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10	Hochschule Weihenstephan-Triesdorf	HSWT	DE	Beneficiary
11	Association for the Development of West Athens	ASDA	GR	Beneficiary
12	Behavior SMART OOD	BES	BG	Beneficiary
13	Conselleria de Generalitat Valenciana	GVA	ES	Beneficiary
14	Municipality of Gabrovo	MoG	BG	Beneficiary
15	Empower Insight	EI	FR	Beneficiary
16	Stiftung Global Infrastructure Basel	GIB	CH	Associated Partner
17	Verbraucherzentrale Sachsen e.V.	VZS	DE	Associated Partner
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Abbreviations

AS	Associated Partner
CA	Consortium Agreement
CINEA	European Climate, Infrastructure and Environment Executive Agency
CL	Case Leader
CoP	Communities of Practises
CT	Coordination Team
DoA	Document of the Action
EC	European Commission
EU	European Union
GA	Grant Agreement
IPR	Intellectual Property Rights
KPI	Key Performance Indicator
NBS	Nature-Based solutions
NGO	Non-Governmental Organization
PC	Project Coordinator
PM	Project Manager
SRL	Societal Readiness Level
TL	Task Leader
TRL	Technical Readiness Level
WP	Work Package
WPL	Work Package Leader

More in abbreviation

CCA	Climate change adaptation
DRR	Disaster risk reduction
DRM	Disaster Risk Management
DG	Directorate General (EU)
NatCat	Natural catastrophes
JRC	Joint Research Center (EC)
EEA	European Environment Agency
EIOPA	European Insurance and Occupational Pensions Authority
EU RDH	EU Risk Data Hub
UNDRR	United Nation Disaster Risk Reduction
DRR	Disaster Risk Reduction
GIS	Geo informatic systems
GDPR	General Data Protection Regulation
KB	The Knowledge Bank (NO)
DSB	Directorate of Civil Protection (NO)
NVE	The Norwegian Water Resources Directorate (NO)
GVA	Valencian region
WA	West Athens region
ASDA	Association for the Development of West Athens
RDH	Regional Data Hubs
CSRD	EU Corporate sustainable reporting directive

EXECUTIVE SUMMARY

The deliverable (D1.3) provides recommendations for the development and the implementation of Regional Data Hubs (RDH) that integrate climate/related risk and loss data. Such hubs can facilitate the coherence between climate change adaptation (CCA) and disaster risk reduction (DRR) policy areas. By providing structured, harmonized, and accessible data, they enable local and regional governments to make better-informed decisions, enhance resilience, and reduce vulnerabilities to climate change and disasters.

The analysis builds on findings from the SOTERIA project, particularly lessons learned from three pilot regions (Valencia, Gabrovo, and West Athens) and from Norway's Knowledge Bank, which is considered as a best-practice model of public–private collaboration on insurance loss data sharing. By combining case study evidence, literature review and expert consultation, this deliverable identifies mechanisms, barriers, and enablers for the creation of regional data hubs that can bridge institutional gaps between government agencies, municipalities, and the insurance sector.

The deliverable highlights key challenges in current practices like fragmented data, limited access to insurance loss data, coverage gaps and technical and institutional barriers. Despite these barriers, the analysis highlights clear opportunities.

At the same time, it points to clear opportunities for action. RDHs can (i) enable municipalities to carry out risk and vulnerability assessments (RVAs) with higher accuracy and detail, (ii) provide evidence for budget prioritization and long-term investment in adaptation, (iii) build institutional trust between insurers and public authorities, (iv) encouraging systematic data sharing and (v) align local action with broader frameworks such as the EU Climate Law, EU Adaptation Strategy, and the Sendai Framework for DRR.

However, for RDH to be effective, some enabling conditions are essential. As OECD (2020) underlines in the context of CCA and DRR coherence, these include strong leadership and engagement of government bodies, broad stakeholder participation, clear allocation of roles and resources, and mechanisms for monitoring, evaluation, and continuous learning. RDH provides the technical and institutional backbone to deliver on these factors. They can also help identify trade-offs such as the growing reliance on post-disaster funding when adaptation is underfunded and unlock synergies, for example by integrating climate projections and loss data for more comprehensive risk assessments, while minimizing redundancies in data collection

In conclusion, this deliverable provides practical guidance for policymakers, practitioners, and insurers to establish Regional Data Hubs that connect fragmented data into integrated systems. By doing so, RDHs become not only technical platforms but also governance mechanisms that strengthen coherence between CCA and DRR, bridge gaps between public and private actors, and help regions across Europe prepare for the escalating risks of climate change.

1. Introduction

1.1. Purpose and scope of the document

This document provides practical guidance for developing Regional data Hubs (RDH) that integrate climate-related risk and loss data. These hubs are essential tools to help local and regional authorities better plan climate adaptation and disaster risk reduction (DRR). Indeed, integrated data can support smarter planning, improve resilience and foster cooperation between sectors like insurance, government and urban planning.

The recommendations are based on the SOTERIA project's findings and particularly from task 1.2, which worked closely with the three pilots of the project - the Valencian region (lead by GVA), the Municipality of Gabrovo (lead by MoG) and Association for Municipalities the West Athens Region (lead by ASDA and DEMO). It also uses lessons from Norway, where the insurance industry initiated a collaboration with both national and local authorities, which led to the insurance companies sharing granular data, and the establishment of the Knowledge Bank, a national data hub.

The goal is to help regions and its municipalities across Europe to establish similar system by offering steps, examples, and lessons learned as well as barriers and enablers for its implementation,

This deliverable is part of Task 1.2 of the SOTERIA project.

1.2. Why these recommendations?

The need for these recommendations arises from a critical gap in how climate-related risk and loss data are currently managed and used across Europe. At present, there are no national or regional hubs that systematically collect, compile, and integrate this type of data from multiple sources (except in Norway) (EU, 2024a). Information remains scattered across various institutions (municipalities, national agencies, and private actors such as insurance companies). Each entity collects data to meet their specific mandates and legal responsibilities, often working in isolation. As a result, it is difficult to build a complete picture of climate risk or assess cumulative losses at a regional and municipal level. This fragmentation limits effective planning and risk assessment for climate adaptation and disaster risk reduction.

A review of available guidance highlights this gap. While many academic studies and institutional reports, from organizations like UNDRR, the World Bank, Copernicus, and EIOPA, emphasize the importance of data for planning and resilience, they do not provide practice-oriented advice on how to build or govern Regional Data Hubs (RDHs). There are valuable resources focused on open data, climate services, technical platforms, or insurance-related loss data. However, these tend to address specific components rather than offering an integrated, cross-sectoral approach. In particular, no existing documents offer concrete, replicable recommendations on how to create RDHs that bring together public and private data across different administrative levels, while also navigating legal, technical, and

organizational challenges. This is especially true in the context of EU regions, where governance structures are complex and responsibilities are shared.

Despite the lack of consolidated guidance, there is a clear and growing demand for such recommendations. The SOTERIA project's pilot regions (Valencia, Gabrovo, and West Athens) have all expressed the need for structured support in setting up data hubs. Feedback gathered through two rounds of questionnaires, expert interviews, and thematic workshops confirms that regional and municipal authorities are looking for more than just technical specifications. They need guidance on institutional roles, governance models, building trust among stakeholders, and setting up legal agreements for data sharing. There is also increasing interest at the EU level, where agencies seek to bridge gaps between climate adaptation, disaster risk reduction, and financial resilience.

This document responds directly to that demand. It offers practical, usable guidance to help regions develop their own RDHs based on real experiences and tested approaches. It draws from the lessons of the SOTERIA pilot regions and from Norway's decade-long effort to build the Knowledge Bank (a national data platform developed through public–private collaboration). By presenting these insights in a structured, accessible format, this guide fills a strategic and practical gap. It connects broad policy frameworks such as the EU Green Deal, the Paris agreement, the Sendai Framework, and the Corporate Sustainability Reporting Directive (CSRD), with on-the-ground tools like Copernicus, DEMO, and the RDH pilots. It also provides actionable recommendations for various stakeholders, from regional planners and national agencies to the insurance sector.

Most importantly, this document helps to align climate adaptation and disaster risk reduction by promoting integrated data use. In doing so, it supports the creation of more resilient, better-informed regions capable of responding to the growing risks posed by climate change.

1.3. Target audience

This document serves as a guide and recommendation for the development of regional data hubs to integrate climate-related risk and loss data, aimed at policymakers and practitioners across Europe.

- Regional and municipal decision-makers are at the frontline of the climate risks. They need integrated data to guide local planning, prioritise investments and respond efficiently to emergencies.
- National government agencies responsible for climate and disaster planning play a central role in setting standards, guidelines, establishing funding mechanisms, maps, and creating regulatory frameworks that support the development and scaling of data hubs.
- EU-level institutions such as DG CLIMA, DG FISMA, EIOPA, DG ECHO, -with support from Joint Research Centre which provides independent, evidence-based knowledge and science, define strategic priorities, ensure compliance with EU legislation, and facilitate cross-border collaboration. These institutions need tested, practical models to inform policy and investment decisions at the European level.
- Insurance industry stakeholders hold key datasets on losses and exposures, place, time and cause of damage. Their involvement in data hubs is essential to improve risk understanding and to foster stronger public–private cooperation in resilience-building

efforts.

- Researchers and developers of climate services contribute to the technical design and functionality of data systems. They help transform raw data into accessible, actionable information for policy and planning.

This document serves as a shared reference to help all these actors coordinate, align efforts and develop systems that support climate adaptation and disaster risk reduction in an integrated way.

1.4. Methodology

This document is based on a combination of literature review, case study analysis, and engagement with regional stakeholders. A key focus is to understand how regions and municipalities currently use, share and access climate related risk and losses data and what challenges are they facing doing so.

First, a literature review was conducted of EU directives such as the EU Climate Law and the EU Floods Directive, climate frameworks, and existing hub models. These provide the legal and institutional context in which national and regional authorities operate. The review helped identify existing obligations, potential data sources, and institutional responsibilities.

In parallel, we conducted a detailed case study of the Norwegian Knowledge Bank, a national platform that integrates climate risk and insurance loss data. Norway's experience, based on more than ten years of public–private cooperation, offers practical lessons on building governance structures and setting up a data platform, with data from both public and private insurance. This example was followed closely because it shows how data hubs can evolve over time, and how institutional trust, legal clarity, and consistent funding are key to long-term success. (Due to CRA partner in SOTERIA being the initiator and head of the process on behalf of the Norwegian insurance sector.[1])

Stakeholder feedback from the SOTERIA pilot regions was a core part of the process. Early insights came through discussions, email exchanges, and contributions to the Story Map developed under Task 1.1. To build on this, a questionnaire was sent in June 2024 to the three pilot regions - Valencia, Gabrovo, and West Athens - through their respective CS leaders. The aim was to gather input on how municipalities access and use climate-related risk and loss data, and to identify drivers and barriers in this process.

However, this first questionnaire received limited responses - only one per region. The data collected was not sufficient to draw broad conclusions, and it did not include questions on data visualization or use cases, which are critical for hub development Task 2.5.

To address these gaps, a second questionnaire was developed under Task 2.5 and 1.2. It included new sections focused on use cases, data-sharing practices, and the concept of regional data hubs. This questionnaire was distributed more widely, targeting staff from various departments within each municipality. It was also timed to follow key workshops (Task 1.5) and the Climate Resilience Dialogue (Task 4.2), to build on discussions already underway. The extended deadline allowed for improved participation (October 2024 for Task

[1] https://climate-adapt.eea.europa.eu/en/metadata/case-studies/use-of-insurance-loss-data-by-local-authorities-in-norway

1.2 questions and January 2025 for Task 2.5)

This second round of responses offered a more representative view of how different institutions gather data, how accessible it is, and what barriers exist to using data effectively. The feedback helped map key actors and datasets, understand institutional needs, and identify what is enabling or hindering progress toward building regional data hubs.

In addition, expert interviews and webinars were conducted to deepen the findings. These included exchanges with the European Insurance and Occupational Pensions Authority (EIOPA), DG CLIMA, Norwegian authorities, and other experts involved in climate risk and data governance. Their contributions helped clarify technical and institutional challenges, especially in linking public and private data sources.

Finally, internal analysis across SOTERIA Work Packages 1 and 2 (WP1 and WP2) provided further depth. This included structured reviews of data needs, interoperability challenges, governance models, and legal frameworks. These internal discussions ensured that the recommendations reflect the collective understanding of the project team, based on cross-disciplinary knowledge.

2. Context and challenges

2.1. Policy and regulatory landscape

A wide range of international and EU-level policies and regulations define the roles and responsibilities of public authorities, particularly municipalities and regions in climate change adaptation and disaster risk management. These legal and strategic frameworks assign normally clear duties to local and regional governments that cannot be fulfilled without access to accurate data. As such, they create an implicit and often explicit need for building data hubs to support implementation.

2.1.1. Institutional roles and governance levels

Climate risk governance and disaster risk reduction (DRR) are structured across several governance levels (international, European, national, regional, and local). Understanding who holds what responsibility is essential for designing effective data systems, such as Regional Data Hubs (RDHs), that enable coordinated action and decision-making.

- International level

International agreements such as the Paris Agreement (particularly Article 8 on loss and damage) and the Sendai Framework for Disaster Risk Reduction provide global reference points. They are not legally binding but strongly influence national and EU-level strategies, emphasizing the need for better data sharing, integration, and cross-sector coordination.

- EU level

The European Union defines a range of binding directives and regulations that member states must implement through national law. These include the EU Floods Directive, the EU Climate Law, the INSPIRE Directive, and the Corporate Sustainability Reporting Directive (CSRD). Additionally, EU agencies such as EIOPA, and the Joint Research Centre (JRC) support implementation through tools like Copernicus and the Risk Data Hub, which help harmonize disaster and climate data across borders.

- National level

National governments are responsible for transposing EU directives into domestic legislation. They define legal obligations, set strategies, and assign mandates to regional and local authorities. National laws determine what kind of data needs to be collected, by whom, and for what purpose, often specifying the formats, standards, and institutional roles for risk management and climate adaptation. National laws and regulations define the role and responsibility of each public authority; and by that, what kind of data these institutions/authorities will need and collect to fulfil their responsibility according to the framework and regulations they follow.

- Regional level

Regions may act as coordinators, data aggregators, or even regulators, depending on the administrative system of each country. In federal or decentralized contexts (e.g. Spain, Germany), regions have significant autonomy and responsibility in planning, environmental

protection, and emergency response. In more centralized systems, they support or supervise the actions of municipalities.

- Local/Municipal level

Municipalities are the main implementation actors. They apply national and regional frameworks to local contexts through land-use planning, infrastructure investment, emergency management, and climate adaptation strategies. To meet these obligations, municipalities must conduct risk and vulnerability assessments (RVAs) and make evidence-based decisions which require access to reliable and granular data. Without such data, legal compliance and effective planning are severely constrained.

In this multilevel system, responsibilities are distributed vertically, but effective action depends on horizontal coordination and data sharing.

Regional Data Hubs can act as critical infrastructure for connecting these levels and enabling municipalities to fulfil their legally defined roles. It can provide a “real time” window on ongoing risk accumulation identifying new risk patterns and trends that should feedback into recalibrated risk information.

2.1.2. Overview of the key frameworks

To understand why regional and local authorities must collect and manage data, it is essential to examine the obligations derived from their legally defined roles. These responsibilities directly determine what kind of data is needed, at what scale, and for what purpose. Another critical factor is whether such data is available, accessible, and usable. The three main frameworks identified for CAA and DRR are the EU flood Directive, EU adaptation strategy and the EU climate law.

2.1.2.1. EU Flood Directive

The EU Flood Directive (2007/60/EC)[2] is a prime example. It requires Member States to: (i) identify areas at significant risk of flooding, (ii) conduct detailed flood risk assessments, (iii) develop flood hazard and risk maps and design and implement flood risk management plans and (iv) take adequate and coordinated measures to reduce this flood risk.

These tasks fall on local and regional authorities, who must collect, analyze, and manage data on hazards, land use, population exposure, infrastructure, and vulnerabilities. Thus, the directive creates a concrete data demand, making local data hubs critical tools to carry out these legal obligations effectively.

2.1.2.2. EU Adaptation Strategy

In the *EU Adaptation Strategy*[3] (February 2021), one of the objectives is “smarter adaptation”, within which a key action is “more and better climate-related risk and losses data”. The strategy urges national and local actors to integrate climate risk and loss data into decision-making. It also promotes common data standards, enhanced access, and the use of platforms like the EU Risk Data Hub. While not legally binding, it defines strategic responsibilities for adaptation that municipalities are expected to pursue again, relying on data to guide decisions

[2] https://eur-lex.europa.eu/eli/dir/2007/60/oj/eng

[3] https://climate.ec.europa.eu/eu-action/adaptation-and-resilience-climate-change/eu-adaptation-strategy_en

and investments.

Extract of the EU Adaptation Strategy:

"To avoid "climate-blind" decisions, data from both the private and public sector should be recorded, collected and shared in a comprehensive and harmonised way. The Commission will promote common rules and specifications for the recording and collection of data on climate-related losses and physical climate risk, and support the central recording of this data from the public and private sector at EU level through its Risk Data Hub. It will encourage at the national level a voluntary approach of public private partnerships for the collection and sharing of loss data based on enhanced cooperation with Member States, cities and industry. The Commission will also define the data needs, and explore with industry the best ways to ***collect comprehensive and harmonised data from insurers,*** *empowering, as relevant, the European Insurance and Occupational Pensions Authority (EIOPA).*

The Commission will facilitate access to climate-related risk and losses data for stakeholders. The review of the INSPIRE Directive in 2021 as part of the 'GreenData4All' initiative offers an opportunity to revise the legislation to cover environmental and climate-related disaster loss data, extending the scope of public access. Climate-related disaster loss data could also be considered as high value datasets in future revisions of the implementing act of the Directive on open data and the re-use of public sector information. Similarly, data collected in public private partnerships will be made as accessible as possible.

