for **FOOD AND NUTRITION SECURITY**

European Commission

# Competence Centres



Competence Centre on
**COMPOSITE INDICATORS
AND SCOREBOARDS**

Competence Centre on
**MICROECONOMIC EVALUATION**

**Competence
Centre on
TEXT MINING
AND ANALYSIS**

COMPETENCE CENTRES

**Competence
Centre on
MODELLING**

**Competence
Centre on
FORESIGHT**

**Competence Centre for
TECHNOLOGY TRANSFER**

**Competence Centre on
BEHAVIOURAL INSIGHTS**

European
Commission

# Sharing the same objective

European Commission

# From complexity to enhanced efficiency
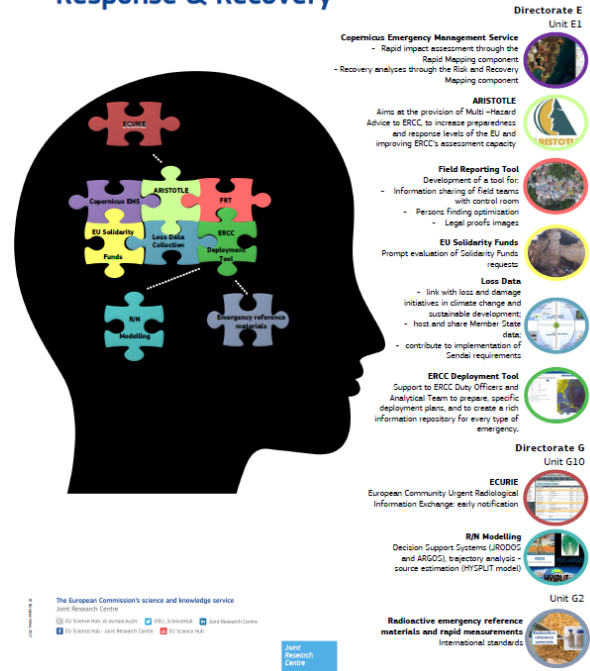
# Disaster Risk Management Knowledge Centre DRMKC

Partnership

Knowledge

Innovation

The **DRMKC** gathers together different European Commission's services, European countries and the whole community dealing with disasters to manage **disaster risk** in a **more coordinated way.**

Enhanced **effectiveness** of better coordinated policies based on **Knowledge transfer** across sectors.

The **DRMKC** aims to **integrate** and **consolidate** existing scientific **multi-disciplinary knowledge** to **co-develop innovative solutions for existing needs.**

European Commission

# Disaster Risk Management Knowledge Centre DRMKC
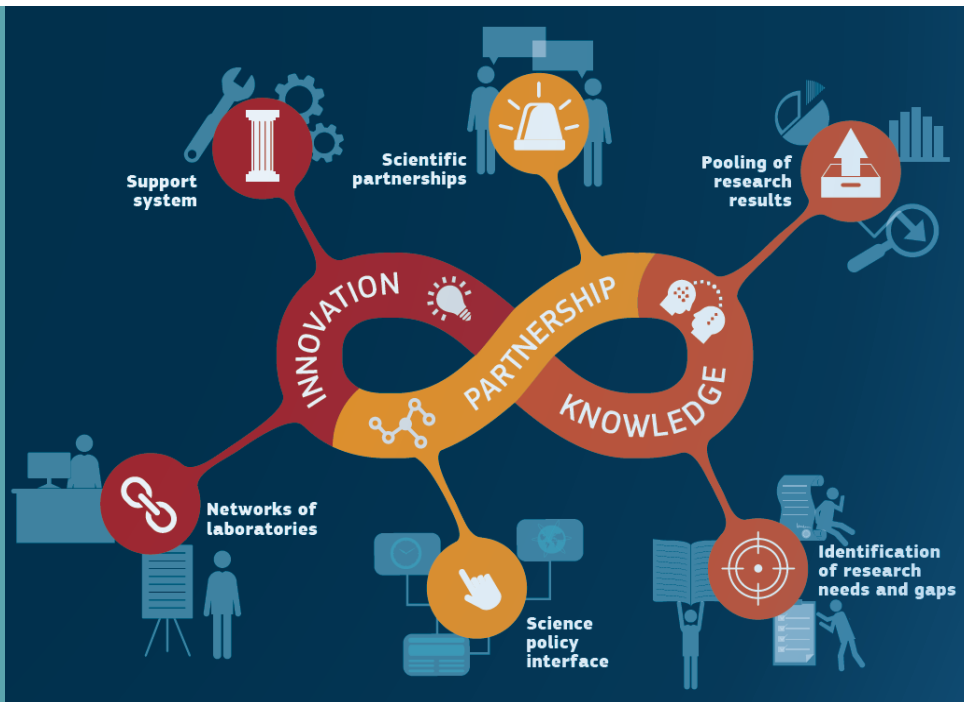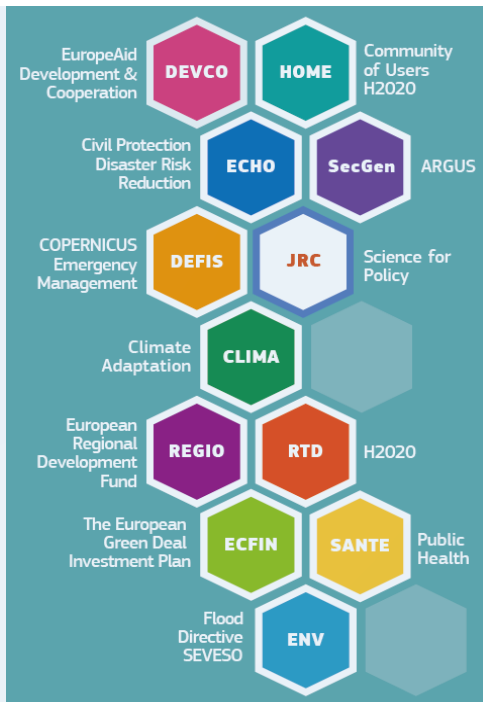
# The dynamicity and diversity of the challenges requires continuous collective efforts

At legislative level, but as well at the scientific and operational ones.

European Commission

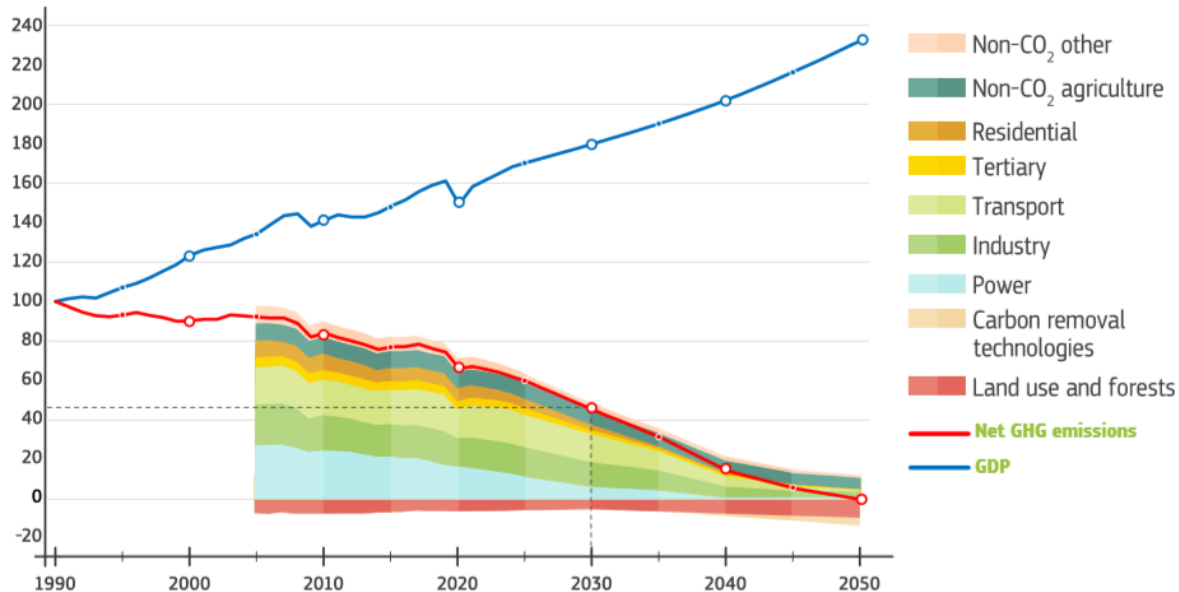# Heatwave Europe 24th June 2020



Amsterdam 23°C
Warsaw 33°C
London 34°C
Berlin 31°C
Paris 38°C
Gallargues 34°C
Rome 36°C
Madrid 37°C
Cordoba 42°C
200 miles

European Commission
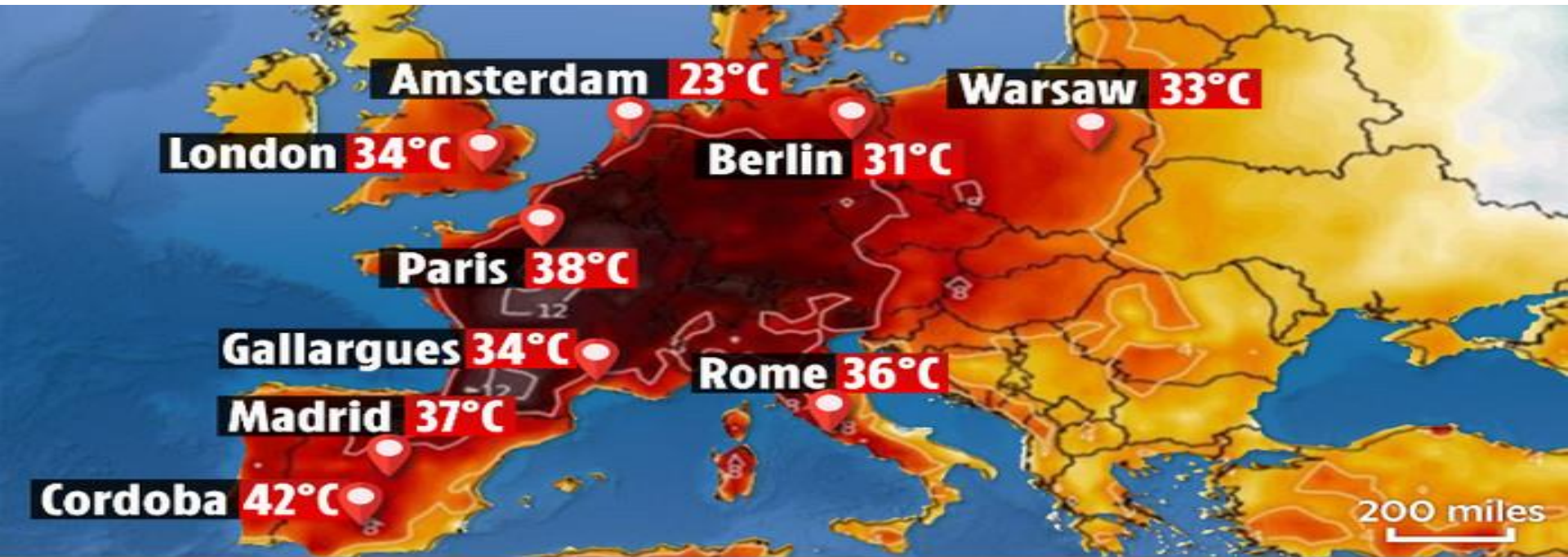
# Ukraine, June 2020



Source: National State Emergency Service of Ukraine

European Commission

# EU Climate Target Plan 2030

Europe has a strong track record of **cutting emissions whilst growing its economy.** Achieving our new target of 55% greenhouse gas emissions by 2030 will require action across all sectors.