The Commission will:

- *promote and support the use of its Risk Data Hub to harmonise the recording and collection of comprehensive and granular climate-related risk and losses data, and promote national level public private partnerships to collect and share such data;*
- *explore with EIOPA and industry the best ways to improve the collection of uniform and comprehensive insured loss data, and will empower EIOPA as needed;*
- *extend the scope of public access to environmental information in the INSPIRE Directive to include climate-related risk and losses data."*

2.1.2.3. EU climate law

The EU Climate Law[4] establishes a legally binding commitment for the EU to achieve climate neutrality by 2050. Article 5 specifically focuses on adaptation, requiring (i) continuous progress in enhancing adaptive capacity and reducing vulnerability, (ii) National adaptation strategies based on the best available scientific data and (iii) better integration of adaptation into all policy areas.

This reinforces the need for coherent, data-driven planning at all administrative levels.

[4] https://climate.ec.europa.eu/eu-action/european-climate-law_en

Extract of the EU climate law:

This is a binding regulation REGULATIONS REGULATION (EU) 2021/1119 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') It sets rules for both climate mitigation and adaptation. The most relevant is Article 5 /Adaptation to climate change
1. The relevant Union institutions and the Member States shall ensure continuous progress in enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in accordance with Article 7 of the Paris Agreement.
2. The Commission shall adopt a Union strategy on adaptation to climate change in line with the Paris Agreement and shall regularly review it in the context of the review provided for in point (b) of Article 6(2) of this Regulation.
3. The relevant Union institutions and the Member States shall also ensure that policies on adaptation in the Union and in Member States are coherent, mutually supportive, provide co-benefits for sectoral policies, and work towards better integration of adaptation to climate change in a consistent manner in all policy areas, including relevant socioeconomic and environmental policies and actions, where appropriate, as well as in the Union's external action. They shall focus, in particular, on the most vulnerable and impacted populations and sectors, and identify shortcomings in this regard in consultation with civil society.
4. Member States shall adopt and implement national adaptation strategies and plans, taking into consideration the Union strategy on adaptation to climate change referred to in paragraph 2 of this Article and based on robust climate change and vulnerability analyses, progress assessments and indicators, and guided by the best available and most recent scientific evidence. In their national adaptation strategies, Member States shall take into account the particular vulnerability of the relevant sectors, inter alia, agriculture, and of water and food systems, as well as food security, and promote nature-based solutions and ecosystem-based adaptation. Member States shall regularly update the strategies and include the related updated information in the reports to be submitted under Article 19(1) of Regulation (EU) 2018/1999.

2.1.3. Other relevant framework supporting the need for a more coherent approach strategy and data hubs

- Sendai Framework

According to *Sendai Framework for Disaster Risk Reduction (2015-2030)*[5], "understanding disaster risk", requires that the signatory countries systematically evaluate, record, share and publicly account for disaster losses and understand the economic impacts at national and sub-national levels. The framework recognized the critical role of geospatial technologies in disaster risk related actions (in support of its Priorities 1 and 4). This recognition resulted in initiatives to use spatial information at all the stages of DRM covering all geographical scales (local, sub-national, national, regional).

Policies for disaster risk reduction and management have evolved from defence against hazards to a *more comprehensive, integrated risk management approach* that includes prevention, preparedness, response and recovery. The implementation of this approach is currently taking place at both international and national level.

[5] https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

- Paris Agreement (2015)

The Paris agreement (Loss and damage Art. 8)[6] recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage. Parties are to *enhance understanding, action and support,* including through the Warsaw International Mechanism, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change. This further means strengthening dialogue, coordination, coherence and synergies among relevant stakeholders, and enhancing action and support, including finance, technology and capacity-building.

On the EU level there are various EU directives and regulations with the goal to provide important and authoritative information to the society, define and create common standards, make data open and accessible, etc.

- *European Union Civil Protection Mechanism*

Article 6 of the European Union Civil Protection Mechanism (2013)[7] obliges the EU Member States to develop risk assessments at national or appropriate sub-national levels and to make a summary of the relevant elements thereof. To do a risk assessment you need data from hazard, exposure and vulnerability. And to add forward-looking climate predictions.

- *General Data Protection Regulation (GDPR)*

All sharing of data needs to be aligned with the GDPR (2016)[8] regulation, which protects the natural persons with regard to the processing of personal data and the free movement of personal data. E.g. to share granular loss data from insurance companies with public authorities for climate adaptation will require an agreement with the policyholder, or new legal provision.

- *Financial/insurance regulation on sharing of data*

EU Solvency II[9] sets out requirements applicable to insurance and reinsurance companies in the EU with the aim to ensure the adequate protection of policyholders and beneficiaries. The national framework will have restrictions on what data the insurance companies can share and their duty of confidentiality regarding customer relations. The companies are obliged to prevent unauthorized persons from gaining access to or knowledge of information about customers' and others' business or personal relationships, unless they are required by law or regulations given by law to provide information, or are given permission to provide information that is otherwise subject to a duty of confidentiality. This duty of confidentiality normally does not prevent information from being disclosed with the written consent of those who have a right to confidentiality.

- *The GreenData4All-initiative*[10]

[6] https://unfccc.int/most-requested/key-aspects-of-the-paris-agreement

[7] https://unfccc.int/topics/adaptation-and-resilience/workstreams/loss-and-damage/warsaw-international-mechanism

[8] https://eur-lex.europa.eu/eli/reg/2016/679/oj/eng

[9] https://www.eiopa.europa.eu/browse/regulation-and-policy/solvency-ii_en

[10] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13170-GreenData4All-updated-rules-on-

This initiative aims to help deliver on Europe's green and digital transformation by updating EU rules on environmental geospatial data and on public access to environmental information. The aim is to *enable greater sharing of data between the public & private* sectors and with the general public and unlock the full benefits of data sharing for data-driven innovation and evidence-based decisions. GreenData4All – updated rules on geospatial environmental data and access to environmental information. The Commission adaptation is planned for in the fourth quarter of 2025.

- *Water frame directive (WFD)*

The Water Framework Directive (2000)[11] is the regulation for water protection in Europe, setting out rules to halt deterioration in the status of EU water bodies and achieve good status for Europe's rivers, lakes and groundwater. It focuses on ensuring good qualitative and quantitative health, i.e. on reducing and removing pollution and on ensuring that there is enough water to support wildlife at the same time as human needs. It ensures an integrated approach to water management, respecting the integrity of whole ecosystems EU tools.

- *EU taxonomy*

The EU taxonomy[12] is a cornerstone of the EU's sustainable finance framework and an important market transparency tool to help direct investments to the economic activities most needed for the transition, in line with the European Green Deal objectives. The taxonomy is a classification system that defines criteria for economic activities that are aligned with a net zero trajectory by 2050 and the broader environmental goals other than climate.

The Taxonomy Regulation entered into force on 12 July 2020. It establishes the basis for the EU taxonomy by setting out the 4 overarching conditions that an economic activity has to meet in order to *qualify as environmentally sustainable*. To be considered sustainable, an economic activity must according to the taxonomy contribute to one or more of the EU's environmental goals: • Limitation of climate change • Climate adaptation • Sustainable use and protection of water and marine resources • Transition to a circular economy, waste prevention and recycling • Prevention and control of pollution and • Protection of healthy ecosystems

The Screening criteria in the taxonomy delegated act describe conditions for how *non-life insurance can contribute to climate adaptation,* and which economic activities are considered sustainable under underwriting of climate-related perils in non-life insurance. One of the *five* economic activities which meets the technical screening criteria is *data sharing*.

Data sharing:

1. With due regard to Regulation (EU) 2016/679 of the European Parliament (GDPR) and of the Council, a significant ***share of loss data related to insurer's activity*** is made available, free of charge, to one or several public authorities for the purpose of analytical research. Those public authorities declare to use the data for *purposes of enhancing adaptation to climate change* by the society in a region, country or internationally and the insurer provides the data at a level of granularity sufficient for the use declared by the respective public authorities.

2. Where the insurer is not yet sharing such data with a public authority for the aforementioned purpose, it has declared the intention to make its data available, free of charge, to interested

geospatial-environmental-data-and-access-to-environmental-information_en

[11] https://environment.ec.europa.eu/topics/water/water-framework-directive_en

[12] https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

third parties and has indicated under which conditions such data can be shared. That declaration of intention to share available data is easily accessible, including on the insurer's website, for relevant public authorities.

2.2. EU tools/platforms

The European Union has developed a comprehensive ecosystem of data platforms to support climate adaptation, risk assessment, and resilience planning. These platforms integrate satellite data, climate models, and risk tools to assist public authorities, researchers, and other stakeholders in making informed decisions. Figure 1 shows the key EU and EU-affiliated platforms relevant to these efforts.

It's possible to categorize these services in 5 types:

- Observational data: Raw data about the Earth collected from satellites, ground stations, and sensors. It shows what is happening now (e.g., atmosphere, oceans, land cover, disasters).
- Climate services: Forecasts, projections, and processed data showing how climate is changing in the short, medium, or long term. Helps plan for future climate conditions (seasonal forecasts, long-term projections, downscaled models).
- Risk assessment: Tools and platforms that use data to map risks, vulnerabilities, and potential impacts of disasters. Helps authorities, businesses, and communities understand where risks are highest and how to prepare.
- Economical data: Models and platforms that link climate hazards to financial and economic impacts. Needed for insurance, investment planning, and cost–benefit analysis of adaptation measures.
- Historical data: Databases of past disasters and climate events. Helps understand long-term trends, compare with future projections, and improve preparedness.

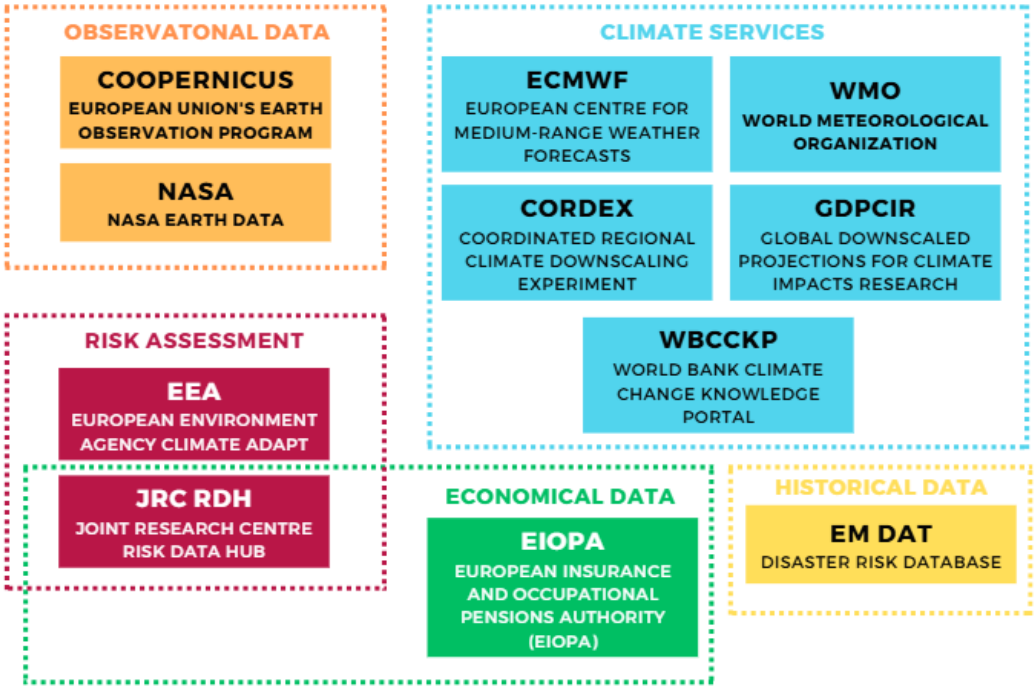


Figure 1. Publicly available data services for climate risk management regrouped by categories (source: authors).

2.2.1. Observational data

2.2.1.1. Copernicus

Copernicus is the European Union's Earth observation program, delivering comprehensive and up-to-date information about the planet and its environment. By gathering data from satellites (Sentinel and other satellites) and ground-based stations, it offers valuable insights for environmental monitoring, climate change adaptation, and disaster management. The Copernicus program offers a wide range of data and services through several dedicated portals, providing access to land, atmospheric, and ocean observations. These resources support environmental monitoring, climate analysis, and emergency response. Most of the data and information provided by Copernicus is freely available and can be accessed by any individual or organisation in the world without restriction.

Copernicus data services:

- CDSE Portal: Sentinel and contributing mission data with cloud processing tools.
- WEkEO Portal: Sentinel and other mission data for climate and environmental analysis.
- CAMS Portal: Atmospheric composition data.
- CMEMS Portal: Ocean and marine environment data.
- CLMS Portal: Land monitoring data like land cover and vegetation.
- C3S Portal: Climate change data, past and future climate trends.
- EMS Portals: Emergency response data, such as floods, fires, and droughts. Access is restricted to authorised users, while the general public can only access non-sensitive information.

- Security Service Portals: Border and maritime surveillance, EU security support. Data is not available to the general public without authorization.

2.2.1.2. NASA Earth Data[13]

NASA Earth Data delivers a vast array of Earth observation data through its Earth Data platform. The data includes satellite imagery, atmospheric conditions, ocean temperatures, land use, and more, which are critical for understanding and managing climate risks.

- MODIS (Moderate Resolution Imaging Spectroradiometer) data for monitoring global vegetation and land cover.
- GPM (Global Precipitation Measurement) data for precipitation patterns.
- GRACE (Gravity Recovery and Climate Experiment) data for monitoring groundwater and ice mass changes.

2.2.2. Climate services

2.2.2.1. ECMWF - European Centre for Medium-Range Weather Forecasts[14]

ECMWF is a leading authority in the field of meteorology, known for its weather prediction models and its work in climate monitoring and forecasting. It is a principal contributor to the Copernicus program, providing reliable data on climate change, the atmosphere, floods and wildfires.

- Medium-range weather forecasting (up to 15 days ahead)
- Extended-range forecasts (up to 46 days ahead)
- Long-range or seasonal forecasts (up to seven months ahead)
- Integrated Forecasting System (IFS) is an operational tool used to forecast weather patterns and various aspects of the Earth system.

2.2.2.2. CORDEX (Coordinated Regional Climate Downscaling Experiment)[15]

CORDEX is a global initiative of the World Climate Research Program (WCRP) to provide high-resolution regional climate data. It downscales global climate model output using regional models or statistical methods to produce detailed climate projections for specific areas. These data are useful for understanding the influence of climate at the local scales, assessing climate impacts, adaptation planning, and policy development. CORDEX data are publicly available and support a wide range of climate-sensitive sectors.

Various climate projections for Europe:

- Soil erosion indicators for Italy from 1981 to 2080[16]
- Temperature statistics for Europe derived from climate projections[17]

[13] https://www.earthdata.nasa.gov/technology/open-science
[14] https://www.ecmwf.int/
[15] https://cordex.org/
[16] https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-soil-erosion?tab=overview
[17] https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-temperature-statistics?tab=overview

- Temperature and precipitation climate impact indicators from 1970 to 2100 derived from European climate projections[18]
- Water level change indicators for the European coast from 1977 to 2100 derived from climate projections[19]

2.2.2.3. World Meteorological Organization (WMO)[20]

It provides climate services that include global and regional climate monitoring, forecasting, and climate-related risk assessments. Their data services support disaster risk reduction and climate adaptation strategies.

- Global climate indicators and trends.
- Extreme weather and climate event tracking.
- Seasonal climate forecasts and outlooks.

2.2.2.4. Global Downscaled Projections for Climate Impacts Research (GDPCIR).

In a recent study, Gergel et al.[21] focus on improving the resolution and accuracy of global climate model (GCM) data for use in climate impact research. GCM output, which is often too coarse and biased, is adjusted using the Quantile Delta Mapping (QDM) method and then downscaled using the Quantile-Preserving Localized-Analog Downscaling (QPLAD) technique to preserve trends, especially at the extremes (distribution tails). The result is the Global Downscaled Projections for Climate Impacts Research (GDPCIR), a global, daily, high-resolution temperature and precipitation dataset applicable from 1950 to 2100 under different emission scenarios. The dataset, hosted on Microsoft's Planetary Computer, is intended to support climate impact modelling across multiple sectors.

2.2.2.5. World Bank Climate Change Knowledge Portal[22]

This portal offers access to comprehensive global, regional, and country-level data on climate change. The platform offers data on temperature, precipitation, climate risks, and vulnerabilities.

- Historical climate data and future projections.
- Country-specific climate profiles.
- Tools for analyzing climate impacts and risks.

2.2.3. Risk assessment

2.2.3.1. JRC Risk data hub[23]

The Disaster Risk Management Knowledge Centre (DRMKC) Risk Data Hub is a multi-hazard

[18] https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-hydrology-meteorology-derived-projections?tab=overview
[19] https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-water-level-change-indicators?tab=overview
[20] https://wmo.int/
[21] https://gmd.copernicus.org/articles/17/191/2024/
[22] https://climateknowledgeportal.worldbank.org/
[23] https://drmkc.jrc.ec.europa.eu/risk-data-hub/#/

geo-platform designed to facilitate the integration of scientific knowledge and policy at various levels. It aims to improve the accessibility and usability of research results for decision makers, thereby supporting disaster risk management and resilience planning by providing access to disaster risk data, tools and resources across Europe.