Legend:
- Non-CO$_2$ other
- Non-CO$_2$ agriculture
- Residential
- Tertiary
- Transport
- Industry
- Power
- Carbon removal technologies
- Land use and forests
- **Net GHG emissions**
- **GDP**

# EU Climate Target Plan 2030

## Energy – 75% of emissions

- Burning fossil fuels is the largest source of greenhouse gas emissions in the EU
- The energy system plays a central role in the transition to a climate-neutral economy

## Buildings – 36% of emissions

- The building sector is responsible for 40% of final energy use
- This sector has a large and cost-effective potential to become more energy-efficient and reduce emissions

## Transport

- The transport sector has the lowest share of renewable energy use
- It will need to increase its renewable energy share to around 24% by 2030

## Land Use Sector

- Nature absorbs $CO_2$ and is vital to the fight against climate change
- To achieve climate neutrality by 2050, we need to grow our carbon sink to reach 300 million tons $CO_2$eq by 2030

European Commission

# Forest fires near Chernobyl nuclear plant, April 2020

# Japan, March 2011 – Natech becomes evident



Radioactive Seawater Impact Map (update: March 2012)
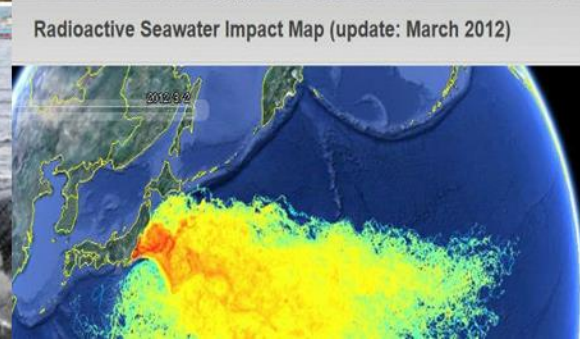
# Terrorism

# New threads & vulnerabilities
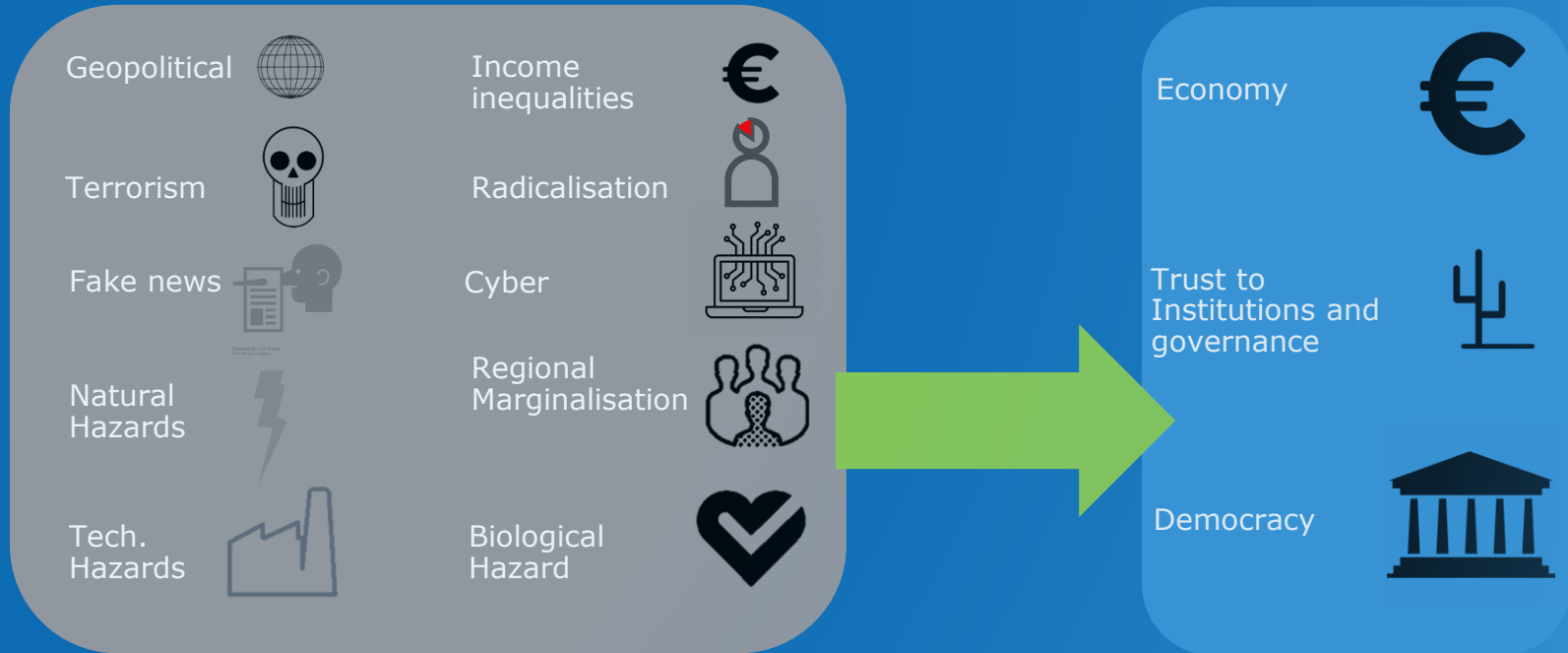
# Hybrid Threats modus operandi

**Exploitation of Societal vulnerabilities**

**Intrinsic**
Marginalised groups
Minorities
Poor governance
Weak institutions

**Temporary**
Economic crisis
Major disasters
Radicalisation
Foreign influence

Whole governance response

Hybrid Threats

Building Resilience

Media

**Disinformation campaigns**
Propaganda through media (traditional, internet, social)

**Attacks to State Services, Infrastructures & Resources**

**Infrastructures, critical services** (e.g. power, gas, water, health, finance, supply chains, etc.)

**Might be exploited by adversaries**

**Natural disasters -** Temporarily affecting infrastructures

**Epidemiological Emergencies -** Population under physical and psychological stress and overwhelmed hospitals and first responders

European Commission

# New Security Union (July 2020)



The EU supports member states in fostering security for all those living in Europe by helping to

- combat terrorism and organised crime
- detect and prevent hybrid threats
- increase the resilience of our critical infrastructure
- promote cybersecurity
- foster research and innovation

# … and COVID-19



Situation of September 2020

COVID-19 Confirmed cases
- 0 - 100
- 101 - 10.000
- 10.001 - 50.000
- 50.001 - 300.000
- 300.000+

European Commission
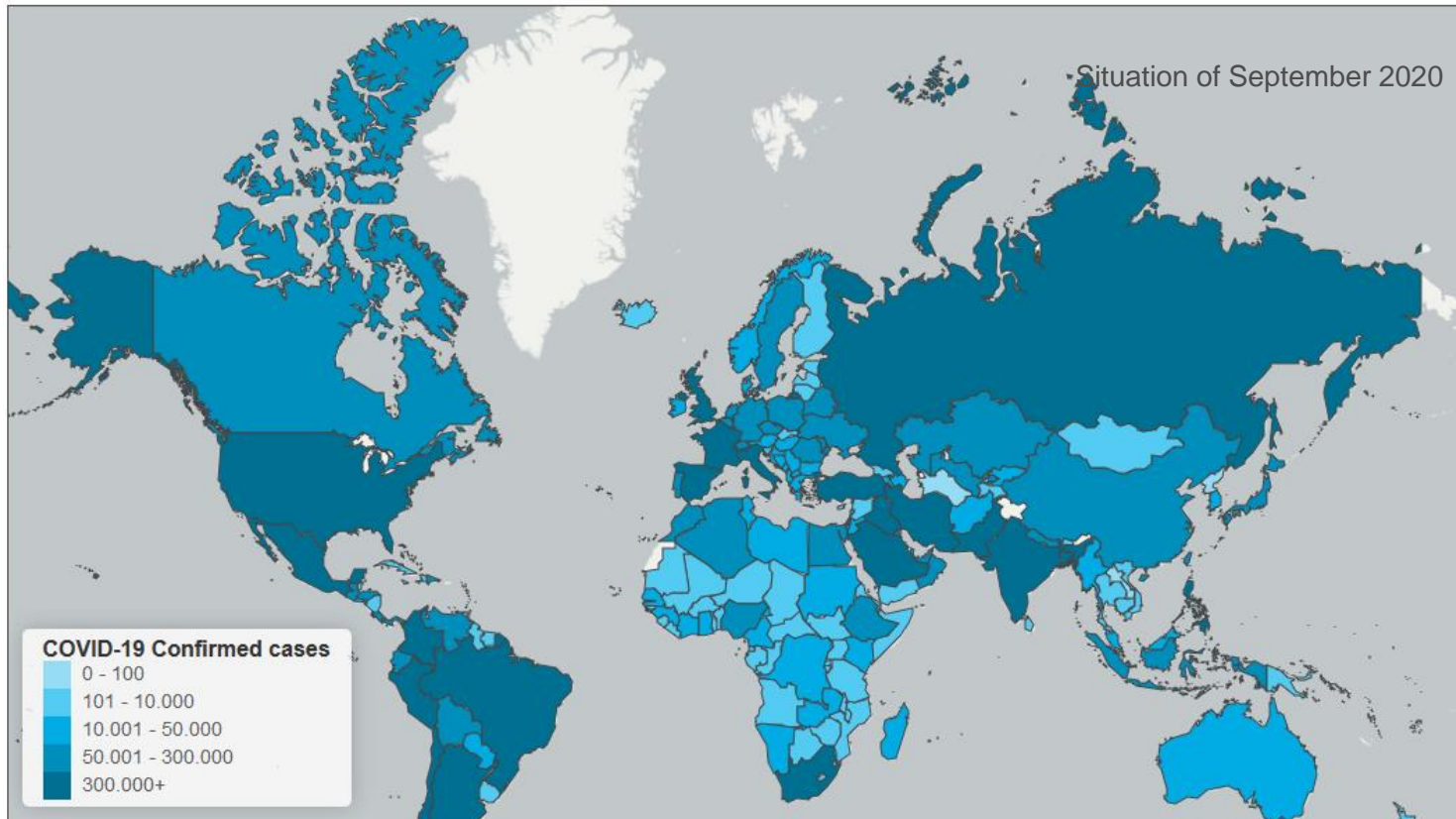
# A new start

## Health

- Legislative proposals to establish a new **European Biomedical Advanced Research and Development Agency**
- Legislative proposal to extend the mandate of the **European Medicals Agency**
- Legislative proposal to extend the mandate of the **European Centre for Disease Prevention and Control**
- Discuss **health competences for the EU** in the **Conference on the Future of Europe**

European Commission

# A more coordinated action based on evidences is a Must

# Covering all phases of the DRM Cycle



**DRM Cycle**
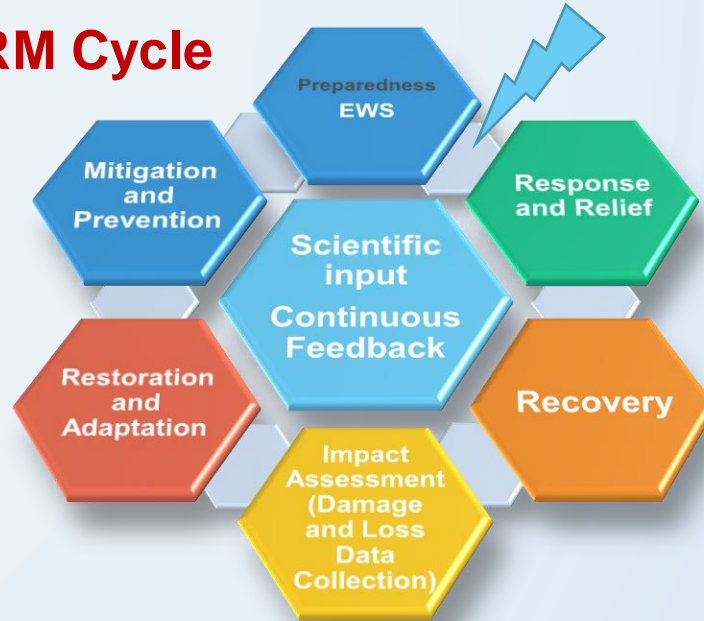
# DRMKC – Developing Collective Knowledge to support the advance of Innovative Policies

## Science 4 DRM

The Science for DRM has mobilised the DRM community with the common aim of summarising the state-of-art, to learn from the past experiences and to contribute to the definition of the new challenges.
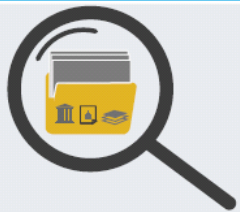
## PROJECT EXPLORER

The DRMKC Projects Explorer is continuously updated with information regarding research projects and institutions . It is an essential tool to discover who knows what.

## Gaps Explorer

The DRMKC Gaps Explorer offers science-based knowledge and targeted recommendations, tailored to different stakeholder profiles – scientists, practitioners and policy-makers, regarding the way forward.

## Risk Data Hub

The DRMKC Risk Data Hub is a multi-hazard Geo-portal providing a common tool for scientists, practitioners and policy-makers to support bridging science and policy in the frame of DRM.

## INFORM

The Index for Risk Management (INFORM GRI) provides a quantitative assessment of the risk of humanitarian crises in a multi-hazard context with a major focus on developing countries.

Knowing more and losing less     Early detection, faster reaction     Acting today, protecting tomorrow

European Commission

# From knowledge to gaps

# Database of DRM Research Projects, Institutions and Results



**Explore DRM Projects**

Contents: **Who has been working on what and with whom?**

**Towards enhanced exploitation of research results**

# Developing collective knowledge

## Science for DRM Report

- >6000 downloads and

- >3500 copies distributed



It has been the base for CONRIS
**training on DRM at the University:**

- **Saxion UAS** (the Netherlands) in April 2018
- **Coventry University** (UK) in November 2018.
- **Autonomous University of Barcelona** (Spain) in February 2019.
- **Deventer UAS** (the Netherlands) in March 2019.
- **Coventry University** (UK) in February 2020.
- **Saxion UAS** (the Netherlands) in March 2020 (postpone due to the COVID 19 emergency)
- **HWR Berlin's Department of Police and Security Management** (DE) in October 2020

Download: https://drmkc.jrc.ec.europa.eu/knowledge/SCIENCE-FOR-DRM/Science-for-Disaster-Risk-Management-2017

European Commission

# Science for DRM 2020:
# Acting today, protecting tomorrow



## Currently ~300 participants
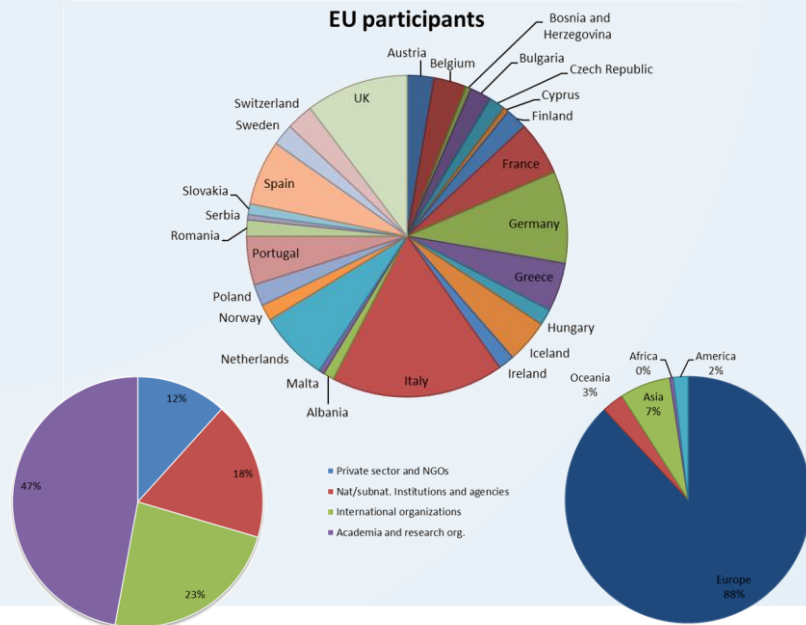


**Multi-hazard** approach: from asset perspective
Identification of **solutions** through the analysis of case studies

**Climate Change** is one of the driving and cross-cutting topics
Focus on **Impact Assessment**

# Science 4 Policy

## Landscape of risks in the EU

### (2017 EU risk overview SWD(2017)176)

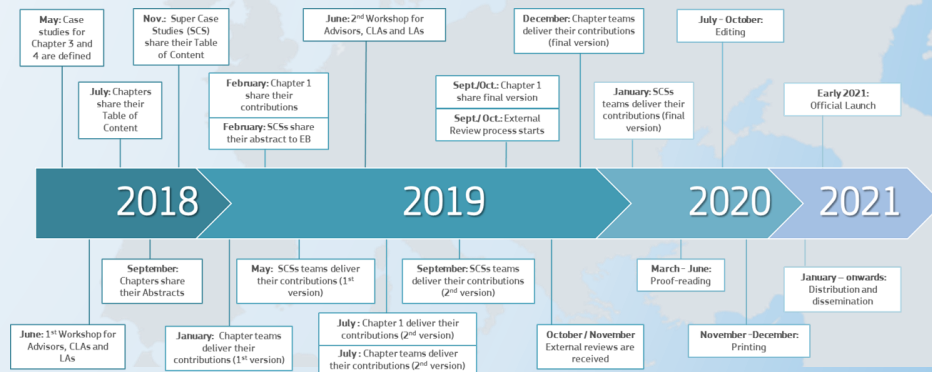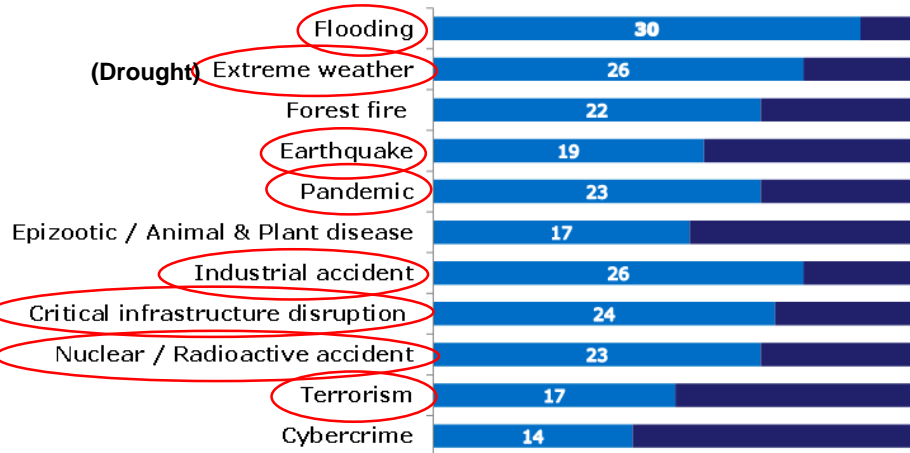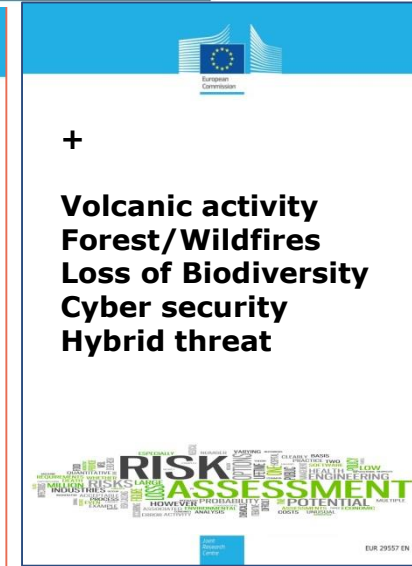| Risk | Value |
|---|---|
| Flooding | 30 |
| (Drought) Extreme weather | 26 |
| Forest fire | 22 |
| Earthquake | 19 |
| Pandemic | 23 |
| Epizootic / Animal & Plant disease | 17 |
| Industrial accident | 26 |
| Critical infrastructure disruption | 24 |
| Nuclear / Radioactive accident | 23 |
| Terrorism | 17 |
| Cybercrime | 14 |