Key services include:

- Delivering comprehensive datasets on a range of hazards, vulnerabilities and exposures across Europe to support risk assessment and decision making.
- Providing interactive maps and visualization tools for analyzing the spatial distribution and impact of risks to support planning and preparedness.
- Enabling users to simulate and evaluate potential disaster scenarios, thus supporting the evaluation of risk reduction strategies.
- Facilitating the exchange of best practices, case studies, and resources among stakeholders involved in disaster risk management and resilience-building.

2.2.3.2. European Environment Agency (EEA) Climate Adapt[24] platform

It is a European knowledge-sharing portal to help Europe adapt to climate change. It provides data and information on climate change impacts, vulnerability and adaptation measures.

- Interactive maps and graphics showing climate impacts and vulnerabilities across Europe.
- Information on adaptation measures and case studies.
- Tools for assessing climate risks and developing adaptation strategies.

2.2.4. Economical data: The European Insurance and Occupational Pensions Authority (EIOPA)[25]

The CLIMADA-App[26] model is an open-source, probability-based tool for assessing the economic risks associated with climate change. It evaluates the impact of hazards such as tropical cyclones, floods, droughts and European winter storms on a global scale and provides high-resolution data and forecasts. For all hazards, both historical and probabilistic event data sets are available. Additionally, some hazards are modelled under selected climate change scenarios at specific future time points, such as 2040. The tool helps decision-makers understand climate risks and identify cost-effective risk reduction measures.

EIOPA has also provided a list of other initiatives supporting open source platforms:

- Global Earthquake Maps (GEM) - Developed by the Global Earthquake Model Foundation, the OpenQuake Engine is an advanced open-source earthquake hazard and risk modeling tool.[27]
- Risk Modelling (RMSG) focuses on advancing the global understanding and measurement of natural hazard and catastrophe risks by leveraging the risk analytics

[24] https://climate-adapt.eea.europa.eu/en
[25] https://www.eiopa.europa.eu/tools-and-data/open-source-tools-modelling-and-management-climate-change-risks_en
[26] https://wcr.ethz.ch/research/climada.html
[27] https://www.globalquakemodel.org/

of the re/insurance sector.[28]

- The Climate Impact Explorer - this tool provides detailed projections of physical climate risks at the national and subnational levels. It provides data on how different climate scenarios and levels of warming may impact sectors, showing both chronic and acute climate changes.[29]
- Oasis Loss Modelling Framework - A free, open-source catastrophe modelling platform available to anyone who needs it, designed to support disaster risk assessment and management.[30]

2.2.5. Historical data: EM-DAT[31]

The Emergency Events Database EM-DAT was created in 1988 as a joint initiative between the Centre for Research on the Epidemiology of Disasters (CRED) and the World Health Organization (WHO).

The CRED is now part of the Institute of Health and Society attached to the University of Louvain (UCLouvain). The EM-DAT database and project are primarily sponsored by the United States Agency for International Development (USAID).

The EM-DAT contains data on the occurrence and impacts of over 26,000 mass disasters worldwide from 1900 to the present day. The database is compiled from various sources, including UN agencies, non-governmental organizations, reinsurance companies, research institutes, and press agencies. The Centre for Research on the Epidemiology of Disasters (CRED) distributes the data in open access for non-commercial use.

There are further resources to support the coordination and collaboration on climate data and service delivery like the world Climate Services Programme (WCSP), the Global Climate Observing System (GCOS), the Working Group on Climate of the Committee on Earth Observation Satellites (CEOS)/Coordination Group for Meteorological Satellites (CGMS), the Group on Earth Observation (GEO), the World Climate Research Programme (WCRP) and the World Adaptation Science Programme (WASP).

Additional data hubs have been identified and assessed in the Milestone 2.1 document[32], including inspire Geoportal, Oasis Hub, R4RE Mapping Platform, The Norwegian Knowledge Bank, and Nature4Citites.

The data provided by Copernicus and other services can be applied across a broad spectrum of fields, including urban management, sustainable development, nature conservation, and regional or local planning. In addition, all these data usage examples can contribute to enhance risk mitigation and provide tailor-made insurance solutions.

[28] https://www.insdevforum.org/working-groups/rmsg/
[29] https://climate-impact-explorer.climateanalytics.org/
[30] https://oasislmf.org/
[31] https://www.emdat.be/
[32] Milestone 2.1

2.3. Challenges in CCA and DRR practice

2.3.1. Lack of coherent national-level coordination

At the national level, fragmented institutional responsibilities between Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) present one of the most persistent challenges to effective and integrated climate risk governance. Although both agendas share the goal of reducing vulnerability and strengthening resilience, they are often managed independently by different ministries, agencies, and legal frameworks.

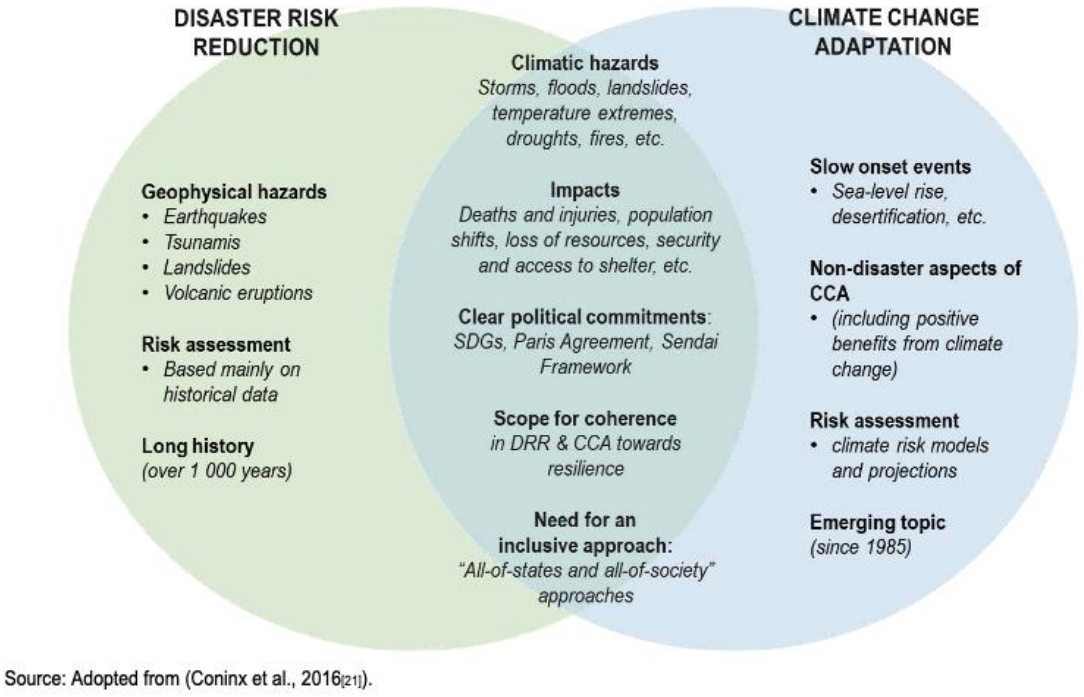
Institutional mandates are typically derived from international and European Union agreements but are delegated to distinct actors. For instance, implementation of the Sendai Framework is usually assigned to the Civil Protection Ministry and its national agency, whereas responsibility for the Paris Agreement and the EU Climate Law primarily rests with the Environmental Ministry and affiliated bodies. This institutional separation generates parallel strategies, limited coordination, and duplication of efforts.

These institutional divides result in siloed strategies, weak coordination, and duplicated efforts. Interventions for CCA and DRR often aim for similar outcomes such as reducing exposure to climate hazards, minimizing losses, and increasing preparedness. Yet, as the OECD (2020) points out: "Interventions to adapt to climate change and reduce disaster risks share common objectives, but too often they are developed and deployed through administrative silos. The wide range of institutions and government officials responsible for managing climate hazard exposures and reducing vulnerability often miss potential synergies and duplicate efforts."

There is rarely a unified strategy that bridges CCA and DRR, and most countries do not provide a mandate for coordination across ministries. This results in fragmented budgeting processes, limited adoption of cross-cutting tools such as Nature-Based Solutions (NBS) and missed opportunities for joint risk assessments and data sharing.

The degree to which countries pursue coherence between CCA and DRR is shaped by national and local conditions like political will, institutional power, governance tradition, socio-economic development levels and the severity and frequency of climate and disaster risks. Again, as the OECD (2020) emphasizes: "The extent to which countries are taking a coherent approach to CCA and DRR – or whether it is even a priority – depends on the political, socio-economic and environmental context and circumstances. The priority given to enhancing coherence may be determined by the nature of risks in a country and the political importance assigned to each institution."

However, mechanisms for coordination and information exchange remain underdeveloped in most settings. National agencies and ministries typically lack common platforms for data integration or joint decision-making, and there are few institutional incentives to align policies across domains. This lack of coherence at the national level translates into operational constraints at the local level, where integrated planning and implementation are most urgently required.



Source: Adopted from (Coninx et al., 2016[21]).

Figure 2. Terms and meanings in CCA and DRR: commonalities and differences (source: OECD, 2020).

2.3.2. Local- level consequences of fragmented approaches

Local and regional authorities are tasked with translating national laws and strategies into tangible actions. However, the lack of national coherence often cascades down, making it difficult for cities and municipalities to respond effectively to climate risks.

Especially in larger municipalities, responsibilities are split across departments such as urban planning, transport, emergency services, finance, infrastructure, water and sanitation. Without formal coordination mechanisms, these departments operate in isolation and thus can duplicate efforts and miss synergies.

Data management constitutes another major barrier. Local departments rely on heterogeneous tools, models, and indicators, which produces fragmented assessments of risk exposure and leaves significant gaps in disaster impact data particularly concerning economic losses from smaller or recurrent events. Because damage costs are often absorbed within general maintenance budgets, their true financial burden remains invisible. Without reliable loss data and systematic cost–benefit analyses, local governments struggle to justify or prioritize preventive investments in CCA and DRR.

Local authorities lack clear guidance and funding to manage multi-sectoral integration. There is often no political support to initiate long-term, cross-departmental planning processes.

The lack of standardized disaster loss data across the European Union exacerbates these challenges. Data collection methods and governance structures vary widely among member states and regions, hindering cross-border cooperation, benchmarking, and regional-level planning. Although the insurance sector generates highly detailed data on climate- and

disaster-related losses, these datasets are rarely integrated into public decision-making. Emerging initiatives such as EIOPA's open insurance exploration[33] demonstrate potential to enhance transparency and risk understanding, provided that issues of legality, privacy, and competition are adequately addressed.

Many countries have seen the importance of integrating Disaster Risk Management (DRM) into Climate Change Adaptation (CCA). This would promote the adoption of a risk management approach to climate-sensitive decision-making, and serves as a reference to integrate DRM with climate change adaptation (CCA) (ADPC, 2013 & OECD, 2020).

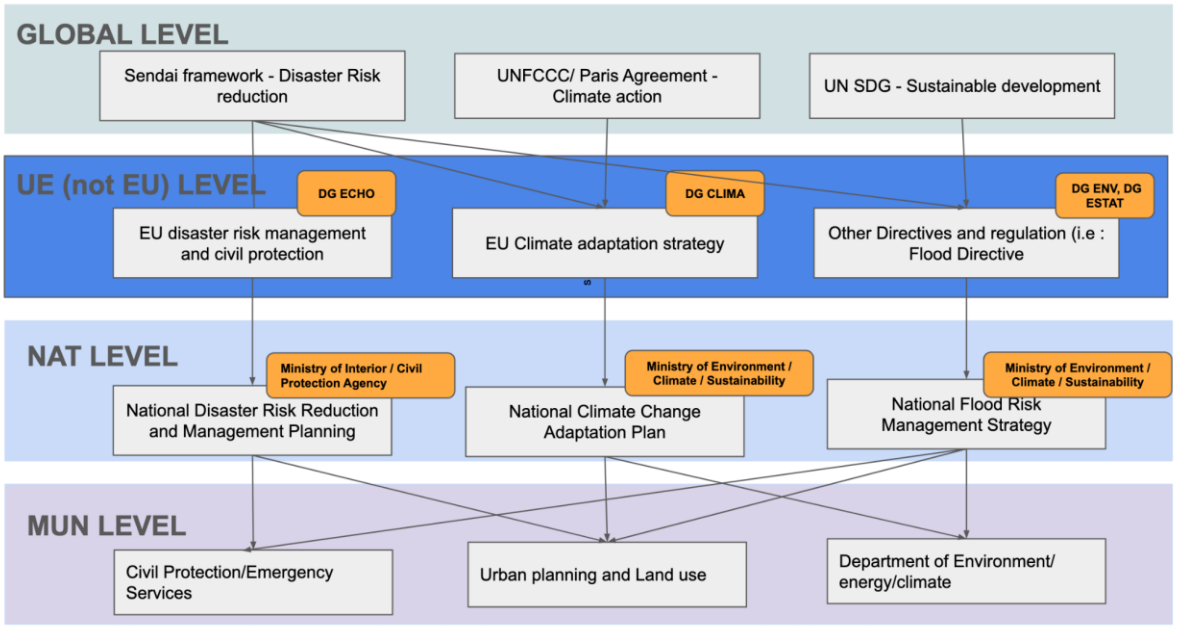


Figure 3. Fragmented CCA and DRR frameworks and laws (source: authors). In many countries, disaster risk and climate change/environmental issues are usually addressed separately, following UN agreements. However, the organization of these areas can vary slightly, and they may also be referred to by different names.

2.3.3. Feedback on the use of EU RDH and other initiatives

Pan-European initiatives and data sets like the Copernicus Data Services and EU RDH provide comprehensive datasets covering various natural hazards and risks, but there is very little information on how these platforms are being used in climate adoption at the national and local level. In dialogue with the EU Risk data hub (EU RDH) there is an upcoming report (July 2025) which explores this question. The report will be published under the Expert Group for Disaster Prevention and Risk Management (DPEG)[34].

In the previous reporting cycle (2023), it was revealed that "no country refers to the reporting of risk data to the European Commission's Risk Data Hub". And that this merits further

[33] https://www.eiopa.europa.eu/consultations/open-insurance-accessing-and-sharing-insurance-related-data_en

[34] https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupId=3733&fromMeetings=true&meetingId=26197

examination. It was further revealed that collection of data on past disaster events are fragmented and unstructured in almost all countries. According to EU RDH, they have conducted a survey on current availability and practices among UCPM countries for collecting loss data. There is no legal obligation currently for EU Member States to report data to RDH, but RDH is engaging with national agencies to encourage voluntary reporting and standardization.

The possibility of using satellite data, climate information and other derived products from Copernicus, ESA, EEA and other data providers in combination with advances in machine learning and remote sensing techniques, (e.g. to produce continuous surface coverage maps and detection of detailed ecosystems, etc) is a field in rapid development, and better overview of the possibilities and recent advancements which makes this more applicable to local scale should be supported.

2.4. Why Regional Data Hubs?

A Regional Data Hub is a technical and institutional system for collecting, harmonizing, analyzing, and sharing climate-related risk and loss data. It serves local/regional governments and stakeholders for planning, risk assessments, and investments.

RDHs address these challenges by offering a structured, legally compliant, and scalable mechanism for integrating multi-source data (public and private), supporting local planning with decision-ready insights, encouraging cross-department and cross-level coordination and reducing reliance on scattered, one-off data initiatives.

Gathering this information from different sources into one place, giving an overarching knowledge base, would make national, regional and local authorities able to:

- Identify hazards and evaluate the existing risks.
- Understand the value of compiling climate-related risk and loss data in one place giving a more holistic approach seeing how risk interconnects.
- Get access to a more comprehensive picture with harmonised and systemized and more granular data that will:
    - enhance risk awareness and new insights into unknown risks.
    - improve knowledge for planning and decisions of future development areas.
    - improve knowledge base on existing areas/infrastructure to prioritize, maintenance, monitoring (damages), rehabilitation, and more accurate investments.
    - improved knowledge base for risk assessment, e.g. risk and vulnerability analyses (which in some countries are mandatory by law), and through this, contribute to the regions and municipalities/cities being able to fulfil their role and responsibility.
- Take more adequate, and more coordinated actions and measures to reduce the climate and disaster risk, and become better adapted, and become more resilient against more extreme events.
- Funding to CCA and DRR tends to happen post bigger disaster events. A RDH will give statistical impact data over time and hinder short-time vision in funding.
- Identify conflict or lack of harmonisation between national and regional regulation within climate adaptation and disaster risk reduction, and thereby what changes are

needed in the existing regulations.

- identify and improve knowledge about the economic consequences of the climate change effect on the society/municipality.
- Use the loss data/economic costs related to climate change in political budget processes, which are essential information to obtain funding to CCA and DRR projects/measures.
- Basis for better collaboration within the municipalities (e.g. land-use planning and technical sector).
- Bring awareness of the impact of climate change to the society.

3. Designing a Regional Data hub

3.1. Data types and sources

3.1.1. Types of data

Climate-related risk refers to information and statistics that quantify the potential financial, operational, and societal impacts arising from climatic conditions and events, including data on the associated hazards of climate change and the measures taken to respond to those changes. The last point is an important clarification recognizing that climate-related risk applies both to the impact of and responses to climate change (IPCC, 2023).

- Disaster loss data

Loss and damage are often divided into economic loss and damage, which includes harm to livelihoods and property, and non-economic loss and damage. Damage in this definition includes loss of life and losses to ecosystem services and cultural heritage. This includes public and private losses from climate-related impacts, for example loss of life, damage to infrastructure, or commercial operations. It also includes costs of emergency response and recovery at asset and at different administrative levels. Climate risk and loss data recording and sharing supports work on the Sendai Framework for Disaster Risk Reduction.