+NaTech

**The most frequently identified disaster risks among MS**

**Version 0** — Open for Public Consultation — **Version 1**

JRC SCIENCE FOR POLICY REPORT

Recommendations for National Risk Assessment for Disaster Risk Management in EU

Approaches for identifying, analysing and evaluating risks
Version 0

Karmen Poljanšek, Ainara Casajus Valles, Montserrat Marin Ferrer,
Alfred De Jager, Francesco Dottori, Luca Galbusera, Blanca Garcia Puerta, Georgios Giannopoulos, Serkan Girgin, Miguel Angel Hernandez Ceballos, Giorgia Jurlaro, Vasileios Karlos, Elisabeth Krausmann, Martin Larcher, Anne Sophie Lequarre, Theocharidou Marianthi, Milagros Montero Prieto, Gustavo Naumann, Amos Necci, Peter Salamon, Marco Sangiorgi, Maria Luisa Sousa, Cristina Trueba Alonso, Georgios Tsionis, Juergen V. Vogt, Maureen Wood

2019

NRA Context — Risk Identification — Risk Analysis — Risk Evaluation — Risk Treatment

EUR 29557 EN

**+**

**Volcanic activity**
**Forest/Wildfires**
**Loss of Biodiversity**
**Cyber security**
**Hybrid threat**

RISK ASSESSMENT

EUR 29557 EN

European Commission

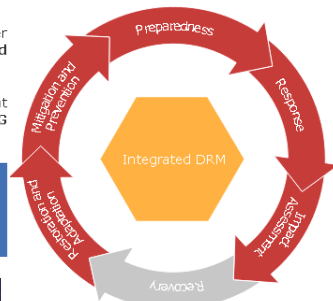# Gaps Explorer: Next steps towards a more Resilient

## GAPS EXPLORER

In the scientific world, as the **flood of knowledge increases**, there is a greater need for **systematic reviews** to guarantee proper **exploitation of results** along with the definition of **the way forward**. While knowledge is abundant, gaps do still exist: **DG Research and Innovation (RTD)** contributes to mapping these gaps through their **Projects for Policy** series of reports.

Inspired by this initiative, the DRMKC has developed the **Gaps Explorer** to provide targeted recommendations, tailored to different stakeholder profiles – Policy-Makers, Practitioners and Scientists – based on thematic reviews. The first pilot has been co-developed by **DG RTD** and JRC on **Forest Fires**. We expect many other topics to come …

### Single Hazard
FOREST FIRES

River Flood

### Multi-Hazard
Work in Progress…
Enhancing Synergies for disaster prevention in the European Union

Hybrid Threats
NATURAL TECHNOLOGICAL

Preparedness
Response
Mitigation and prevention
Impact Assessment
Prevention and Adaptation
Recovery

Integrated DRM

Policy Makers

Practitioners

Scientists

**56** PROJECTS

**302** INVOLVED INSTITUTIONS

**103.2** M € BUDGET

Display  € Total Costs

| FIRE SCIENCE | |
|---|---|
| Fire Behavior | 25 M € |
| Fire Ecology | 9 M € |
| Fire Spatial and Temporal Patterns | 24 M € |
| Social Aspects | 24 M € |
| Climate Change | 11 M € |
| **FIRE PREVENTION** | |
| Fire Meteorology and Danger Rating | 9 M € |
| Fuel Management | 49 M € |
| Preparedness | €€€ |
| Wildland-Urban Interface (WUI) | 25 M € |
| **FIRE DETECTION** | |
| Land, Aerial and Space Detection | 7 M € |
| **FIRE SUPPRESSION** | |
| Firefighting Techniques | 8 M € |
| Fire Safety | 8 M € |
| Technological Tools | 41 M € |
| **POST-FIRE RECOVERY** | |
| Damage and Loss Assessment | 11 M € |
| Restoration | 8 M € |
| **FIRE INTEGRATION** | |
| Integrated Fire Management | 21 M € |

FOREST FIRES

Science-Policy Interface: Needs and Gaps Assessment

European Commission

# Fostering prevention and adaptation

# Innovation: from data to knowledge
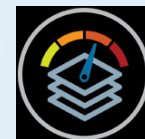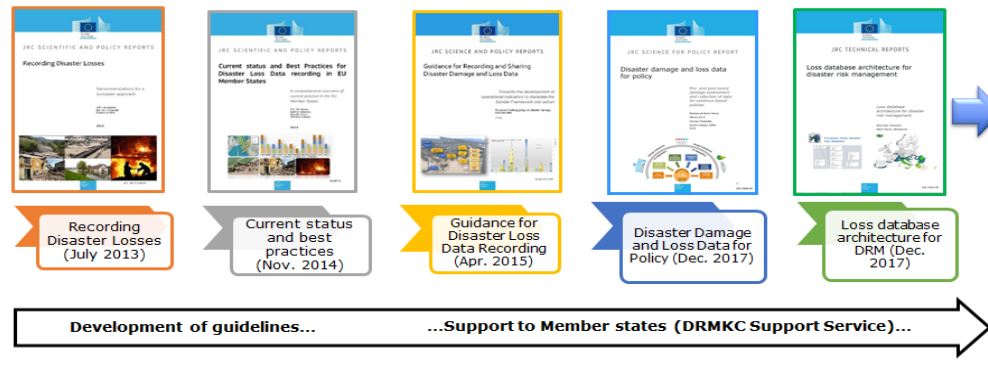
# DRMKC Risk Data Hub: Data4Policy



□ Risk Data hub – Scientific partnership

GHSL (Global Human Settlement Layer)
Copernicus
EFFAS (The European Flood Awareness System)
EDO (European Drought Observatory)
Risk-Data Hub
ESDAC (European soil Data Base)
GDACS
EFFIS (European Forest Fire Information System)



DRMKC - Risk Data Hub
Home  About ⌄  Analysis Tool ⌄  Archives  Events  Publications
DRMKC › Risk Data Hub › Home

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

Risk Analysis
Maximum potential impacts in Map Viewer

Damages and Losses
Impacts from past events in Map Viewer

Facts and Figures
Cross-hazard comparative view of both past and future impacts



INSPIRE

Floods Directive (Directive 2007/60/EC)
Serious cross border health threat (Decision 1082/2013/EU)
Critical Infrastructures Protection (Council Directive 2008/114/EC)
EU Strategy on Adaptation to Climate Change
SEVESO Directive (2012/18/EU)
Council Decision 87/600 Euratom

Union Civil Protection Mechanism (Decision No 1313/2013/EU)

Robust Risk Assessments

Evidence- based Disaster Risk Management plans

Access to cohesion instruments able to finance risk-prevention measures

European Regional Development Fund (ERDF)

Horizon 2020 Research Programme

Improve models to calculate potential damages

PREVENTION  PREPAREDNESS

Loss and damage data collection at local level

GDACS
EFFAS
EFFIS
EDI

RECOVERY  RESPONSE

Link to Surveillance and Early Warning Systems

Security Union – Community of Users

Evaluate DRR actions implemented and learn from past events

Quantify losses for loss compensation

Solidarity Funds

International Agreements:

**Linking research results and policies**

**Reinforcing Prevention and Adaptation**

Linking **Risk** Assessment (future) with **Impacts** collection (past): **Learning from the past** & **Planning for the Future**.