Direct disaster losses refer to directly quantifiable losses such as the number of people killed and the damage to buildings, infrastructure, and natural resources. Indirect disaster losses include declines in output or revenue and impact on the well-being of people. It generally arises from disruptions to the production and flow of goods and services because of a disaster (UNDRR, 2021).

Figure 4. Visual representation of direct/indirect and quantifiable/non-quantifiable losses (source: UNDDR, 2021).

- Insurance loss and damage data (insurance, emergency services)

The data can help local, regional, and national governments, insurers and supervisors to monitor whether losses are increasing in specific regions and/or for specific perils. A pivotal goal in SOTERIA is to explore access to, and use of insurance loss data to contribute to better risk awareness and risk assessment in decision making of climate adaptation. Insurance companies collect data on damage and economic losses via claims from their customers. Therefore, they have the most accurate and normally digitised loss data on compensation paid to the insured, time and location (address) of the insured building damaged, and the cause of the damage (e.g. water flowing into the house due to pluvial flood, or riverine flood, landslide, fire etc.).

The insurance companies will only collect data they need to be able to compensate the insured according to the insurance contract. The insurance company operation, ownership or transaction of insurance or reinsurance business is regulated and defined by the insurance licence given by the national finance and insurance supervisor/authorities, based on a legal framework (e.g. Solvency II). The framework also regulates if and when the insurance companies can share damage and loss data.

Furthermore, advances in machine learning, satellite image processing and geographical information systems (GIS) have enabled the generation of additional data points and synthetic information on disaster impacts in data-scarce environments. This means that disaster losses and damages data collected in the aftermath of an extreme event can be combined with other data sets and sources to build a more consistent and comprehensive empirical base for risk models, recovery plans and financing strategies (UNDDR 2025).

- Heatwave is not part of non-life insurance products and loss data

Heatwaves are normally treated as a subset of droughts because droughts would primarily be a concern for the agricultural sector. It could have a consequence on the transport or energy sectors via *business interruption* (i.e. railway tracks are no longer usable or power plants are

not as efficient). Drought causing soil subsidence is not a disaster event like any other. Although potentially destructive, it is usually a very slow and gradual process. Moreover, heatwaves could have larger impacts on society through higher rates of excess *mortality* (McMichael et al., 2006). As a result, the impacts of heatwaves are more likely to be covered by *health and life insurance*, instead of non-life insurance for extreme weather directly. The considerations of health and life insurance are different to those of non-life insurance.

In SOTERIA the main emphasis is put on more acute natural catastrophes (like pluvial and fluvial flooding, earthquake, storm) covered by non-life insurance, also because the SOTERIA associated partners are non-life insurance companies where a main goal is to include their damage and loss data into a RDH.

- Local infrastructure, citizen data (crowd-sourced, municipal reports).

The mapping exercise conducted in SOTERIA (task 2.1) reveals significant variations in how pilot regions record, collect, and share climate-related risk and loss data. While municipalities often possess detailed background data on properties, buildings, and infrastructure, the accessibility of this information in regional or national infrastructures and the utilisation of this information differ markedly across regions. Access to this data may be restricted or provided upon request. Larger municipalities may have open data portals or GIS viewers.

What is collected, compiled and shared will, to a larger extent, depend on the size of the region/municipality/city, their resources and political decisions (strategies, plans, and priorities), knowledge, and resources. Business level data can be data from insurance companies and a relevant example of data provided by citizen-led initiatives are crowd-sourced data like OpenStreetMap.

3.1.2. Key data sources for RDHs

The key data sources for RDHs are:

- **Insurance data**: Claims data offer the most precise view of damage patterns, especially for insured assets. They include cause, address, amount, and timing of damage. These are typically digitised and granular.
- **Climate risk data**: Hazard maps, exposure layers, vulnerability indices from satellite, modelling, and observational systems (e.g., Copernicus, CORDEX).
- **Local administrative data**: GIS-based infrastructure maps, land use records, and municipal risk assessments (e.g., ROS analyses).
- Crowdsourced/citizen science data: Examples include OpenStreetMap and app-based disaster reporting.

From our findings (and experience with the Norwegian case), loss data on the *asset level* is crucial to utilizing risk analysis and planning, especially for local governments/municipalities/cities. Local information (on the address level) from all damage incidents in a specific area at a given time is valuable for exposing vulnerable infrastructure and securing funds for prioritized investments, renewal, and maintenance (Aall, 2018).

3.2. Barriers to effective data use

3.2.1. Legal barriers (privacy, ownership).

The SOTERIA studies and experience from Norway (sharing data from the Knowledge Bank) reveal that the municipalities need damage and loss data on granular/asset level. Current available climate-related risk and loss data held by the national authorities is normally on an aggregated level. The main barrier for this granular data-sharing is the implementation of EU personal data protection law (GDPR), financial regulation and for insurance data, the competition and business sensitivity factor. Use of personal data agreement can be a solution, otherwise there

However, in Norway, part of the public-private/insurance data-sharing project, a new regulatory provision was introduced so the insurance sector could share their damage and loss data at asset level with municipalities and two national agencies (see translation made by Mia Ebeltoft in Annex IV).

3.2.2. Fragmented data

The climate related risk and loss data are normally scattered in various European, national or regional public or private data platforms or systems. Within the European Union, the Union Civil Protection Mechanism (UCPM) plays a role in supporting disaster risk management efforts, emphasising the significance of data not only in guiding disaster response but also in mandating data collection for prevention and preparedness.

However, even in countries with high public data maturity, data supporting climate resilience goals is often fragmented across multiple platforms and stored in diverse formats within organisational data silos. This fragmentation can result in inconsistent data collection, inadequate quality controls, and incomplete data with a lack of granularity, which may lead to gaps and inefficiencies that hinder disaster risk reduction and accurate assessments of disaster costs as pointed out in several studies (De Groeve et al., 2015, Themessl et al. 2022) and recent policy briefings (Lakhina, 2023 and EU Communication, 2023).

3.2.3. Producer - user disconnect

Huge amounts of data are already available and produced by many stakeholders including national statistical offices. However, concerted efforts will be needed to better link data producers and users to increase understanding of what is already there, and to ensure that data produced are policy-relevant, and gaps are being addressed (UNECE 2023). International efforts, such as the United Nations' work on standardisation, offer valuable insights.

This includes developing Hazard Information Profiles (HIPs) and a new disaster loss accounting system to support the Sendai Framework, utilising recent technological advances. While these systems will be designed to provide timely data for proactive risk management, they will also address location- and activity-specific factors affecting data reliability (e.g., unvalidated crowd-sourced data) and aim to also provide information to support decision-making in DRR and CCA, urban planning, and economic development. The Open Geospatial Consortium pilots in disaster risk and climate adaptation further demonstrate the application of data models and advancements in geospatial data sharing and processing across sectors

and scales (OGC 2022, 2023, 2024).

3.2.4. Lack of data

Lack of awareness and limited data on catastrophe risks (and on the funds spent on prevention) can hamper the design of risk management strategies.

At present, data quantifying disaster losses is unsatisfactory: it is often not recorded and/or not available in accessible formats and databases once collected. To avoid “climate-blind” decisions, data from both the private and public sector should be recorded, collected and shared in a comprehensive and harmonised way. However, as systems, tools and formats are not standard. This is a challenge.

3.2.5. The need of climate-related loss data on asset level

In some national regulations (e.g. Norway) the municipalities are required to prepare risk and vulnerability analyses (ROS analyses). These are intended to identify hazards and risks, including threats to biodiversity and ecological function. These analyses are part of the municipality's comprehensive social planning and are an important basis for requirements for land use planning and the prevention of natural damage.

Finding in SOTERIA shows that use of (historical) insurance loss data on the asset level contributes to better ROS analysis. Especially for larger cities, granular damages and loss data are valuable, as they contribute to prioritising the most exposed and vulnerable areas for investment in upgrading and maintenance infrastructure (e.g. change of water and sewage pipes).

3.2.6. Uncertainty in climate predictions

The historical damage and loss data are not enough for how to plan for the future climate change with increased damage and losses. Regional / local climate predictions therefore need to be combined with these historical impact data when planning (showing the cause of damage (hazard), areas exposed and vulnerable for repeated damage) to be crossed/connected with climate predictions.

3.2.7. Both public and private

With low insurance penetration one needs to compile climate-related risk and loss data from both private insurance and public institutions.

However, building well-functioning, data-driven climate-related risk and disaster reduction systems is only possible when countries can use and reuse both public and private data, leveraging synergies between them to create more value. Also, creating trust in the integrity of the data system by staying vigilant against potential harms (including cybercrime and discrimination) is equally critical.

3.2.8. Institutional (roles, access).

The quality and trustworthiness of data are critical in decision-making processes and in powering various systems. Data often comes from several sources, with each having a different structure, size, query language and type.

What type of data is collected, what is accessible, how it is used, stored, and shared will for a large extent, vary from country to country, region to region, as well as from municipality to municipality.

For national authorities the collection of data is driven by their role and responsibility which in most cases is anchored / part of national regulation. For regions and municipalities, it would also be driven by what the regulation and/or framework has defined as their role and responsibility, including obligations to the society, inhabitants, etc. The need of data and what data will in a larger extent depend on the size and complexity of the municipality and city, and from political decisions (strategies, plans, and priorities), economy and resources.

3.2.9. Technical (GIS, models, format, standards).

For regions and municipalities, often with limited resources and expertise, it is a huge task, political will and more resources to collect and systemize information and data from different sources. To coordinate the data within the municipalities different units/departments is also a barrier, as each department often needs different data depending on their (legal) role and responsibility. Often each department builds and uses tailor-made geo-informatic systems (GIS) for risk assessment (e.g. land-use planning uses maps, whereas the technical department like water and sewage uses models and special tools to calculate dimensions of pipes). GIS provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication, efficiency, management, and decision-making.

Each municipality decides on what GIS models to use and invest in, depending on their need (size, complexity, staff/resources etc.) and economy. Therefore, municipalities and cities can have different standards, formats, systems, data and tools and ways of cooperating to fulfil their legal obligations and requirements related to climate adaptation and disaster risk reduction.

These systems and tools can change depending on the needs of new systems and reinvestments from the municipality side.

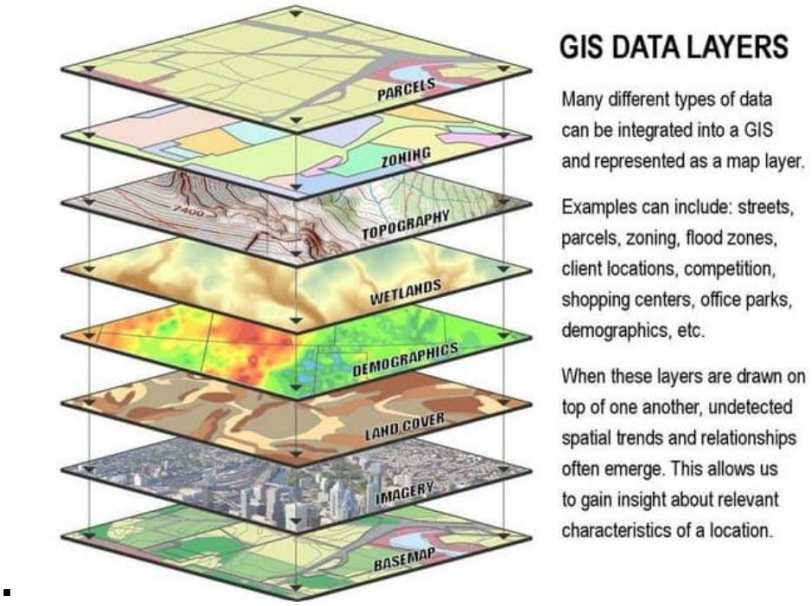


Figure 5. GIS data layers (source: Eastern Ecological Science Center, 2016, link).

3.2.10. Human resources (capacity, tools)

Resource constraints are also a repeated barrier (through dialogue with regions). Organizing workshops and discussions is complicated by limited time and resources particularly within public institutions. This shortage hampers efforts to engage stakeholders effectively.

3.3. Functionalities/ components

3.3.1. Functional building blocks

A RDH can be seen as a system built from several essential building blocks.

The first block is data collection, which gathers information from many different sources, such as satellites, sensors, insurance companies, municipalities, or even citizens.

The second block is storage and cataloguing, which ensures that all this information is safely stored, well-organised, and searchable.

The third block is processing and harmonisation, where the raw data is cleaned, standardised, and transformed into comparable formats so that it can be used together.

A fourth block is analysis and modelling, which turns the harmonised data into useful knowledge, such as risk maps or loss estimates.

The fifth block is visualisation and access, which provides user-friendly tools (dashboards, maps, reports) so that decision-makers can easily understand and use the information.

Finally, there is the governance block, which defines the rules for sharing, protecting, and

maintaining the data hub over time.

3.3.2. Processing and harmonization

To establish a regional data hub, one needs to map the various data resources and identify which would be relevant to include in a regional data hub. A data source may be the initial location where data is born or where physical information is first digitised, however even the most refined data may serve as a source, as long as another process accesses and utilises it. Data resources can be recorded, collected, stored, and shared through various mechanisms. Common types of data sources include data catalogues, datasets and data services.

Data Catalogue	**Data Service**	**Dataset**
A catalogue or repository that hosts the Datasets or Data Services being described.	A collection of operations that provides access to one or more datasets or data processing functions.	A conceptual entity that represents the information published.

Figure 6. Definition of data resources (following DCAT-AP). DCAT version 3 introduces the Dataset Series as the fourth element, which is a collection of datasets published separately but sharing some characteristics that group them (source: Milestone 2.1, SINTEF).

A useful concept to characterise refined data sources is through Analysis Ready Datasets (ARD) and Decision Ready Indicators (DRI), terms introduced by the Open Geospatial Consortium's (OGC) Disaster Pilot and Climate Resilience Pilot 2023. According to this concept, data workflows take raw data and process it to create one of these two types of datasets, as illustrated in the figure 5. Along this process from left to right, data is typically refined through downscaling, re-gridding, information pooling, and data fusion. This refinement not only reduces the size of the data but is intended to increase the amount of useful information available to decision-makers, provided that the data meets user needs.

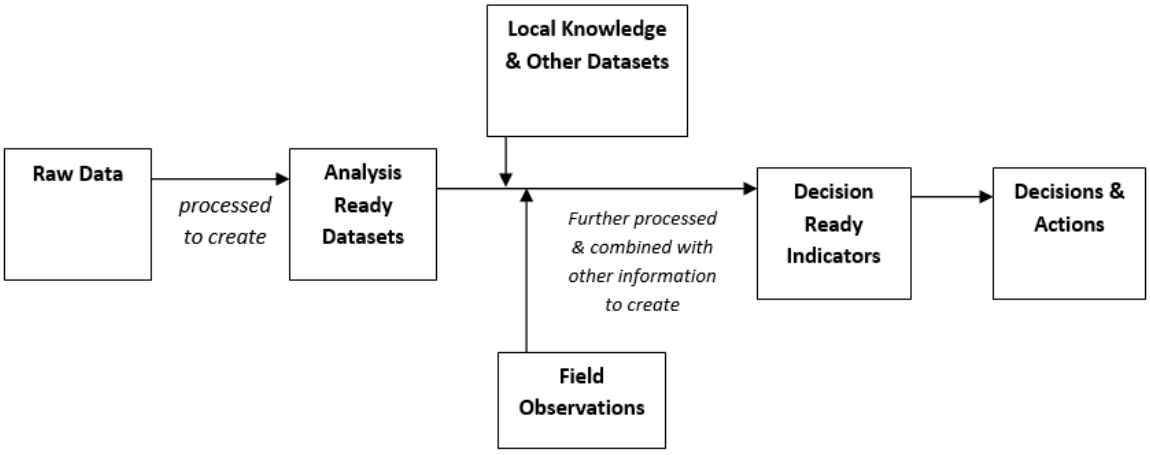


Figure 7. A simplified data refinement model from the OGC Disaster Pilot (source: OGC).

Analysis Ready Datasets (ARD) are processed data formatted for immediate use in GIS applications. They can be visualised, analysed, and combined with other information to aid Disaster Response Planners and Managers in decision-making. Mainly used by Data

Analysts, they are also accessible to planners and managers.

Decision Ready Indicators (DRI) are ARDs further processed into specific information that directly supports disaster-related decisions. Easy to understand and use, they help Disaster Response Planners, Managers, Field Responders, and the public without requiring specialised knowledge or software.

In summary, the concepts of ARD and DRI provide a framework for understanding how raw data can be transformed and refined into actionable information that meets the needs of various stakeholders involved in disaster response and climate resilience efforts. As illustrated in Milestone Document 2.1, different types of climate-related risk data—such as asset-level loss data, impact data, and information on hazard events—often require pre-processing to transition from raw data to formats that can be linked with other information.

Figure 8. The four types of geospatial data and how other data may require pre-processing (source: Milestone 2.1, SINTEF).

Additionally, data may need to be transformed to anonymize or aggregate information before it can be delivered to stakeholders, ensuring compliance with GDPR, protecting business sensitivities, and maintaining confidentiality. Consequently, data can be aggregated at various levels, such as along rivers, roads, administrative boundaries, regular grid cells, as shown in the other figure from M2.1[35]

Figure 9. Data aggregation techniques for asset-level data from the regions (source: Milestone 2.1, SINTEF).

3.3.3. Design principles for effective RDHs

To design a RDH effectively one needs to follow a set of design principles (they will be further explained in Chapter 5 of this deliverable). First, it is important to start small and scale gradually. Beginning with a limited set of use cases or data types helps to demonstrate value quickly, build trust among stakeholders, and reduce the risks of early failures. Once confidence and experience are built, the hub can expand in scope and complexity.