Supporting the development and monitoring of DRR strategies

**All Hazards approach**

**RM Plans including Climate Change Adaptation Strategies** evidence-based.
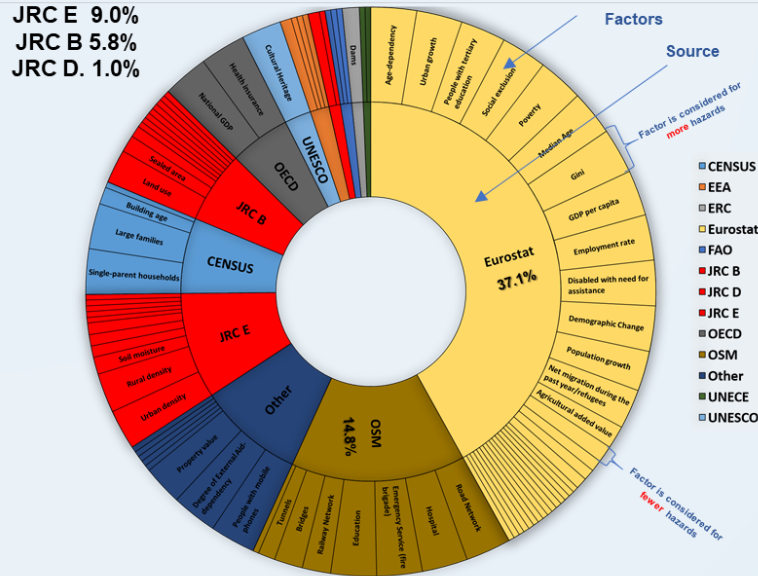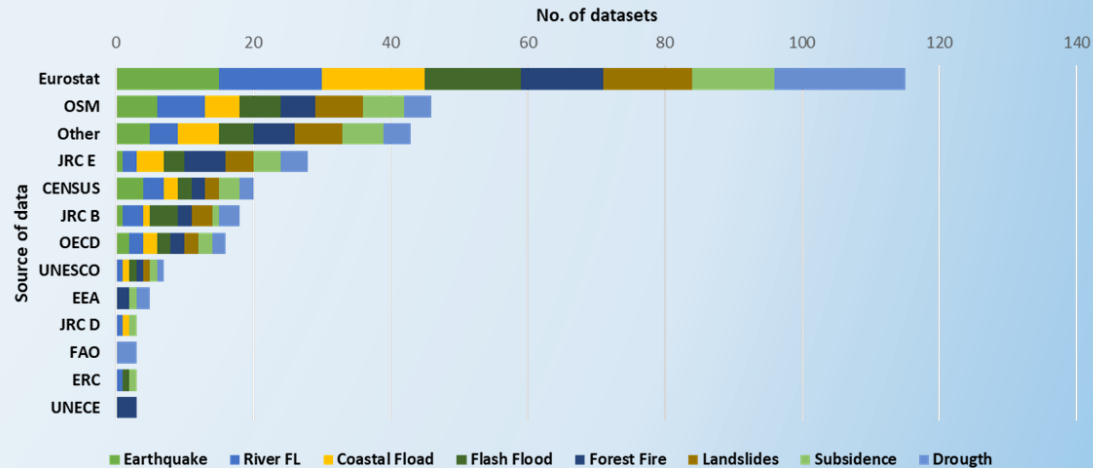
European Commission
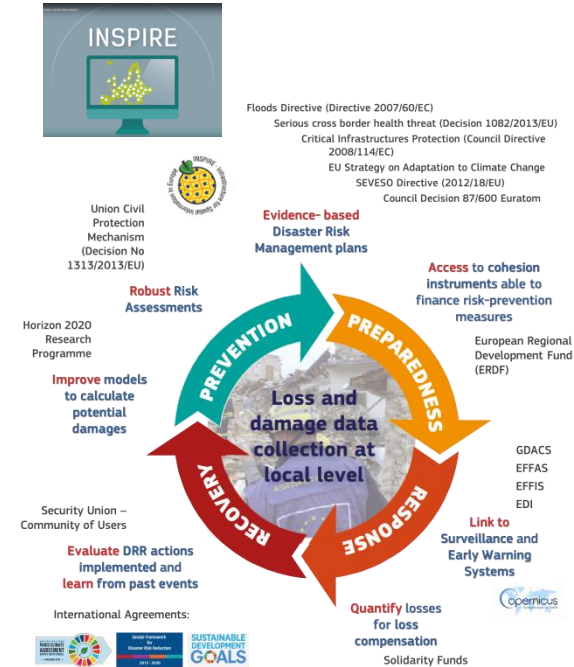
# DRMKC Risk Data Hub: Data4Policy

**Datasets considered for Vulnerability Assessment – from raw to Vulnerability indicators**



**Raw datasets (factors) identified per source**
(all hazards considered)

JRC E 9.0%
JRC B 5.8%
JRC D. 1.0%

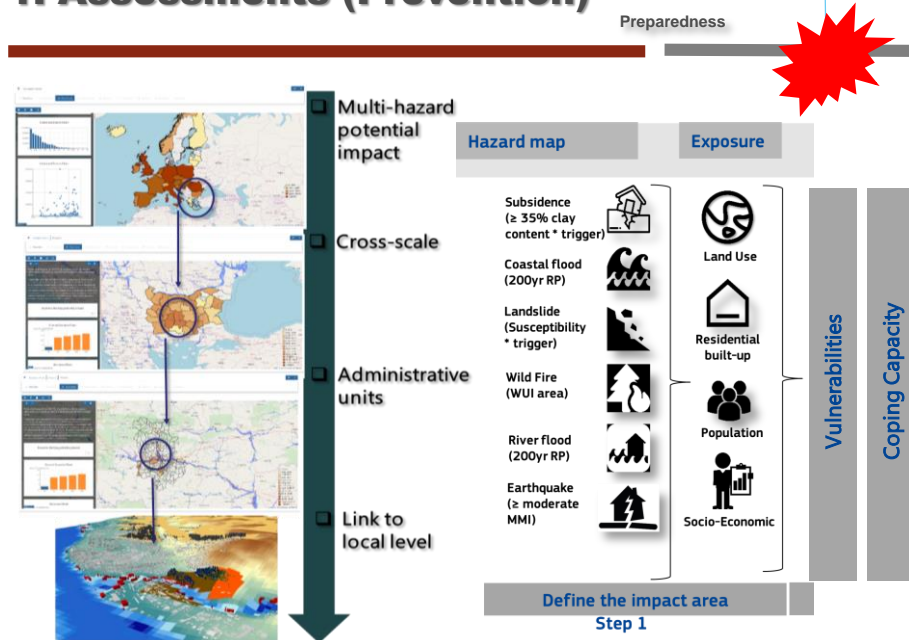**Aggregated factors (sum of datasets) per hazard and source**

**Risk = Hazard x Exposure x Vulnerability**

# DRMKC Risk Data Hub: Data4Policy



**1. Assessments (Prevention)**

**2. L&D/Lessons learned**

$$Risk = \frac{Hazard \; x \; Exposure \; x \; Vulnerabilty}{Coping \; Capacity} = Potential \; Impacts$$

**INFORM** is developing **a suite** of quantitative products to support decision making in **different phases** of disaster risk management cycle



| PRODUCT | APPLICATION | ANALYSIS | STATUS |
|---------|-------------|----------|--------|
| **INFORM RISK** | Development, risk reduction, crisis prevention, preparedness | Generalised risk of a crisis based on structural conditions | Operational |
| **INFORM WARNING** | Preparedness, early warning, early action | Indicatons of elevated risk, emerging crisis or crisis trigger | In development |
| **INFORM SEVERITY** | Early action, crisis response | Severity of an existing crisis | Release in 2020 |

# PESETA IV project

## Extreme heat and cold in a changing climate:
## Impacts on human health in the EU & UK

### A grim future

The area of the red and blue circles represents fatalities from extreme heat and extreme cold respectively.

**Projected annual deaths due to extreme heat in 2100 without adaptation**

3 °C rise: 90,000
2 °C rise: 49,000
1.5 °C rise: 29,000

**Projected annual deaths due to extreme cold in 2100 without adaptation**

With unmitigated climate change human exposure to severe heatwaves could be around 30 times greater than present at higher latitudes, while it could be 40-50 times greater in countries in southern Europe.

**Present day**
2,700 annual deaths

*Heat (or cold) waves are instances of more than 3 consecutive days with EXTREME warm (or cold) temperature above a daily threshold*

### Adaptation options

Stay cool     Stay hydrated

Stay informed

Sustainable Green Cities:
- green roofs
- parks
- shaded areas

### A north – south divide
The rise in exposure to and fatalities from extreme heat is most pronounced in southern European countries and the highest number of fatalities occur in France, Italy and Spain.

### Urban heat island
During hot spells, temperatures can be several degrees higher in cities compared to surrounding rural areas.

### Vulnerable people
Sensitivity or susceptibility to harm and lack of capacity to cope and adapt, like elderly.
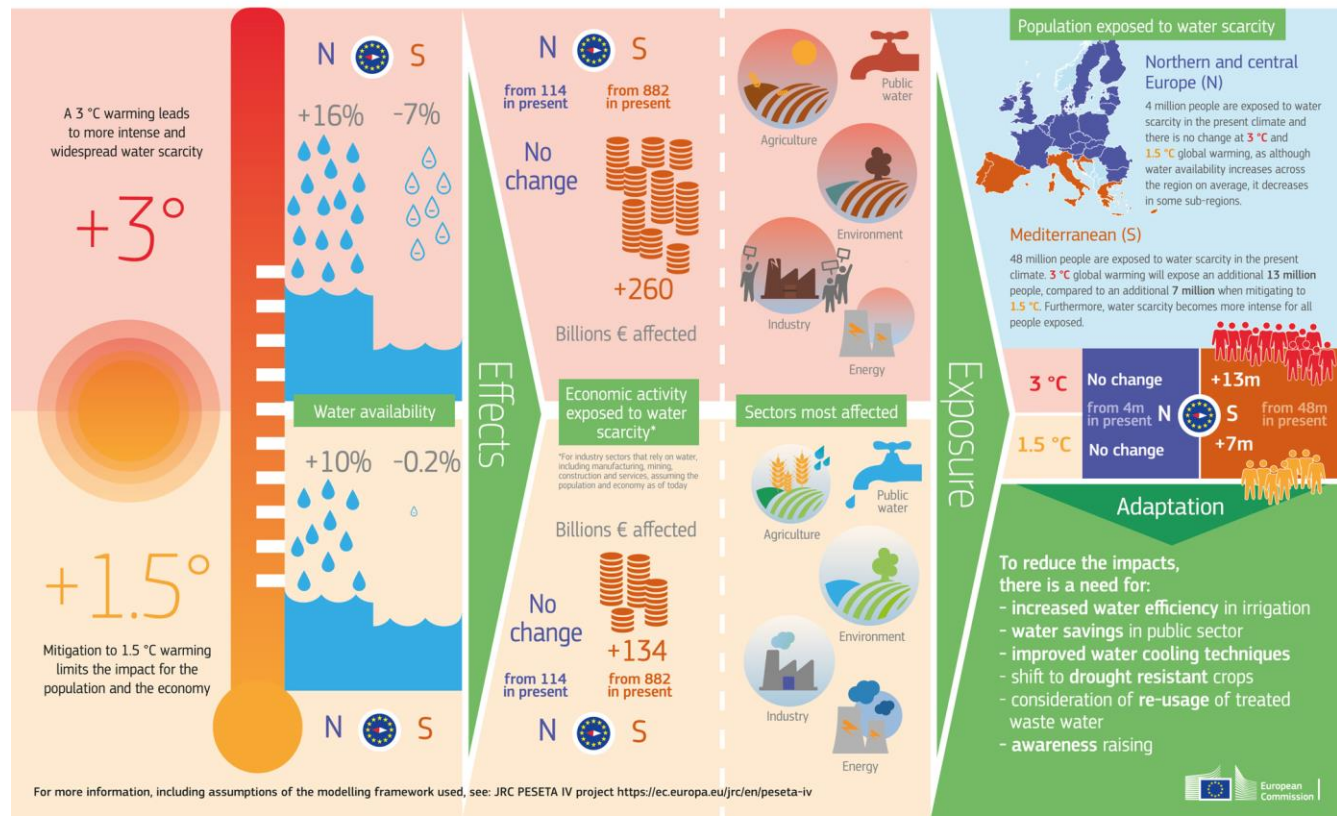
**Proportion of population aged over 65 years**
The share of people older than 65 will increase from 19% now to 30% by end of this century.
2015   2100

For more information, including assumptions of the modelling framework used, see: JRC PESETA IV project https://ec.europa.eu/jrc/en/peseta-iv

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**KEY MESSAGES**

**Mortality from extreme heat could increase by 30 times**

Without climate mitigation and adaptation, the annual death-toll from extreme heat in the EU+UK will be over 30 times more than nowadays, by end of the century.

**x30**

Milder winters will significantly reduce exposure to, and deaths from, extreme cold.

**Mitigation can strongly reduce the impacts**

Limiting warming to 1.5°C in 2100 reduces the impact from around 90,000 annual deaths (3°C) to around 30,000.

Additional information:
https://ec.europa.eu/jrc/en/peseta-iv

European Commission

# PESETA IV project

## Increasing water scarcity in a changing climate

Impact of non-mitigated climate (+3 °C) vs mitigated climate (+1.5 °C) on **northern** and **southern** Europe



A 3 °C warming leads to more intense and widespread water scarcity

+3°

Mitigation to 1.5 °C warming limits the impact for the population and the economy

+1.5°

**Effects**

N · S
Water availability
+16%  -7%
+10%  -0.2%

**Economic activity exposed to water scarcity***
*For industry sectors that rely on water, including manufacturing, mining, construction and services, assuming the population and economy as of today

N from 114 in present · S from 882 in present
No change
+260
Billions € affected

N from 114 in present · S from 882 in present
No change
+134
Billions € affected

**Sectors most affected**

Public water
Agriculture
Environment
Industry
Energy

**Exposure**

**Population exposed to water scarcity**

Northern and central Europe (N)
4 million people are exposed to water scarcity in the present climate and there is no change at 3 °C and 1.5 °C global warming, as although water availability increases across the region on average, it decreases in some sub-regions.

Mediterranean (S)
48 million people are exposed to water scarcity in the present climate. 3 °C global warming will expose an additional 13 million people, compared to an additional 7 million when mitigating to 1.5 °C. Furthermore, water scarcity becomes more intense for all people exposed.

| | N | S |
|---|---|---|
| 3 °C | No change (from 4m in present) | +13m (from 48m in present) |
| 1.5 °C | No change | +7m |

**Adaptation**

To reduce the impacts, there is a need for:
- **increased water efficiency** in irrigation
- **water savings** in public sector
- **improved water cooling** techniques
- shift to **drought resistant** crops
- consideration of **re-usage** of treated waste water
- **awareness** raising

For more information, including assumptions of the modelling framework used, see: JRC PESETA IV project https://ec.europa.eu/jrc/en/peseta-iv

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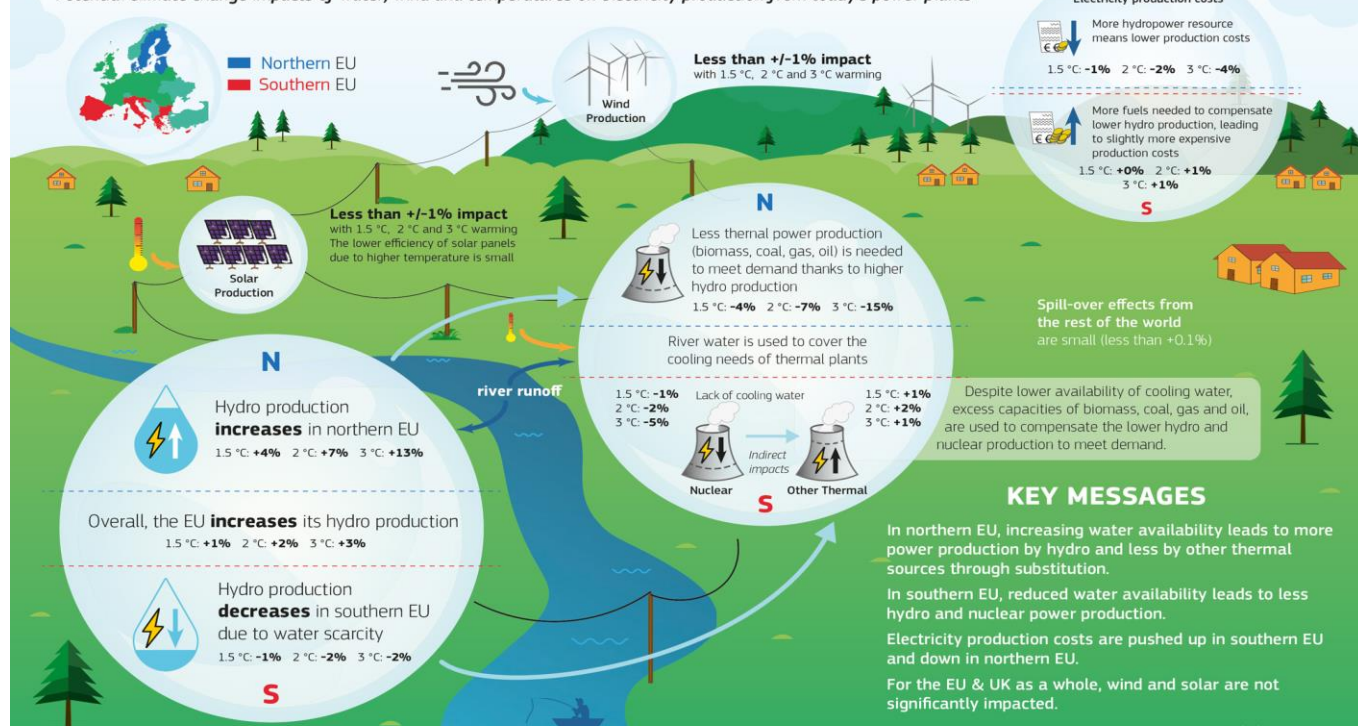Additional information:
https://ec.europa.eu/jrc/en/peseta-iv

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# PESETA IV project



**Electricity production in a changing climate**

Potential climate change impacts of water, wind and temperatures on electricity production from today's power plants

Northern EU
Southern EU

**Wind Production** — Less than +/-1% impact with 1.5 °C, 2 °C and 3 °C warming

**Electricity production costs** (N)
More hydropower resource means lower production costs
1.5 °C: -1%  2 °C: -2%  3 °C: -4%

More fuels needed to compensate lower hydro production, leading to slightly more expensive production costs
1.5 °C: +0%  2 °C: +1%  3 °C: +1%  (S)

**Solar Production** — Less than +/-1% impact with 1.5 °C, 2 °C and 3 °C warming. The lower efficiency of solar panels due to higher temperature is small

(N) Less thermal power production (biomass, coal, gas, oil) is needed to meet demand thanks to higher hydro production
1.5 °C: -4%  2 °C: -7%  3 °C: -15%

Spill-over effects from the rest of the world are small (less than +0.1%)

River water is used to cover the cooling needs of thermal plants

river runoff

Lack of cooling water
1.5 °C: -1%          1.5 °C: +1%
2 °C: -2%           2 °C: +2%
3 °C: -5%           3 °C: +1%
Indirect impacts
Nuclear  (S)  Other Thermal

Despite lower availability of cooling water, excess capacities of biomass, coal, gas and oil, are used to compensate the lower hydro and nuclear production to meet demand.

(N) Hydro production **increases** in northern EU
1.5 °C: +4%  2 °C: +7%  3 °C: +13%

Overall, the EU **increases** its hydro production
1.5 °C: +1%  2 °C: +2%  3 °C: +3%

Hydro production **decreases** in southern EU due to water scarcity
1.5 °C: -1%  2 °C: -2%  3 °C: -2%  (S)

**KEY MESSAGES**

In northern EU, increasing water availability leads to more power production by hydro and less by other thermal sources through substitution.

In southern EU, reduced water availability leads to less hydro and nuclear power production.

Electricity production costs are pushed up in southern EU and down in northern EU.

For the EU & UK as a whole, wind and solar are not significantly impacted.

For more information, including assumptions of the modelling framework used, see: JRC PESETA IV project https://ec.europa.eu/jrc/en/peseta-iv

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**KEY MESSAGES**

**Regional differences in production** (N S)

In northern EU, increasing water availability leads to more power production by hydro and less by other thermal sources. In southern EU, reduced water availability leads to less hydro and nuclear power production.

**Production costs** (€)

Electricity production costs are pushed up in southern EU and down in northern EU.

**Minor impacts on solar and wind**

For the EU+UK as a whole, wind and solar are not significantly impacted by climate change.

Additional information:
https://ec.europa.eu/jrc/en/peseta-iv

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# PESETA IV project



Welfare loss from climate change impacts

JRC PESETA IV conducted an economic analysis of climate change impacts on river and coastal flooding, agriculture, droughts and energy supply. Welfare impacts are estimated as if the future climate affects the economy of nowadays.
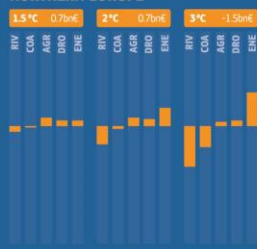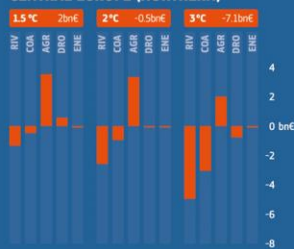
**KEY MESSAGES**
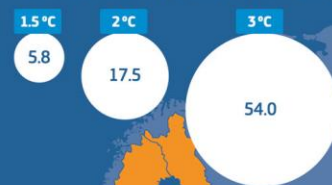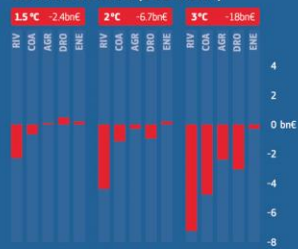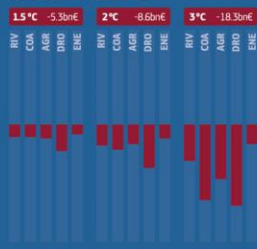
**Far greater impact on southern Europe**

The magnitude of welfare losses in southern regions is estimated to be several times larger compared to northern regions.