A second principle is to involve end-users, both public and private data contributors, from the beginning. Municipalities, regional authorities, insurers, and other stakeholders should actively participate in shaping the hub to ensure that it meets real needs and that data contributors see value in sharing their information.

Third, designers must prioritize usability and accessibility for municipalities. Since local governments are often at the frontline of climate adaptation and disaster risk reduction, the hub should provide simple tools, intuitive dashboards, and clear visualisations that can be understood by non-technical staff.

[35] Milestone 2_1.pdf (SINTEF)

Another crucial principle is to co-design with end-users, such as municipalities. This means developing the hub through continuous dialogue, testing prototypes together, and adjusting functions to reflect practical needs and institutional realities.

RDHs should also be built with modularity and flexibility, so that new types of data, tools, or user groups can be added over time without redesigning the whole system. This ensures that the hub can evolve as technology advances and as regional priorities change.

A further principle is to ensure legal compliance, especially with GDPR and rules around commercial sensitivity. Protecting personal data and respecting confidentiality is essential for maintaining trust with citizens, insurers, and other contributors.

Another key consideration is to plan for long-term operations and maintenance. A hub is not a one-off project but an ongoing service. This requires stable funding, clear governance, and well-defined roles for data stewardship, monitoring, and updates.

Finally, it is necessary to recognise the challenge of personnel limitations. Many municipalities lack funding, expertise, or staff who fully understand and can use climate and loss data. Therefore, investing in training, capacity building, and knowledge-sharing networks is essential to make the hub truly usable and impactful.

3.4. Barriers, enablers and strategic choices for RDH implementation

3.4.1. Barriers to developing and using RDHs

Different risk and needs

Natural catastrophes, climate risk, exposure and vulnerability, and type of adaptation measures, varies across regions and municipalities. And although these risks and adaptation challenges can be somewhat the same, each nation, region and municipality can differ in terms of culture, maturity and what data is needed or the enablers to obtain them.

In their report Rusdal & al (2019) point to the following important barriers in local work on climate adaptation: Lack of local expertise, insufficient administrative capacity, lack of risk and vulnerability analysis (RVA) and/or climate adaptation planning, uncertainty about climate projections, lack of division of responsibilities and/or coordination, lack of consideration of climate change in plans, routines and measures, and maintenance backlog and/or too low a standard in existing physical infrastructure.

Governments signal are too general

The municipalities point out that there are a large amount of government management signals in the area of climate adaptation, but that these are perceived as so general that it is difficult to translate these into a local context that provides a real management impulse. Actual local efforts are largely triggered by negative events; i.e. it is easier to get hasty rather than a precautionary strategy in climate adaptation (Rusdal & al, 2019).

Different challenges between larger and smaller cities

The barriers vary between larger and smaller cities. Larger cities normally have better economic funding, more resources and experts, which means better risk models and geo-informatic information (GIS). Which allows them to make better risk assessments and risk-

and vulnerability analysis for strategy and actions in climate adaptation work.

A growing and economically large risk due to climate change in larger cities is cloudburst and flash floods. A cloudburst is a sudden rainfall which can be quite unexpected, very abrupt, accompanied by hail and thunder. Larger cities built around a river can also have flash flood, which is sudden flooding that occurs when floodwaters rise rapidly with no warning within several hours of an intense rain. They often occur after heavy rainfall, usually from a storm. Insurance statistics show this insurance losses are the most costly (see figure 10 below under chapter 4, the Norwegian case).

Climate insurance protection gap

As climate-related disasters become more frequent and severe, the risk of abrupt economic and financial losses increases. Catastrophe insurance is a key tool to mitigate these losses, but insurance coverage is expected to decrease or become more expensive as a result of climate change (EIOPA, 2023).

Insurance penetration is the traditional indicator that reveals how developed the insurance market is in a particular economy. The penetration varies between all the countries in Europe. And due to differences on what climate-related perils is part of a NatCat insurance coverage makes it difficult to compare. EC has looked into the possibility of a more unified NatCat insurance system. However, this has shown challenges as each insurance scheme is different and based on national regulation. The insurance sector, via Insurance Europe has also pointed out a one-size-fits all solution is not optimal.

Complexity - time consuming

To develop a regional data hub is complex and time consuming as it requires the involvement of stakeholders and people from, and within, national, regions and municipality level. The experts involved will come from different fields of expertise, with different understanding and views. And can therefore take several years.

Lack of drivers

Politicians and staff experts often have different knowledge on climate change, with politicians, (with less knowledge), driven by short term period and other goals, and therefore not willing to prioritize risk reduction and adaptation measures over other services and demands from their inhabitants (voters).

Key questions

The key questions are, therefore, to identify and determine:

- what data is available and on what level (granular or aggregated)?
- what institutions/stakeholder need which (type of) data, and on what level?
- determine which data can be made openly available and which data are needed to be on a granular level (in a RDH)?
- whether the regional data hub should be tailor made for each region or, if on a national level, develop standards to enable replication in other countries or regions?
- how to improve data quality?
- how to use the data in planning work?
- legal matters regarding privacy and use of the data?

3.4.2. Enablers for RDH

The enablers for a RDH are several. Here are some of the main enables from our findings:

- Strong public-private partnerships (e.g. with insurance sector).
- You have a mandate. And it needs to include resources through the whole project.
- Behavioural characteristics: is not just about having a mandate: you have to care about it.
- Examples of success (e.g. Norwegian Knowledge Bank).
- EU-level support tools (Copernicus, RDH pilots).
- Local demand and engagement (SOTERIA pilots).
- Use of standards (e.g. INSPIRE, open data frameworks).

3.4.3. National or regional data hub?

Another question that came up during the dialogue with the regions is why a regional might be preferred over a national one. SOTERIA aims to work with regions and in some countries, regions possess a strong autonomy, with extensive, delegated power from the national legislation (e.g. Spain and Germany). However, this is not the case in many other countries. Updating national regulations and climate-related risk and loss data for each regional data hub in a country can be less effective, and time- and resource consuming. In contrast, a national data hub provides regions and municipalities with a coordinated set of systemized criteria. In Norway, as shown through the Norwegian case, a national data hub/platform was the most natural option as the focus was on sharing insurance loss data from the whole country with other data from public authorities. The decision on national or regional needs is within the regions, coordinated with the national authorities.

4. Case studies and lessons learned

4.1. Process leading to the Norwegian Knowledge Bank

- Overview of development phases (2010–2020).
- Multi-stakeholder collaboration: Finance Norway (insurance), national and local authorities.
- Legal and technical agreements for data sharing.
- Benefits and impact for planning and risk- and vulnerability analysis.
- Key lesson: Trust-building, institutional anchoring, and simplicity matter.

SOTERIA has in-depth knowledge from the process in Norway where the insurance industry initiated a multi-stakeholder cross-over collaboration between the insurance industry and national and local authorities. From this process a national data hub compiling public and insurance data was later established. The process is used as a reference in working with the regions. We see a pivotal and essential factor for success is the anchoring of the process, and knowledge from loss data.

4.1.1. Multi-stakeholders' collaboration

In 2010 Finance Norway initiated a collaboration with both national public bodies and local governments. The aim was building trust and agreement on a common understanding of climate risk and how the collaboration could pave the way for better new solutions and sharing knowledge and data.

- *Dialogue with the Municipalities - building trust and knowledge-sharing*

Finance Norway started a dialogue with several municipalities both directly and through their association, participating in workshops, seminars and their networks. Due to many court cases between insurance companies and municipalities on the liability for sewer back damages, it had become a mistrust between the parties.

The dialogue revealed that the municipalities had or did not collect any damage and loss data (due to flash floods and cloudburst), and that they needed the data to be on an *address level* to have real effect; showing the most vulnerable and (often) repetitive areas damaged (so-called "hotspots"). However, when asking, the answers from companies had been negative due to compliance with data protection law and also the business sensitivity factor. As the insurance penetration of property insurance is very high in Norway, the insurance companies collect an extensive amount of damage and loss data. A large amount of this data is provided further to Finance Norway/the insurance association, but on an aggregate level.

- *Different understanding / awareness caused the conflict*

The dialogue and change of data also revealed very different perceptions between the insurance sector and the municipalities on the amount and consequences of disaster and rise due to climate change. As they had a very different picture on the size of the "problem". This is shown by the figure below. The blue line is the insurance damages and loss data from sewage backup to properties, while the orange line is the information the municipalities had, which was based on damages paid by the municipalities. (Often due to subrogation from the insurance companies.)

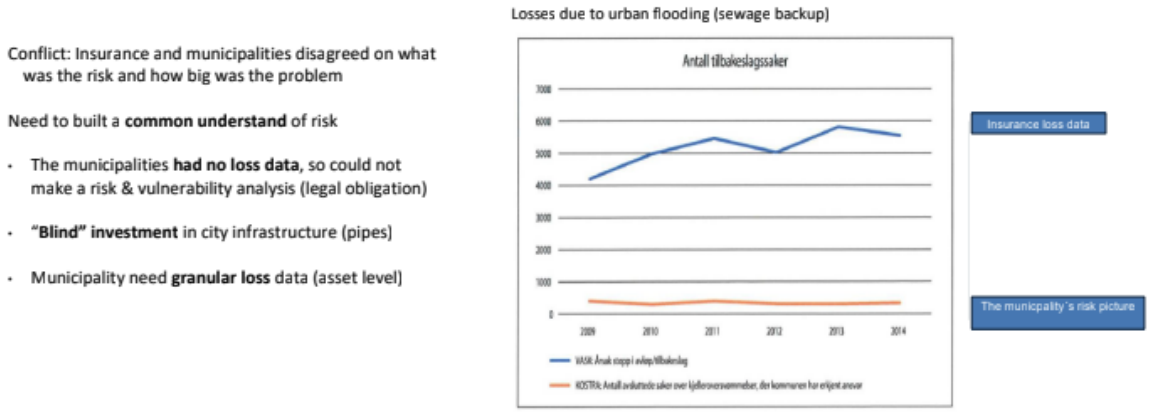


Figure 10. Losses due to urban flooding (sewage backup) (source: Finans Norge, 2024). The blue line indicates the increase in insurance loss data from sewer backup, while the orange line is what damage due to sewer backup is paid (and therefore known) by the water and sewage sector (municipalities).

- *The importance of granular insurance statistic*

From 2008 Finance Norway started to collect damage and loss data to properties (buildings)

from its members, caused by sewer backup and storm water (pluvial flooding), in comparison to only fluvial (river) flooding. This revealed that damages and losses due to pluvial flooding represented by far the largest insurance payouts. Also showing a clear increase due to more extreme cloudburst and flash floods.

OECD (2008) report on the "condition of infrastructure in Norway" found the main rise of the damages from sewer backup and storm water was due to insufficient maintenance and lack of capacity in water and sewage pipes. Which is a well known situation also in many European cities. The insurance industry has argued that since damages are often up to 100% compensated by the insurance companies, this has led to lack of incentive on the side of the municipalities to invest in upgrading the infrastructure.

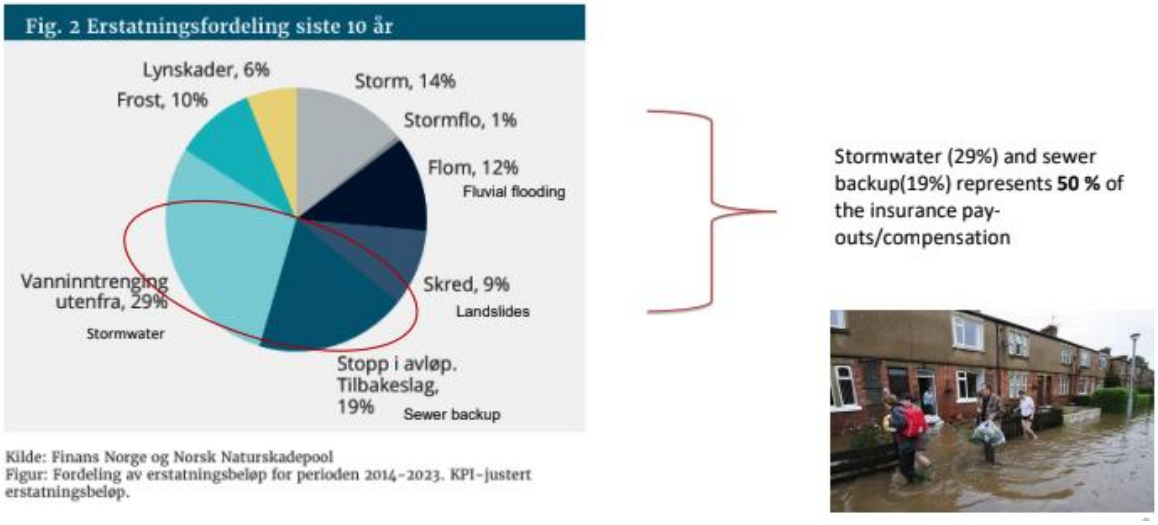


Figure 11. Climate-related insurance payouts 2014-2023 repartition in Norway (source: Finans Norge, 2024). Damage due to "urban flooding" (stormwater and sewer backup) represents around 50 % of the climate-related insurance payouts. Fluvial flooding payouts represent "only" 12 %.

The figure above shows the importance of *separating urban/pluvial and fluvial insurance losses.* Under Norwegian insurance compensation law urban flooding is not part of the natural peril scheme. Repetitive damage in the same locations, and questions of apportionment of liability, had also led to frustration among local policyholders and which escalated tensions between urban municipalities (in particular) and property insurance companies, amongst others the question on liability and who should bear the damage costs.

- *Mandate to CCA/DRR work*

The Non-life insurance executive board decided on a mandate, strongly driven by the awareness of the rise in claims.

The mandate given by the board included:

- Establishing of an insurance working committee on climate change adaptation and disaster risk with representatives from the insurance companies, who map how climate change affects the non-life insurance industry today and forward.
- Explore how the industry can contribute to the society becoming more resilient.

- Create a more constructive and positive dialogue with the municipalities through their representatives; The technical water association (Norsk Vann) and the Federation of Municipalities (KS).
- Establish a Nordic committee to share experience from the Nordic insurance industry and the challenge of the CC and make concrete suggestions to what action the industry can do to contribute.
- Establish dialogue with the relevant national and local authority and other relevant stakeholders for a more positive dialogue, and explore possible solutions.

Anchoring the mandate on the highest level; Non-life executive board, which consists of the CEOs of the largest insurance companies, - was an important factor for the later data-sharing and the establishment of the national data platform, the National Knowledge Bank.

4.1.2. Benefits for planning and risk- and vulnerability analysis.

Based on meetings and dialogue between the insurance committee and several municipalities, a pilot project was launched between Finance Norway and ten municipalities, (Brevik, R., Aall, C., & Rød, J. K., 2014).

The pilot was funded by the insurance companies (through Finance Norway's Non-life executive board) and funding from a Government project “Cities of the future” (Mikkola & al, 2016).

The pilot project demonstrated the data’s value for risk and vulnerability analysis. The municipalities provided feedback that the data can strengthen the knowledge base for prioritizing operations, maintenance, upgrades and new investments.

BEFORE
Picture from Oslo city data - “hot spots”- showing damage (vulnerable areas) on water & sewage infrastructure according to Oslo data

AFTER
Picture after importing 10 years of insurance loss data due to sewage backup

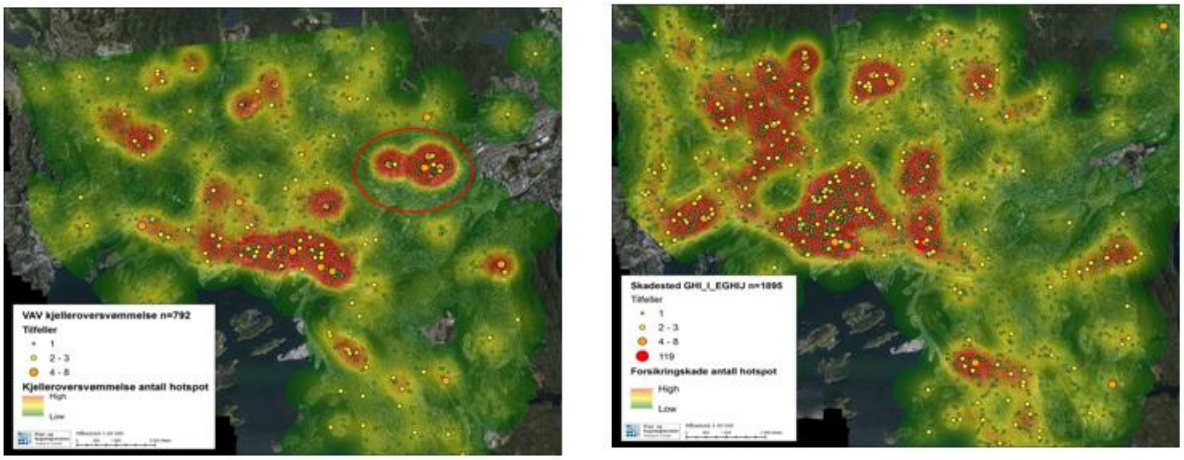


Figure 12. Comparison before/ after using insurance loss data to map vulnerable/"hot spots" for the Oslo city (source: UNDRR, 2019).

The figure 12 shows a map of Oslo city with “hot spots” (damage due to sewer backup)

collected by the city through local newspapers and information from the city fire brigade (left). The picture on the right shows the same type of damages from insurance over a period of 10 years.

Access to insurance loss data also strengthens important collaboration within the municipality, especially between the water/wastewater department and planning departments.

When presenting the results before the insurance companies, they were (still) reluctant to continue sharing the data on a more permanent scale due to the distortion of competition. The attitude on what it took to continue the process towards sharing data on a permanent basis was further explored (Hauge & al, 2018).

Through further dialogue and meetings, the insurance companies eventually agreed to share, but pointed out that the insurance data a) should be protected from competitors, b) all insurance companies should contribute, and c) it should not be traced back to customers.

- *More accurate flood-maps and following projects*

According to the Norwegian Water Resources Directorate (NVE), they will use the local insurance loss data to *calibrate the flood models* leveraging more accurate national flood maps used to prioritise local authorities' awareness, and investments in preventive measures.

The cooperation and projects on loss data sharing has inspired several other research projects aimed at incorporating information on exposure and vulnerable areas into public decision making, including a new initiative among the National Metrological Institute, municipalities and the insurance sector to combine local weather data with the local loss data for the purposes of improving *early warning* for inhabitants and identifying priority areas for emergency response (i.e. "first-at-risk") (OECD, 2016).

- *How to move from a pilot to a national data hub?*

In the first pilot project between the insurance industry and 10 municipalities, they got access to 10 years of loss data on address level to test the value of the data. The figure below shows which further questions needed to be decided on before developing a national data hub.

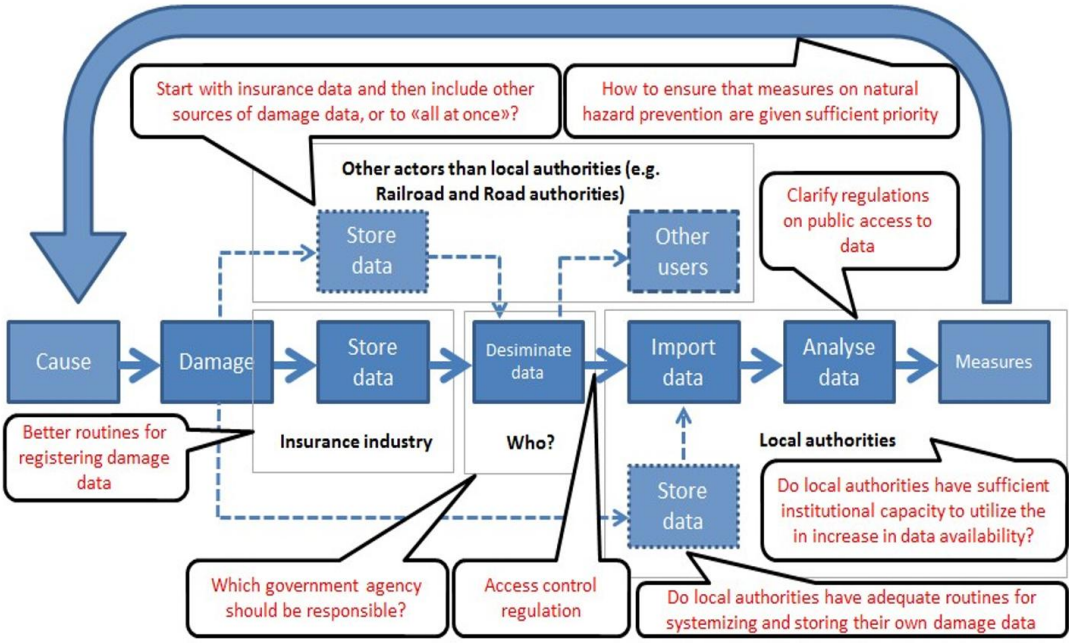


Figure 13. Questions needed to be considered to go from a pilot to a national data hub (source: Brevik & al, 2014).

4.1.3. Key lesson: Trust-building and institutional anchoring

- *Dialogue between the insurance industry and the national authorities*

Finance Norway also simultaneously invited relevant nation agencies to informal discussion. From 2010 regulator meetings were arranged by Finance Norway. This informal forum was represented by people with long experience and a high and trusted position within the institution, and anchored in the top management of the agencies. Which was an important success factor to move the process forward. The forum consisted of most of the relevant national agencies/directorate, including associations: the Norwegian Association of Local and Regional Authorities (KS), the Norwegian Directorate for Civil Protection (DSB), The Norwegian Environment directorate (MDIR), The Norwegian Water Resources and Energy Directorate (NVE), The Norwegian Water association (Norsk Vann), Norwegian Meteorological Institute (directorate), Finance Norway and representatives of the insurance industry.

- *The need of a holistic approach*

The dialogue led to agreeing on a need for a more holistic and coherent approach to climate change adaptation and disaster risk reduction, and was a strong motivator and anchoring forum for the establishment of a formal public forum in 2016, the Natural Hazard Forum[36]. The forum became the anchoring institution for the establishment of the national data platform (The Knowledge Bank). The forum is the most important collaborative arena between public bodies

[36] https://www.nve.no/naturfare/naturfareforum-samarbeid-for-aa-redusere-vaar-saarbarhet-for-naturfarehendelser/

for a unified knowledge base on natural hazards, and it involves broad collaboration to improve society's ability to handle natural hazards, and to identify deficiencies or potential for improvement in society's prevention and management of natural hazards and propose measures to address these. The Natural Hazard Forum initiates and implements projects in areas where there are particular cross-sectoral challenges. It is the national platform for the global framework for disaster reduction (Sendai Framework).

- *Taking part in EU dialogue in CCA strategy*

Based on this cooperation and dialogue, Finance Norway (on behalf of its insurance members), were invited by the Civil Protection agency and the Environmental Agency to attend meetings, committees and conferences under the auspices of the EU Commission and UNDRR Europe. Finance Norway was also part of the private stakeholders working with DG CLIMA in their evaluation process to the EU climate adaptation strategy of 2021.

- *Legal and technical agreements for data sharing.*

The Knowledge Bank was established in 2020, based on a decade-long process which included dialogues and political decisions. It is run by the National civil protection directorate (DSB). In 2021 a provision under the Civil Protection act § 15a was implemented, giving DSB the right to collect, compile and share loss data from insurance companies[37].

The Norwegian provision and the interpretation done by the Ministry of Justice can act as a fundament for replication to other EU/EEA member states being an EU regulation General Data Protection Regulation[38] implemented in all member states. During the projects when data was shared for testing, a personal data agreement between Finance Norway (collecting the data from its members) and the municipalities receiving the insurance data needed to be established. As a part of developing the Knowledge Bank (2017-2020), 10 years of damage and loss data were shared with The Norwegian Directorate for Civil Protection (DSB). This also required a personal data agreement.

Finance Norway also needed an exemption from both the financial and the personal data regulation, which was permitted by, respectfully, the Norwegian Data Protection Authority and the Financial Supervisory Authority of Norway. The insurance data was not considered “sensitive” under the data protection act. Norway is the first European country to analyse the value of insurance loss data in municipal planning and in risk- and vulnerability assessment.

4.2. SOTERIA Pilots regions

4.2.1. Regions climate-related risk and insurance penetration

4.2.1.1. Economic impact and insurance penetration

The economic impact of climate-related extremes and how much of the economic losses are insured, varies considerably across European countries. Which is also the case within the regions we have evaluated, Valencia, Gabrovo and West-Athens, and within its municipalities.

[37] https://lovdata.no/dokument/NL/lov/2010-06-25-45/KAPITTEL_5#%C2%A715
[38] https://eur-lex.europa.eu/eli/reg/2016/679/oj/eng

They also face various risks due to geographic location, difference in economic cost, type of natural catastrophic compensation schemes, maturity of national strategies and plans for climate adaptation, and in implementation of EU regulations on climate adaptation and disaster risk reduction.

However, our findings have shown some common barriers in the three regions for the establishing of a well-functioning regions database: low penetration of insurance, lack of funding, lack of resources and expertise, little or no access to granular data, and difficulties in funding. Statistics from the European Environment Agency (EEA)[39] show that weather- and climate-related extremes caused economic losses of assets estimated at EUR 738 billion during 1980 - 2023 in the European Union, broken down into each country.

Insurance penetration - the protection gap

Natural catastrophes across Europe are becoming more frequent and damaging due to climate change, putting uninsured households at risk of significant losses from extreme weather events. At the same time, according to EIOPA's statistics from their dashboard[40] on the insurance protection gap, only about a quarter of the losses stemming from natural catastrophes have been insured on the continent in recent decades.

Insurance penetration means how much of the economic losses are covered by private insurance. Insurance penetration is essential for how much information and insurance loss data that can be shared, collected and used from the private insurance companies in climate adaptation. For Greece and Bulgaria with penetration around 5-10 % on insurance, (depending on which insurance product) loss and damage data would need to (also) be collected from other sources in a regional data hub.

Mistrust to the insurance industry is a well-known challenge. This could stem from policyholders' bad experiences, misunderstandings regarding the inclusions and exemptions of the insurance contracts offered, or other factors, negatively affecting demand for insurance products and services. Another factor that may contribute to customer's mistrust are the difficulties in comparing insurance products (EC, 2024).

In Spain the insurance penetration is higher and benefits as all NatCat losses insured are compiled by the public insurance company Consorcio de Compensación de Seguros' (CCS). Due to low insurance penetration of property insurance in Bulgaria and Greece, damage and loss data would need to be collected from other (public) sources.

4.2.1.2. Mandatory, law-based NatCat cover.

In France, Spain, Norway and Switzerland, natural catastrophe insurance has long been regulated by law. In Norway and Switzerland private insurers are organised in a national pool, enabling a balanced risk distribution and efficient access to the global reinsurance market. This allows for uniform and affordable premiums for all insured parties. This type of mandatory scheme, normally the NatCat insurance cover being automatically included under the fire insurance, allows for compiling of NatCat damage and loss data.

[39] Economic losses from weather- and climate-related extremes in Europe | European Environment Agency's home page

[40] https://www.eiopa.europa.eu/eiopas-dashboard-identifies-european-natural-catastrophe-insurance-protection-gap-2022-12-05_en

In response to the increasing frequency and severity of natural disasters, Italy is now introducing a mandatory insurance requirement for businesses. From 1 October 2025 (or 1 January 2026 for smaller companies with annual revenues below EUR 10 million), companies in Italy will be required to insure themselves against the following risks: earthquakes, floods, Landslides., high water levels and overflow of reservoirs (Verlingue, 2025).

In Greece a new law came into effect on 1 June 2025 requiring companies with an annual gross revenue of over €2m to purchase insurance against natural disasters (Bernitsas Law, 2024). The types of natural disasters covered are forest fires, floods and earthquakes. The Law imposes an obligation that the compulsory insurance must cover damage to property assets of the company, including privately owned buildings; equipment; raw materials and goods; trucks and vehicles for commercial use; means of production; and stored products; and at least 70% of the value of all the above assets.

This means that the insurance companies in these countries will compile important data for a RDH.

4.2.2. Valencia

The Valencian region is located in the Mediterranean basin and is a hot-spot of climate change, with projections of increasing temperatures together, more hot- and fewer cold-extreme temperatures, precipitation decreases, increasing storm severity, evaporation increases and large declines in riverine runoff. Maintaining ecosystem quality in protected areas like the Marjal wetland is considered one of the main pillars in the regional adaptation strategy as they provide high resilience and capacity to supply environmental services in the context of climate change.

- Main findings/feedback through dialogue and use of questionnaires to map the need of data and developing a regional data hub (RDH).

Climate adaptation plan

The Valencian Community has developed a robust adaptation legal framework. The Valencian Integrated Energy and Climate Change Plan (PVIECC 2030) is the integrated and cross-cutting instrument for the management and planning of sectoral objectives and specific actions that will be developed to respond to the adaptation and mitigation objectives of climate change established in Law 6/2022, of December 5, on climate change and ecological transition of the Valencian Community. This plan aims to achieve an orderly transition towards a resilient and carbon-neutral social, economic, and environmental model, based on a renewable, efficient, decentralized, and multilateral energy system, thanks to the commitment and action of Valencian society as a whole.

Barrier

The main barriers to carry out the different actions are related with the availability of resources both economic and human resources, and to implement them. This applies at regional level, but also at local level.

Agreeing on a Regional data hub

The Valencia regions have through several workshops with representatives from the Generalitat Valenciana (GVA), the Confederación Hidrográfica del Júcar (CHJ), NGOs and industry participants *agree*d on the need for a *unified platform* that could integrate and

consolidate all existing climate related risk data sources in the region including those from PATRICOVA, coastal and marine platforms, and confederation data.

A main point is access to data on a *granular level*. Current available loss data is aggregated at a postal code level, which lacks the precision required to inform specific, *asset-level adaptation and disaster risk management plans*. There is a need for data that captures losses at a more granular scale to better support municipal adaptation planning and resilience measures.

Proposed structure for the Regional Data Hub (RDH)

To address the identified needs, the current proposal focuses on integrating available loss data into existing platforms rather than creating a new one. The goal is to provide unified access to relevant information.

- Focus on flood data as an initial step: Given the availability of flood-related data from the Consorcio de Compensación de Seguros (CCS) and the regional flood risk data from PATRICOVA, the current approach will focus on these datasets as a starting point.
- Integrated visual platform (GVA Cartographic Viewer): The idea is to expand the GVA Cartographic Viewer by incorporating layers for CCS loss data and PATRICOVA flood risk data.
- Potential for future integration: While we are focusing on flood data now, we aim to include other risks, such as fire, in the future. Key stakeholders and actors

Data Providers:

- National level:
    - Consorcio de Compensación de Seguros (CCS) shares data on insured assets and estimated damage by postal code and risk category. Their willingness to integrate *more granular loss data with regional platforms will be essential for the RDH.*
    - Sistema Nacional de Cartografía de Zonas Inundables (SNCZI) offers national flood-prone zone data, which would complement local and regional risk maps.
- Regional level: PATRICOVA (Plan de Acción Territorial sobre el Riesgo de Inundación) manages flood risk assessments and data at the regional level.
- Administrative oversight:
    - Consellería de Medio Ambiente, Infraestructuras y Territorio (Ministry of Environment, Infrastructure, and Territory)
    - Dirección General de Urbanismo, Paisaje y Evaluación Ambiental (General Direction of Urban Planning, Landscape, and Environmental Assessment)
    - Jefa del Servicio de Gestión de Riesgos en el territorio (Head of the Risk Management Service in the territory)

Platform Host:

- Generalitat Valenciana (GVA) Cartographic Viewer: Serves as the platform for visualizing GVA data layers, making it a suitable candidate for housing the RDH information. The GVA would oversee the integration and management of the data within this platform.
- Administrative Oversight: Consellería de Medio Ambiente, Infraestructuras y Territorio (Ministry of Environment, Infrastructure, and Territory), and Instituto de Cartografía

(Cartography Institute).

End Users:

- Local Municipalities: Their data needs and legal requirements, especially regarding municipal adaptation plans, would guide the RDH's structure.
- Constraints: Organizing workshops and discussions is complicated by limited time and resources particularly within public institutions. This shortage hampers efforts to engage stakeholders effectively. Also, Coastal/Ecosystem Management Entities and River Basin Authority is mentioned.

Adaptation plans would guide the RDH's structure.

Identified barriers to data integration.

- Fragmented data sources: There are various existing platforms, and the idea of creating a new one does not seem to be the best option. Instead, the focus should be on *integrating data from these different platforms into a single, user-friendly interface*. However, this presents a significant challenge, as it involves coordinating data from various entities that operate at different administrative levels.
- Institutional collaboration challenges: While there is a shared understanding of the benefits of an integrated platform, further coordination is necessary.
- Data accessibility issues: Accessing comprehensive loss data from the Consorcio de Compensación de Seguros (CCS) poses challenges, particularly regarding asset-level information. Currently, the CCS indicates it lacks access to detailed data across all regions. It is essential to clarify whether this is due to the claim process or not. If this is the case we may need to contact private insurance or to the insurance association UNESPA.
- To better understand their data usage and specific requirements, a questionnaire was circulated in February 2025 to GVA and municipal representatives. This questionnaire provides insights into their interest in such a platform, the platforms they currently use, the data they need, and the barriers they face.

Conclusion and next steps

The Valencia region/CS are the most "mature" region with strong and clear adaptation strategies, and action plans for CCA and DRR. They have during SOTERIA built a multi-crossover cooperation with a broad group of relevant stakeholders, including with the private industry. Separate meetings have been arranged with Consorcio de Compensación de Seguros (CCS), with the goal to include data on insured assets and estimated damage. Their willingness to integrate more granular loss data with regional platforms will be essential for the RDH. However, this would need data protection agreements, or new regulation for permanent basis similar to what has been done in Norway (see chapter 4 and Annex IV).

The Valencia region/GVA together with the SOTERIA/CL team have identified an overview on existing data, barriers and how to approach a development of a RDH. Their focus, based on their dialogue with various relevant actors, is to integrate available loss data into *existing platforms* rather than creating a new one, with the goal to provide unified access to relevant information. As to design, the platforms and information available in Spain and in the Valencian region have been identified. CCS has shared data and it is willing to share more information on loss data to explore including this data in the Cartographic Viewer of the Generalitat (Valencian Infrastructure of Spatial Data (IDEV)).

4.2.3. Gabrovo

In the municipality of Gabrovo, the main threats due to climate change are flash floods/cloudburst, flooding, storm, drought with electricity disruption, and new invasive species in the forests and agricultural lands in the area.

- Main findings through dialogue, meeting and use of questionnaires to map the need of data and developing a regional data hub (RDH).

Climate adaptation strategy

The Municipality of Gabrovo has adopted a Plan for Integrated Development of the Municipality of Gabrovo, with analysis of the economic, social and ecological situation, needs and potentials for development has been prepared for the territory of the entire municipality of Gabrovo.