**Mitigation makes a difference**

Limiting global warming to 2°C would reduce additional welfare losses by 50% compared to 3°C, while achieving the Paris goal of 1.5°C would lower additional welfare losses by 75%.

**Total losses from climate change could be much larger**

The assessment does not evaluate the full economic impacts of climate change in Europe as not all possible climate impacts were analysed, e.g. loss of alpine tundra and shifts in ecological domains.

Additional information:
https://ec.europa.eu/jrc/en/peseta-iv

# … and when the unavoidable happens

# Early detection – faster reaction



**Early Warning & Monitoring Systems**
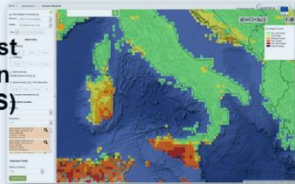
**European Forest Fire Information Systems (EFFIS)**

**European & Global Drought Observatory (EDO & GDO)**
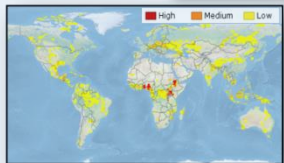
**European & Global Flood Awareness Systems (EFAS & GloFAS)**

**On-demand Mapping**

**Rapid Mapping**

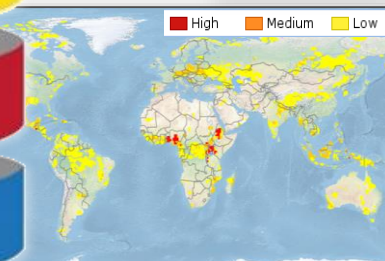24/7 on-demand and fast provision of geospatial information

Rapid Natech Risk Assessment and Mapping System (RAPID-N)

http://rapidn.jrc.ec.europa.eu

Hazards    Assessment

Seine Floods – France – January 2018

Supporting emergency responders by increasing the timeliness of satellite mapping production
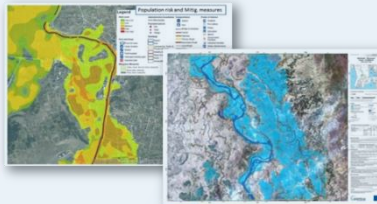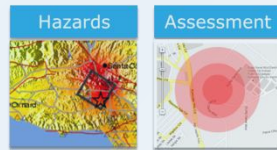
Early warning systems | Multi-hazard integration | Disaster information management

GDACS +

Scientific advice for ERCC, UN and emergency responders in EU and globally

Crisis Situation Rapid Map - Overview for the Pacific Ocean Tsunami in Japan on 11/03/2011 05.46.24 AM UTC.

Copernicus is a European Union Program, coordinated and managed by the European Commission, aimed at **developing European information services based on satellite Earth Observation and in situ (non-space) data**.

Six **Copernicus Core Services** transform satellite and in situ data into **value-added information**, specifically:

**Atmosphere**
(CAMS)

**Marine**
(CMEMS)

**Land**
(CLMS)

**Climate**
(C3S)

**Emergency**
(EMS)

**Security**

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## On-demand Mapping

**Rapid Mapping**

**24/7 on-demand and fast provision of geospatial information**
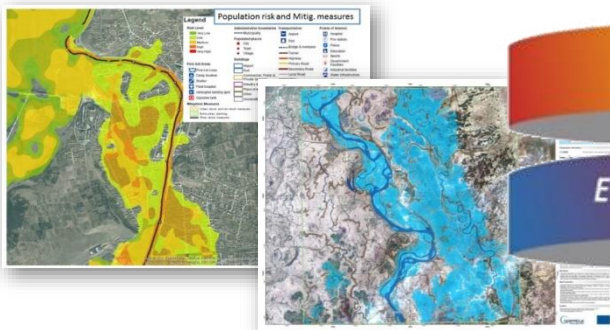
**Risk & Recovery Mapping**

**On-demand GI supporting prevention, preparedness, disaster risk reduction, reconstruction, recovery**

## Early Warning & Monitoring Systems
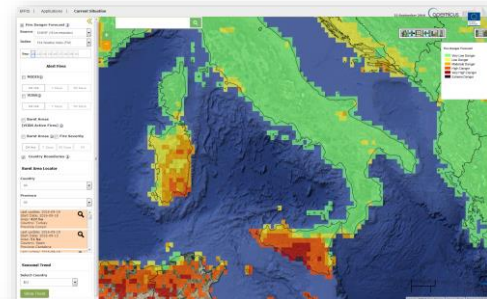
**European Forest Fire Information Systems (EFFIS)**

**European & Global Drought Observatory (EDO & GDO)**

**European & Global Flood Awareness Systems (EFAS & GloFAS)**

RESILIENCE

RECOVERY

EMERGENCY RESPONSE

PREPAREDNESS

High  Medium  Low
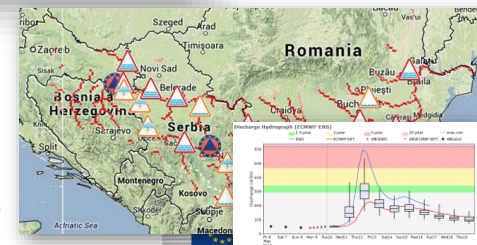
**Flood Awareness Systems (EFAS, GloFAS) to forecast river flooding and inundation**

**On-demand Mapping services to map the flood extent from satellite imagery**
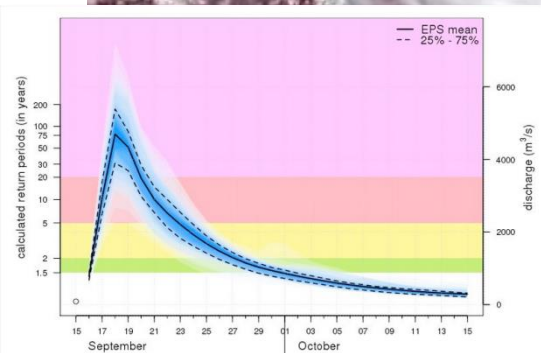
Figure 4. GloFAS streamflow forecasts for Georgetown, South Carolina, based on ensemble output from the ECMWF global model run initialized at 0Z Saturday, September 15, 2018 (8 pm EDT Friday). Image credit: GloFAS, courtesy James Belanger.

**1% Floodplain**
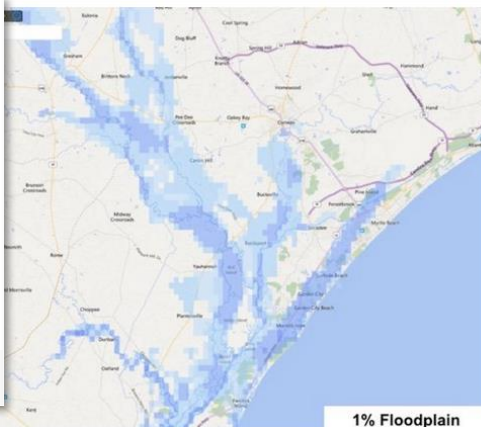
**Figure 3.** Snapshot of the river flooding and inundation for a flood event that has a 1% chance of occuring in a given year across portions of northeast South Carolina. Note: The effect of storm surge and coastal flooding is not included in this image.

[EMSR312] Aparri: Delineation map http://emergency.copernicus.eu /EMSR312

Images from GloFAS cited in https://www.wunderground.com/cat6/Dire-Flood-Threat-Carolinas-Florences-Rains-Continue

www.efas.eu    www.globalfloods.eu

**Forest Fire Information Systems (EFFIS, GWIS) to detect & monitor fires and to forecast the fire danger**
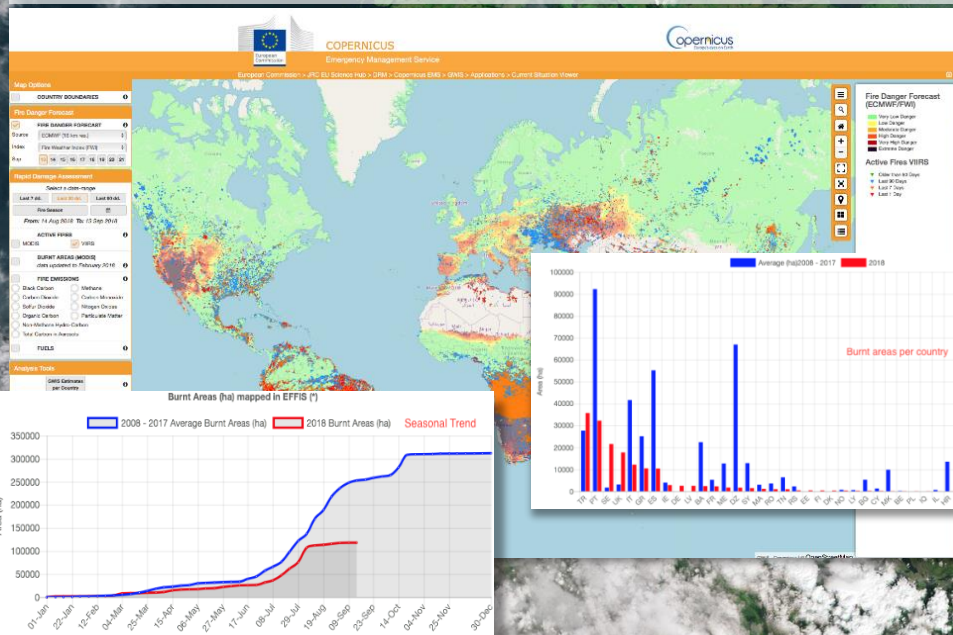
**On-demand Mapping services to assess damages after a forest fire & landslide risk**
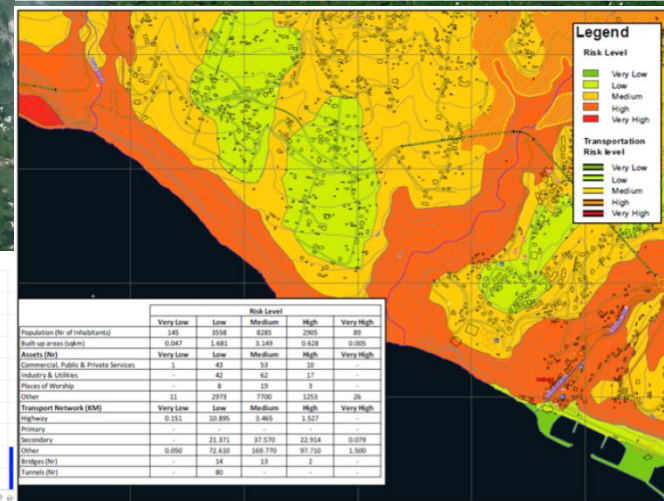


[EMSN031] Forest Fire Damage assessment and landslide risk, Madeira Island     http://emergency.copernicus.eu/EMSN031

http://effis.jrc.ec.europa.eu     http://gwis.jrc.ec.europa.eu

Drought Observatory

To monitor and forecast droughts
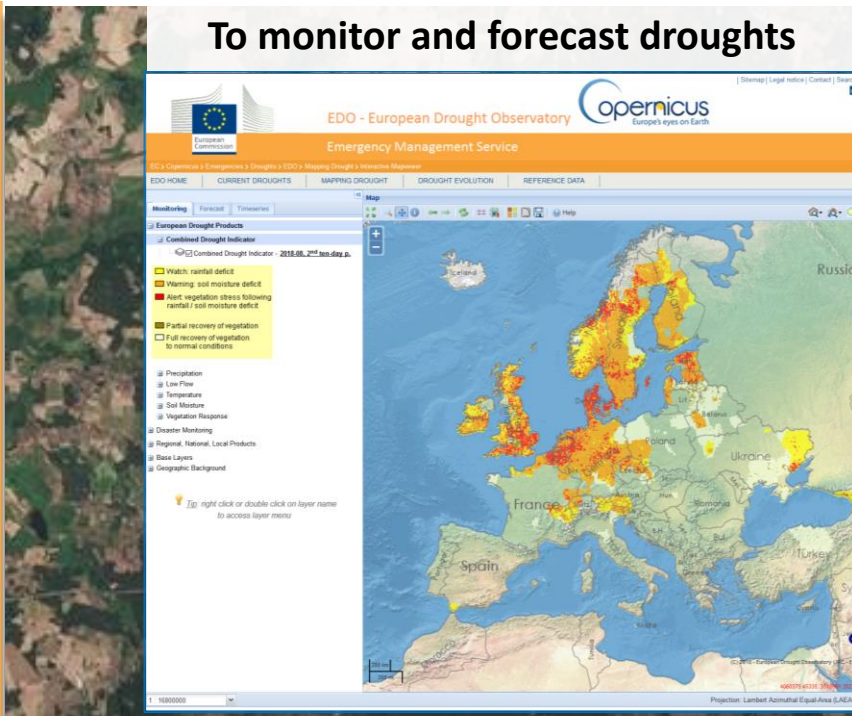
To analyse the risk of drought impacts

Drought in Germany observed by Sentinel-2

# Epidemic Intelligence from Open Sources (EIOS)

- Part of the **WHO Health Emergencies Programme**

- A comprehensive system for the **early detection**, **verification**, **assessment** and **communication** of **public health risks**

- From **open media sources**

- "One Health, All Hazards" approach

- To be integrated with **INFORM-Epidemic** for rapid assessment (Index for Risk Management)
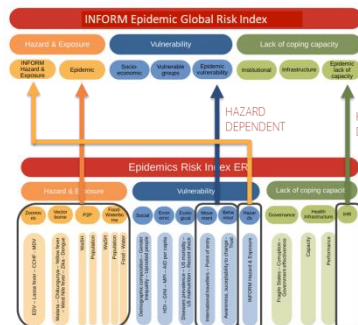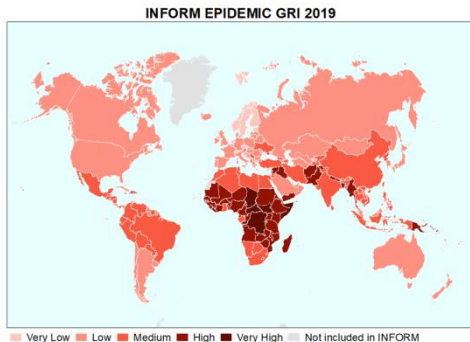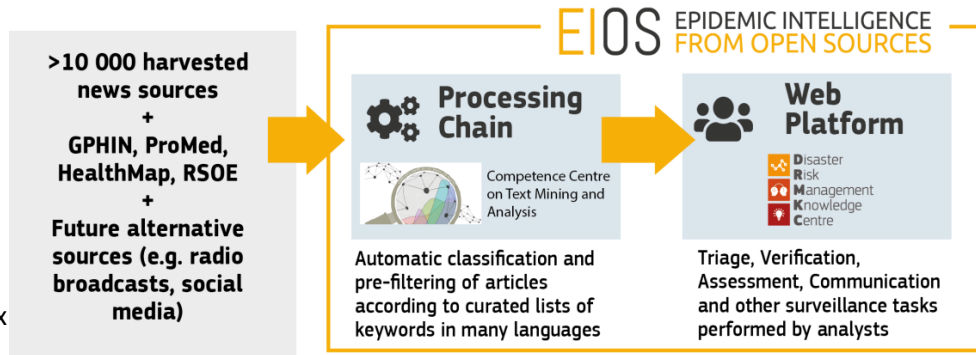
# Continental Early Warning System (CEWS)

- **Early warning and risk assessment system for conflict** and humanitarian issues

- For the **African Union**, founded by DG DEVCO

- In collaboration with JRC Competence Centre for Text Mining and Analysis

  - Automatic event extraction from open source media

- **Tools for collaborative rapid risk assessment:** data visualisation and exploration, support to SOPs, reports and notifications

  - Integration of **AU sources of information** (reports and events from the field)

  - **Contextual information**: future integration with INFORM

- Towards an **African Knowledge Platform**

Emergency Management
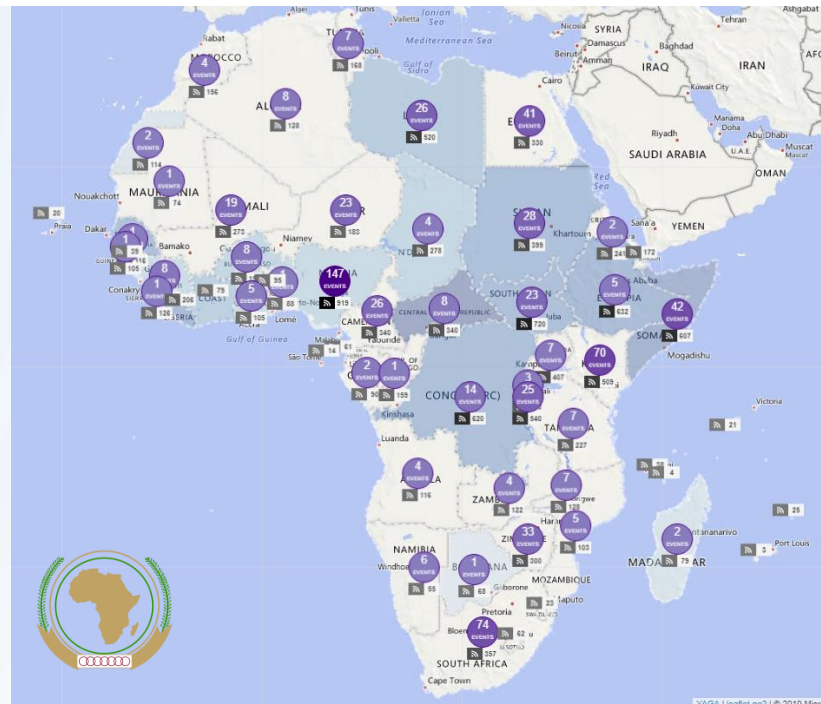
- **Na**tural hazard triggered **tech**nological accidents
- **JRC Rapid Natech Risk Assessment and Mapping System (RAPID-N)**
- <u>**Web-based, publicly available**</u> **decision-support system for** <u>**local and regional**</u> **Natech risk assessment and mapping**
- **Unites natural-hazard assessment, damage estimation and consequence analysis in one tool!**
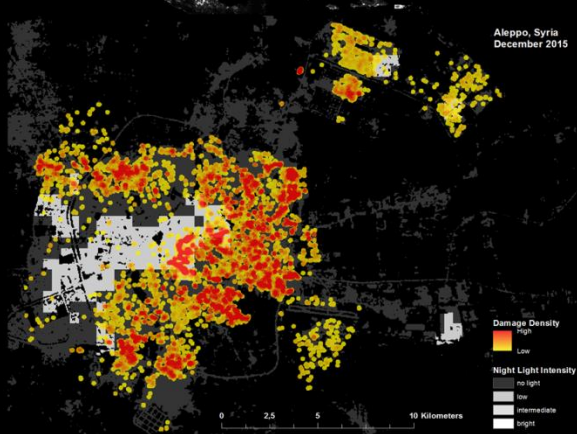- **Publicly available at http://rapidn.jrc.ec.europa.eu**

# Resilience has no borders

# Key messages

- We have to learn how to face a **new era of risks** and to jointly enhance our **Resilience**.

- **Knowledge transfer**, **co-development** of solutions, continuous uptake of **innovative solutions**: these are the ingredients of a more Resilient society.

- Risk awareness, communication, training and education are conditions *sine qua non*

- The **DRMKC** is an initiative aiming to support this process. Their driving force is collaboration because **together we are stronger**. Now is the time to continue with its expansion to fully cover CBRNe, Cybersecurity, Terrorism, …

- To face **the new era of risks** we need to be able to link the dots: to **understand risk,** its components and the existing interconnections.

- New role of the Emergency Services Departments; could be used as targets or vectors

- We need a **reinforced Cohesion** of our societies under the same goal: **to protect our future**.


European Commission

# Protect our Future

# Thank you

Contact us @: EC-DRMKC@ec.Europa.eu

Visit us @: https://drmkc.jrc.ec.europa.eu/