Barriers

The main obstacles are related to actively involving all interested parties. Tracking and control of the planned activities, update of plans, good material security and political uncertainty at the national level. There is data, but *data is not systematized in detail, according to the needs of the region or specifically of the populated place*. And that this is a problem on both regional and national level. The municipalities are after an event obliged to *collect damage data* from households affected due to natural hazard events. This data is shared with the General Directorate on Civil Protection (in the Ministry of Interior) who is serving as a Secretariat for the Internal Institutional Commission on compensation and support under the Council of Ministers. There is some uncertainty on how the data is used, or if it is shared as the answer in the questionnaire was that data sharing is extremely limited at the institutional level.

According to Gabrovo municipality, their private company in charge of water management does not share information on their investment intentions to improve and expand the technical infrastructure. This issue is further compounded by the absence of strategic development documents from these companies.

The municipality of Gabrovo has proactively allocated budget funds to mitigate damage from natural disasters, but for this approach to be effective, *it requires clear normative regulation at the state level.* Additionally, attention should be given to the regional administration as a key implementer of state policy.

Agreeing on further steps towards a data hub

Gabrovo municipality has, under the SOTERIA project, had several meetings. In May 2025 SOTERIA, together with the SOTERIA team in Gabrovo, arranged a large workshop with a large number of participants, from both internally and externally.

Gabrovo municipality:

- The Mayor, Sustainable Development Department, Regional Fire Department and Civil Protection, Regional Forestry Department, GIS (GeoInformaticSystem), Municipal assets and economic development, Budget and finance unit at municipality, Landscape Architect (Green and Blue Infrastructure).

External participant:

- Technical University Department of Mathematics, Informatics and Natural Sciences,

Deputy Mayor of Economics, Village mayor, senior expert of municipal assets, Regional Agriculture Department, Senior expert, Environment at the Regional Governor's Office.

SOTERIA partners:

- BehaviorSMART and Climate Change Advisory (CRA).

Main take-outs from discussions and next step

- Information and data exist both internally and externally, coming from different sources depending on the roles of the different stakeholders.
- Several steps are needed to reach the goal of establishing a regional data hub. One is to develop a quality digital model of the terrain.
- What exists on a national level is of poor quality and on an aggregate level.
- Access to data at the address level is the key to making relevant decisions related to investments and real lowering of the risk.
- Part of the process will involve understanding what is available at the municipality level, and what can be advanced further, especially given that several EU projects relate to this kind of effort.
- Funding to reach the goal of a regional data hub should be an achievable scope.

Conclusion and next step

A municipality data hub: Gabrovo municipality has built up a strong multi, cross-over cooperation both within the municipality and with relevant external stakeholders. This has given them improved knowledge on who has what type of climate related risk and loss data that could be part of a data hub. The process is *strongly anchored with the Mayor*, with strong vision and adaptation strategies, and with funding for further work towards a common data hub. The municipality believes the most effective approach for compiling and using data for better decisions on CCA and DDR is to develop *a municipality data hub*. This process would (from our knowledge) be the first in Bulgaria, and a best practice and lesson-learned to other municipalities, and giving basis for scaling up to a regional data hub at a later stage.

Other relevant meetings

SOTERIA also met with people with long experience from The Ministry of Environment and Water, the University of Sofia and the insurance companies.

1. Meeting with Boryana Kamenova, Director of the Climate Policy Directorate of the *Ministry of Environment and Water* until 2024, and Assoc. Prof. Stelian Dimitrov, PhD. Head of Geospatial Systems and Technologies Dept., *Sofia University*

According to Prof. SD, the main problem in Bulgaria is *flash floods*. The university is involved in projects for the Government mapping flash floods with drones and lasers after an event (e.g. in cities of Karlovo and Tsarevo). Similar mapping is also done 2 years after the events to map where and what infrastructure is built up. These maps are publicly available in 3D images, sufficient resolution (5 cm). As to the question on a *data platform,* the leading role should be taken by the Association of Municipalities, and categorized depending on exposure,

and type of adaptation measures undertaken, and in collaboration with scientists. The data platform/hub could be used for priority ranking of planned projects depending on identified hot spots and usefulness, including as a decision-making system on adaptation activities in municipalities. As next step, it was suggested to:

- Clarify to what extent a national or regional data hub is compatible or similar, and can use findings from the World Bank support to Bulgaria in Collecting Catastrophe Data, Developing National Risk Management Plan including collection of historical damage and loss data and development of concept for future collection.
- Explore if the drones' maps are compatible with existing Flood risk and Hazard Maps, risk profiles, Landslide maps (Ministry of Regional Development and Urban Planning) – especially on resolution and granularity of data.
- How the information will be updated and uploaded, operators on the spot, or centralized.
- Decided on, if such a data hub already exists, who will be the owner and who will work with it in the municipalities.
- A hindrance for development mentioned was corruption amongst politicians and trying to change results from research.

2. The meeting with the *Bulgarian Association of Insurers (ABI)* and its insurance members took place in May 2025. Natural catastrophes (NatCat) cover is included in the property insurance, and normally the premium being based on the risk of damage and loss. The companies use historical loss data and flood models to set the premium; however, the company *can reject offering Natcat cover* if they consider the risk of damage to be too high, due to repeated occurrences or flood maps indicating the property is being exposed in floods/in flood prone areas. The EU taxonomy is one of the strongest drivers for sharing insurance loss data. However, as the penetration of property insurance in Bulgaria is low (between 7-10%) the insurance loss data would need, to be more effectful, be compiled with other public loss and damage data. A possibility of cooperating with Gabrovo municipality was set as a possible outcome.

4.2.4. West Athens

West Athens (WA) region, with the municipalities Agia Varvara, Agii Anargiroi-Kamatero, Egaleo, Ilio, Korydalos, Peristeri, Petroupoli, Fyli, Chaidari, is a Functional Urban Area of the Attica Metropolitan Area (AMA), with major and chronic problems of poverty, social inequalities and marginalization.

- Findings through dialogue and use of questionnaires to map the need of data to develop a regional data hub (RDH).

Climate adaptation strategy

Neither the WA region nor the municipalities has implemented an adaptation strategy in accordance with the EU climate law (Said to be included in 2024).

As to types of climate-related risk and loss data the WA-regions used "risk data from severe or extreme weather events related mainly to rainfall, snowfall, forest fires, earthquakes as well as air pollution and soil contamination data". Based on these they try to identify and map out a vulnerability assessment of each area of the municipality.

They stressed the importance of *more detailed climate data* on both the municipal and regional

unit levels.

Barrier

WA further pointed out that a *lack of concise urban* planning with large “illegal” construction areas, and that urban fabric also exacerbate the impacts of climate extremes such as urban flooding and peri-urban wildfires. Flood protection of WA is the most deficient in the AMA-area, including lack of free spaces for public infrastructure, high air pollution, heatwave and drought.

The municipalities have the mandate to conduct field inspections on impacted private properties and public sector buildings. The data are collected and stored in the respective municipal records and transmitted to the regional and national authorities. Data for statistical related indicators can be obtained from the Hellenic Statistical service. However, “*data sharing is extremely limited at the cross-municipal level”.*

WA-regions also expressed a lack of, or insufficient expertise in the municipalities to be able to carry out the assessments as a main barrier.

Actors for developing a regional data hub

The WA region description of actors in a regional data hub: Association for the Development of West Athens (ASDA), West-Athens Municipalities, NCSRD, Region of Attica, NOA could be considered as sufficient for establishing a regional data hub. These actors were mentioned as “they possess the majority of the existing climate data sources to cover the existing information needed for the scope of the WA regional data hub”. They also believe the GSCP, Insurance Companies and Hellenic Association of Insurance Companies could be potentially included as stakeholders.

WA believes the data hub should be of regional scope and with a flexible structure to collect, process and disseminate data. In terms of practical stakeholder engagement, interaction by the stakeholder and potentially vulnerable groups, and other communities, it is easier to aim for smaller scale scope.

Conclusion and next step

However, the suggestion to establish a RDH did not reflect the priorities or needs discussed during the dialogue sessions or was captured through the questionnaires provided to the WA pilot. Additionally, there was limited involvement from the Case Leader (CL), which made it more challenging to conceptualize a context-relevant RDH. Ultimately, the selected RDH was focused on heatwaves using open-source data. This was not aligned with the expectations or inputs gathered throughout the process of this subtask. Therefore, it is unclear what are the further developments of a RDH.

The WA has built relations with its municipalities to improve knowledge on existing data, and what data is needed to develop as RDH. The feedback showed that they lack implementation of EU framework and climate adaptation strategy and that this is considered as a hindrance, as the framework is a pivotal document for progressing. Also, the work and needs described in the dialogue with and questionnaires to the WA pilot was not reflected or used in the RDH, chosen by the Case Leader (CL). Which was a RDH for heatwave using open-source data.

5. Recommendations and conclusions

5.1. Strategic and policy recommendations

EU level

At EU level there must be a clear overarching political strategy preferably followed by legal frameworks that supports a more coherent and holistic approach to CCA and DRR, which include guidelines on sharing climate-related risk and loss data through a data hub. Sendai Framework for DDR, the Paris agreement/The Warsaw International Mechanism for Loss and Damage, SDG 2030 and EU Green Deal all give the mandate of better use of data to leverage resilience.

The GreenData4All-initiative, with the aim to enable greater sharing of data between the public & private sectors, should include a strategy, plan and recommendations for establishing a data hub in the forthcoming work and mandate.

Policy recommendations must build on best practice from data sharing projects, with lessons learned on how a RDH brings more awareness to socio-economic consequence, more accurate risk assessments, better ground for decision-makers and ultimately a more resilient society.

Knowledge and lessons learned must reach politicians (on all levels) and the political budgets to enable more funding and resources to execute CCA plans and strategies.

Leading role

To make recommendations on the question on who should take the lead in the process, should take guidance in the role and responsibility of the (public) institution, normally defined in national regulation. Either the choice is a regional or national data hub.

From SOTERIA findings the regional (or national) agency of civil protection has the overarching role of understanding disaster risk and collecting data for reporting (e.g. under the Sendai framework), and would be a natural choice to govern a data hub. To include climate-related risk data they need to work in close cooperation with the climate and environment agency. We recommend from the start to include experts in social economy for enabling the short and long-term economic benefits by establishing a RDH, and how it economically will contribute to more resilience and justice to the society.

Dialogue with relevant stakeholder

Identifying and mapping the barriers and opportunities through dialogue with relevant actors, forms the basis for a RDH. This includes public, private entities (SMEs, business and property owners), finance /insurance, academies, NGOs and voluntary organisations.

Input, suggestions and ideas compiled through this dialogue process, including lessons learned from best practice, will create ground for the establishment of a working/project group with a clear mandate to come up with a concept for a RDH.

Insurance data

The insurance industry, (e.g. through their association) should be included in the early face of

the project as their data is comprehensive and reliable showing the economist cost, the cause, occurrence, place and date of the damage. If insurance penetration is low, the group must identify, and involve the institutions/authority which collects damage and loss data and/or compensate the loss after disaster events.

Anchoring

Anchoring the work (concept, process, strategy, goals, action plans, timeline and resources) with the top (also political) management/board is absolutely essential.

Monitor and evaluation

To establish a regional or national data hub, with cross-over cooperation from both private and public stakeholders, identify needs and data, takes time. And resources. It requires strong leadership, political willingness, structure, resources, patience, trust and motivation from all the stakeholders involved. It is a continuing learning process that needs continuous monitoring and evaluating during the process.

5.2. Technical and operational recommendations

Map data needs, availability and quality

Findings from dialogue, meetings and questionnaires with the Valencia region and municipality of Gabrovo, show they need and will take different approaches to a RDH. Valencia has decided to use an existing data platform whereas Gabrovo municipality decided to start with making a municipality data hub. In Norway a national data hub was the most natural choice.

On the one hand, technology can be a great asset to enhancing a regional or local government's ability to be efficient and effective. On the other hand, too much data can lead to data surplus, failing to provide decision makers with the information they need. In both scenarios, before choosing the technical and operational part some mail questions needs to be decided:

1. Who needs what type of data, and on what level, and why?
2. Who has the data, can they share it (availability)?
3. How will or should the data be collected, stored, shared/disseminated (raw data or standardised)?
4. Which data will have what type of benefits/effects, and how will a RDH influence the decision makers?
5. How to balance data with community input in the decision-making process.
6. How do you include future projections/climate scenarios?

Design

The architecture, design and practical implementation of the RDH will largely depend on the answer to these questions, including the size and complexity.

Findings from Valencia, Gabrovo and West-Athens show that the availability and quality of climate-related risk and loss data vary significantly. However, the aim should be high spatial and temporal granularity, regularly updated and available in standardised formats.

Flexibility and testing

The RDH should have a flexible structure enabling it to scale up enlarging/include add-on data

being collected, processed and disseminated. E.g. data from NbS and climate predictions. Testing to identify the ability of external computer systems or software to exchange and make use of information (interoperability). Ontologies can help structure and organise data effectively, and testing data and functionalities is essential to ensure they meet the needs of the regions and municipalities.

5.3. Regulatory framework and guidelines

Regulatory framework

The regulatory framework can be a barrier for sharing granular/asset level. This barrier has been identified as one of the main barriers for data sharing, as the clear condition by the municipalities to be able to identify risks, vulnerable areas, and make risk assessment, is that historical and impact (damage and loss) data needs to be on asset level. The regulatory framework regulating these data is personal data protection law (GDPR - General Data Protection Regulation), and the financial/insurance regulation on data and data sharing. In the pre-face process up to the establishment of a RDH it is necessary to use personal data agreement between the provider of the data (insurance companies) and the receiver of the data (the RDH).

For a permanent RDH solution new regulation should be established), giving the institution that governs the RDH the legal right to collect, compile, store and share the data. As Norway introduced new regulations to meet these barriers, these can lead as guidelines and/or for replication to other member states/ (Please see Annex I for more information).

Guidelines and business sensitivity

To follow up the regulation, national authorities should make guidelines on how regional and local authorities can cooperate, coordinate and compile CCA and DRR data. The guidelines should also include a road map for the establishing of a regional data hub, including the need for flexible solutions to be able to include other data, like nature-related data from nature-based solutions.

The insurance sector has strongly pointed out the need to respect the business sensitivity of the data. Other companies have argued that the data is less sensitive with new technology and impact and weather data, giving much of the risk information needed to take action. This needs in any case to be considered and agreed upon during the process.

5.4. Capacity building and partnership actions

The capacity building should be demand-driven in conjunction with the partners from dialogue, and the pilot projects. The end-users of the data hub data (e.g. local municipalities) should be part of pilot projects early in the process.

Each actor must clearly communicate their needs, benefits (motivation) and hindrance in collecting and sharing data or receiving data in a RDH.

Each actor must define what will be their role and responsibility in the process and in the RDH. And what solutions on how to deal with the difference in needs.

Trust building

Building trust is a crucial part in these types of multi-crossover projects which involve people with different cultures, backgrounds, skills and mandates. This requires good leadership with building up a good atmosphere and trust over time, respecting and seeing the positivity in the differences.

New routines would most likely have to be developed, including new skills and resources at the regional and local level to be able to implement the data from the RDH into their own IT/digital systems and maps/GIS, and to nudge and use them for various purposes and in decision making.

5.5. Conclusion

Capacity-building is at the core of establishing a national or regional data hub. This has long been recognized as one of the means of implementation for the achievement of sustainable development. And it is anchored in SDG 17. It is also pointed out as the main barriers through the SOTERIA dialogue with, and feedback in questionnaires to the regions and their municipalities.

To make smart, better and more cost-effective decisions in renewal projects in regional and municipal planning, knowledge about the causes and consequences of past events is vital. Experience from sharing of granular insurance and public impact and loss data, where the data is incorporated and attached to a unique location on maps (GIS), has shown to be highly valuable for risk assessment and to identify vulnerable areas. The data also gives awareness about the climate-related economic costs. In addition to analysing current climate conditions, GIS can also be used to model future climate scenarios. By inputting, in coherence with loss data, different variables such as greenhouse gas emissions and land use changes, regions and municipalities can simulate how the climate may change over time, and the future rise in loss and damage. Broken down to each region.

In several cases, data from individual incidents has been collected by municipalities, as a basis for projects, but there are currently *no routines for systematically collecting* information from damages.

A key question is to identify which climate related risk and loss data could be made openly available in a data hub, and to determine whether the regional data hub should be tailor made for each region, in comparison to using standards to enable replication to other countries and regions. A tailor made has the drawback of being less replicable, but the benefit of fitting the defined needs of the actors involved.

Several of the pilots point out they need access to *data on a granular leve*l as current available loss data is aggregated and thereby lacks the precision required to inform specific, asset-level adaptation and disaster risk management plans giving better support to the municipal adaptation planning and resilience measures. The insurance companies have the most precise and qualitative (real time) damage and loss data, but sharing on asset level triggers *data protection agreement* or *new regulation*. Where insurance penetration is low, data from public authorities is needed, thus accessibility from national sources are scattered on various platforms and needs to be coordinated.

Insurance penetration varies immensely across the SOTERIA pilot regions/countries. The

increase in climate-related risks and natural catastrophes and need of better data for adaptation are, however, much the same. In sum, what represents the main factors to success is many: culture, political will, (geo/GIS-) technical and cross-over cooperation “maturity”, trust in politicians and systems, corruption, socio-economy **development level**, structure and organisation, and data availability. These are all factors one needs to be aware of and reflect on in the process and development of a RDH.

Outlook for the future

The use of European services, tools and platforms, e.g. the EU Risk Data Hub and CLIMADA, by regions and local authorities in CCA and DRR seem to be spare or not fully exploited. The potential to leverage the use and benefits by regions and local governments of (the data) from these tools and platforms, and how they could be integrated into national and regional data hubs, should be further explored and evaluated.

To split (and share) insurance or publicly available data from pluvial and fluvial flooding, is of great importance. As we have learned from the Norwegian case, 50% of the insurance payouts was due to pluvial flooding, while only 12% to fluvial. As more than 70% (an increasing) of the population live in cities, this data is essential in city planning and resilience work.

Furthermore, a long-term goal should be to explore the possibility, benefits and barriers to include ecological and other climate-related risk data in a RDH, e.g. data from nature-based solutions (NbS). NbS solutions are on the rise, being a vital part of natural processes and ecosystems to solve social, economic or environmental challenges with a positive impact on biodiversity. ESG considerations are gaining traction in businesses and in the financial services, influencing government action although not all hazards and risks are covered. A more coherent and systemic risk perspective is needed, where it should be explored if and how data from a national and/or regional data hub can contribute positively to corporate sustainable reporting (CSRD) and the EU taxonomy, and possibly a part of the framework for developing ESG-related stress testing methodologies and standards across the EU’s financial system.

Good and reliable information on economic loss data compiled through this type of data hub has revealed the need, but also the willingness to increase public and private investment and funding in climate adaptation and disaster risk reduction measures. Cohesion policy plays an important role in targeting investments to promote a transition to a more resilient environment and cooperation mechanisms among regions facing the same risks. The effect of national or regional data hubs could therefore play an important role in the goal of increasing (both public and private) investments in climate change adaptation and disaster risk prevention, and should be further explored.

Findings from SOTERIA could be useful for the EU GreenData4All-initiative mandate to establish rules on environmental geospatial data and public access to environmental information. Knowledge from these data hubs, e.g. similar to the Norwegian Knowledge Bank, could contribute to the aim of full benefits of data sharing for data-driven innovation and evidence-based decisions.

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ANNEXES

ANNEX I. Literature on stakeholders' barriers and drivers to CCA which may be relevant

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Navigating Data in Local Government Decision Making. Answering the questions of what, why, and how data collection and analysis can best serve your community. By Pooja Bachani Di Giovanna and Almis Udrys | Feb 01, 2024 | PM Magazine – Article. Link

ANNEX II: Relevant literature identified in the previous v.1 of the milestone document

Using Data for Decision-Making: Data on the Ground – Applications and Outcomes (Selkirk collage, Canada 2023 newsletter). Link

While climate and environmental issues have received greater attention in recent years, addressing the socio-economic consequences of climate change remains essential. We must maximise the social and economic opportunities of climate action, while minimising and managing the negative effects on people and nature. Case-study-catalogue-2023.pdf (theglobalcity.uk)"

Article 6 of the European Union Civil Protection Mechanism (2013) obliges the EU Member States to develop risk assessments at national or appropriate sub-national levels and to make a summary of the relevant elements thereof. To do a risk assessment you need data from hazard, exposure and vulnerability. And to add forward-looking climate predictions.

Preventive measures are diverse, from planning (land-uses, building codes), mitigation (property level) and protection, (structural measures, NBS) to preparedness and recovery (soft) measures (early warning, emergency measures and insurance, etc.). (NSB in disaster risk reduction Sustainability | Free Full-Text | The (Re)Insurance Industry's Roles in the Integration of Nature-Based Solutions for Prevention in Disaster Risk Reduction—Insights from a European Survey (mdpi.com)

A holistic approach to climate change vulnerability and adaptation assessment (UNDDR, Chinvanno, Suppakorn, 2019) https://www.preventionweb.net/quick/43028. This paper points out gaps in using sectoral vulnerability and adaptation assessment for landscape adaptation planning and proposes instead an extended framework for climate change vulnerability and adaptation with a holistic view of the landscape.

Navigating Data in Local Government Decision Making

As data-driven decision making continues to steadily gain traction in local government, we are faced with many questions. Is this too much data? How exactly can this data inform our decision making? Should decisions be data informed, or data supplemented? One thing is for certain, we cannot ignore this phenomenon. Many local governments have already jumped into the data waters to chart their course on how they will be collecting and using data in the decision-making process. As a result, we are seeing a healthy mix of success stories as well as stories of data potentially in conflict with community interests. This leads us to an initial picture of what data in local government looks like. On the one hand, technology can be a great asset to enhancing a local government's ability to be efficient and effective.

On the other hand, too much data can lead to data surplus, failing to provide decision makers with the information they need. In both scenarios, local governments must determine the following:

1. How they will collect data.

2. The extent to which data will influence their decision making.

3. How to balance data with community input in the decision-making process.

ANNEX III: Summary of the 3 regions a) Policy status and anchoring needs and b) Technical gaps, capacity building and possible actions

Table 1 – Summary of policy status and anchoring needs.

Region	Policy status	Institutional set-up & anchoring needs
Valencia	• PVIECC 2030 – integrated climate & energy plan under Law 6/2022	• Instituto de Cartografía (GVA) identified as platform host within the "GVA Cartographic Viewer" • Multi-stakeholder workshops (GVA, CHJ, NGOs) have agreed on a single hub rather than new platforms
Gabrovo	• Municipal Integrated Development Plan (PIRO 2021-27) • Municipal Disaster Risk-Reduction Programme 2023-25 • Need state-level regulation/guidelines to enable systematic sharing	• Mayor's office chairs a multi-department task-force – recognised local "hub owner" • Data flows currently ad-hoc; national datasets coarse; mandate gaps at state level
West Athens	• No formal regional adaptation strategy yet; individual municipalities drafting hazard-specific plans	• ASDA + nine municipalities form a loose network; lacks binding data-sharing rules. • Potential for insurers & GSCP to join, but governance model still open.

Table 2 – Summary of technical gaps, capacity building measures, and possible actions.

Region	Technical scope & key gaps	Capacity & partnership actions
Valencia	• Build on existing spatial viewer; first step = add CCS loss data + PATRICOVA flood layers. • Loss data only at the postal-code level: need asset-level granularity. • Fragmented data sources across national, regional & coastal services	• Limited human & economic resources hamper more workshops and integration • Negotiations with CCS for granular data-sharing underway; possible future liaison with insurance association UNESPA
Gabrovo	• Vision: start with a municipal hub, then scale regionally. • Need high-resolution digital terrain model & flash-flood layers as national layers are too coarse. • Address-level exposure data is considered critical.	• The municipality has earmarked a budget for DRR. • Possibility to work with Sofia University on drone mapping for high-res terrain. • Stakeholder motivation & private-sector data remain weak.
West Athens	• Concept: flexible, regional-scale hub; finer-resolution climate data still needed despite existing 5 km models. • Cross-municipal data exchange is "extremely limited"; flood protection data most deficient.	• Possible R&D partners: NCSRD and National Observatory of Athens; the Region of Attica could finance. • Municipalities cite technical-expertise gaps and scarce resources.

Insurance penetration & loss data: only Spain has high penetration and a consolidated CCS dataset; Bulgaria and Greece will need to complement scarce insurance data with public compensation records (drawn from your narrative – no file reference).

Cross-cutting technical gap: every pilot stresses the need for higher-resolution, multi-hazard layers (especially flash-flood in Gabrovo, coastal/flood in Valencia, UHI & pluvial flood in West Athens).

Governance gap: Valencia is comparatively mature (legal base + host identified); Gabrovo is ready to pilot a municipal hub but depends on national guidelines; West Athens first needs a regional adaptation strategy and binding data-sharing rules.

ANNEX IV: Proposal and new regulation introduced in Norway giving the Norwegian Directorate for Civil Protection to right to compile, store and share insurance data

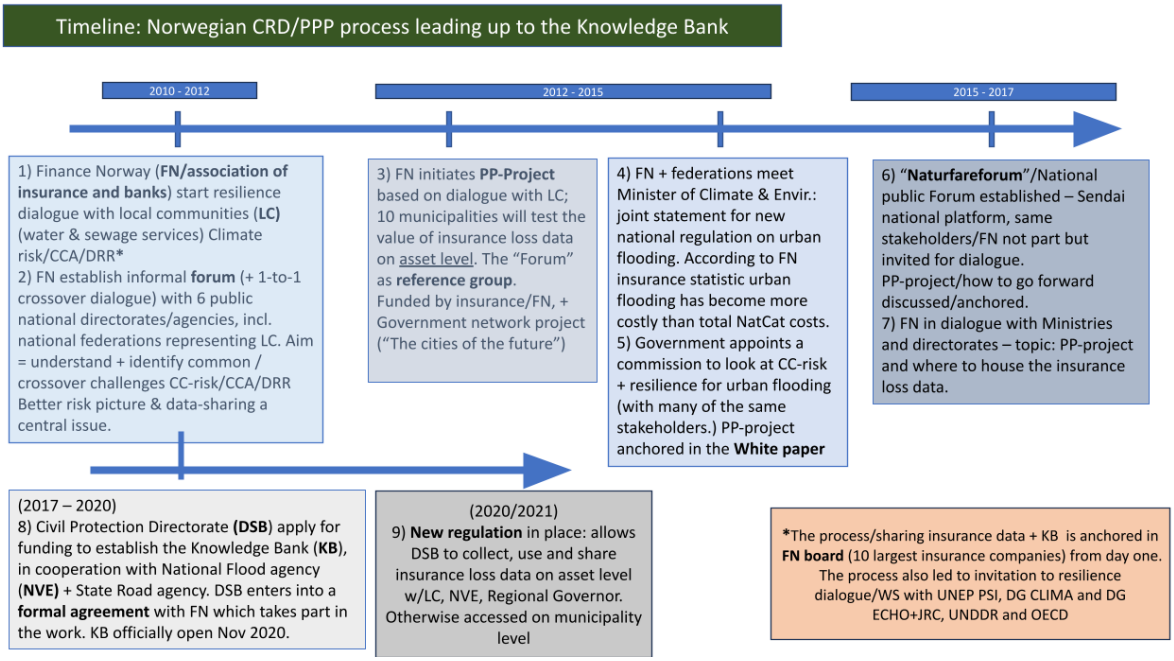

Figure 14: Timeline on the "Norwegian Case" - from starting the private-public cooperation and PPPs to the establishing of the national data hub (The Knowledge Bank), and the new regulations (Made by author/CRA).

Glossary

- Kunnskapsbanken = The Knowledge Bank (map), link Kunnskapsbankkart (no info in engslish)
- DSB/Direktoratet for samfunnssikkerhet og beredskap = The Norwegian Directorate for Civil Protection, link About DSB
- Finans Norge = The Association of insurance and banks, link About Finance Norway
- Finanstilsynet = The Financial Supervisory Authority of Norway.
- NVE/Norges Vassdrag- og Energidirektorat = The Norwegian Water Resources and Energy Directorate, link The Norwegian Water Resources and Energy Directorate

Bill / Prop. 136 L (2019–2020) (The translation was done by Mia Ebeltoft/CRA partner and is not officially approved)

Changes to the Civil Protection Act (collection and processing of information, execution of service, sanctions, etc.) link Prop. 136 L (2019–2020) - regjeringen.no

The Knowledge Bank (Kunnskapsbanken) - processing of information as a result of unwanted incidents - proposed law § 15 a

Ministry of Justice and Emergency Preparedness /The Norwegian Government.

7.1 Applicable law

It follows from the Civil Protection Act, section 14, first paragraph, that the municipality is obliged to map out which unwanted events may occur in the municipality, assess the likelihood of these events occurring, and how they may, if so, affect the municipality. The result of the work must be assessed and compiled in an overall risk and vulnerability analysis. According to Section 14, second paragraph, the risk and vulnerability analysis must be used as a basis for the work with social security and preparedness, including when preparing plans in accordance with the Planning and Building Act.

Insurance companies and bodies that administer public insurance schemes have information on damages and claims settlements that will be important in the The Norwegian Directorate for Civil Protection (DSB)'s preventive work and the municipalities' work to map risk and vulnerability.

Access to share damage data between public and private actors *is limited by the rules in the Personal Data Act and the rules on confidentiality in the Administration Act and other special legislation.* Anyone who performs service or work for an administrative body has a duty of confidentiality according to Section 13 et seq. of the Public Administration Act, and confidential damage data cannot, as a general rule, be shared with others, unless authorized by law. Insurance companies that are covered by the *Financial Enterprises Act* have a duty of confidentiality according to § 16-2 first paragraph of the act, and may not share confidential claim data with others, unless the duty of confidentiality has been lifted by law or a regulation based on law, or the Financial Supervisory Authority has lifted the duty of confidentiality through a special decision.

In a decision on 1 April 2019, Finanstilsynet (The Financial Supervisory Authority of Norway) lifted insurance companies' obligation of confidentiality for sharing claims data on compensation amounts at address level for the period 2013 – 2018 with DSB, municipalities, county governors and the Norwegian Directorate of Water Resources and Energy (NVE).

7.2 The proposal in the consultation document

In the consultation memorandum, the ministry proposed a legal provision, which makes it possible for DSB to own and manage a computer system (the "Kunnskapsbanken"), for the collection of claims data from the insurance companies that must be made available to municipalities and other relevant public bodies. Such collection and making available was proposed to apply where this is necessary to prevent and reduce the consequences of unwanted incidents. Information about damages and claims settlements must be able to be obtained within these counters and made available to public bodies without being hindered by statutory confidentiality obligations.

It was proposed that the ministry could issue regulations on the collection, making available and other processing of information, including the purpose of the processing, how information must be disclosed and processed and which public bodies can access the information.

7.3 The opinion of the hearing bodies

The hearing bodies are positive about the bill, and support the rationale and purpose of establishing the Knowledge Bank.

Oslo municipality has stated a need to gain access to raw data and datasets from the Knowledge Bank, so that these can be used in further analyzes in the municipality. They also see a need for the ministry

to assess the possibility of the municipalities being able to contribute relevant data into the Knowledge Bank. However, this shall not lead to an extension of reporting requirements. FinansNorge believes that the bill should be limited to information about natural events, but at the same time sees that it can be of great societal value if the public gets access to other non-life insurance data that can support the purpose of the Civil Protection Act. FinansNorge believes that it is crucial in the event of any expansion beyond natural events that thorough assessments are carried out, and in dialogue between the actors concerned.

FinansNorge (The association of insurance and banks) asks the ministry to assess whether the authority in § 15 a can allow FinansNorge Forsikringsdrift, (the non-life insurance operation part of Finans Norge) as the central party as data supplier for the insurance industry and DSB, to be given a role as data controller.

FinansNorge believes that the privacy consequences for the data subject should be considered in the draft law, and in this connection has referred to the privacy regulation article 35 no. 10.

7.4 The Ministry's assessments

Natural disasters impose very large costs on society and climate change means that increases in the damage figures can be expected. It is therefore important to have up-to-date and central damage data which can, among other things, provide information on vulnerable areas.

DSB must own and manage a computer system, the "Kunnskapsbanken", for the collection, collation and making available of data on claims and claims settlements for use by DSB itself, municipalities and other relevant public bodies' work with social security. The computer system will contribute to strengthening knowledge about unwanted incidents and their consequences, and further to strengthen preventive social security work locally, regionally and nationally. The knowledge bank will thus be a tool in DSB's work to lay the foundations for good and holistic preventive social security work and to strengthen the municipalities' work with risk and vulnerability analyses and work with plans according to the Planning and Building Act and any other sector regulations.

In order for the Knowledge Bank to function as intended, DSB is dependent on businesses/organisations that have relevant data being able to share this with DSB, so that DSB can carry out assessments, analyses and compilations of the information. DSB initially needs to receive damage data from FinansNorge on behalf of the insurance industry and from the Norwegian Directorate of Agriculture, which administers the Government's natural damage scheme. Furthermore, DSB must be able to make damage data available to the municipalities and other relevant public bodies that have roles in preventive social security work. The data must be made available as statistics and in maps via web-based applications in the Knowledge Bank. Most of the data will be openly available to anyone interested in exploring and immersing themselves in information about adverse events. Some of the data will not be generally available due to confidentiality or other considerations. Users of this data will have a legitimate need for access and will gain access through an appropriate and secure login mechanism. These will be specialist authorities with roles and responsibilities within preventive social security, such as municipalities, the county governor and NVE.

The damage data that it will be appropriate to provide from insurance companies and public insurance schemes for use in the Knowledge Bank contains addresses and coordinates of properties that have

been affected by natural and water damage, as well as information on the cause of damage, time of damage and compensation amount from the insurance companies. It follows from the personal data protection regulation article 4 no. 1 that personal data is any information about an identified or identifiable natural person. This means, among other things, that addresses, coordinates and compensation amounts from the insurance companies are considered personal data.

One of the basic conditions for DSB to be able to obtain and otherwise process personal data in the work with the Knowledge Bank is that the processing can be anchored in at least one of the six possible grounds for processing in the Personal Data Protection Regulation article 6 no. 1 letter a to f. If the processing is based on Article 6 no. 1 letter c) or letter e), DSB must also have a supplementary legal basis to be able to process personal data, cf. personal data protection regulation article 6 no. 3.

Furthermore, one of the basic principles in the Personal Data Protection Regulation is that personal data must be collected for specific, expressly stated and justified purposes, and it is basically not permitted to further process the data in a way that is incompatible with the purposes for which the data was originally collected, cf. the regulation article 5 no. 1 letter b. If the processing of personal data for incompatible purposes is to be permitted, it is required that further processing is based on either the data subject's consent or on Union law or the Member States' national law which constitutes a necessary and proportionate measure in a democratic society to ensure the achievement of the objectives mentioned in the regulation article 23 no. 1.

Access to the collection, making available and other processing of claims data between different bodies is also limited by the rules on confidentiality in the Public Administration Act and other special legislation. In order for the Knowledge Bank to function as intended, there is a need for a new legal provision that ensures DSB sufficient authority to process information that can contribute to strengthening the work to prevent and reduce the consequences of unwanted incidents. In this connection, the ministry points out that the purpose of the processing of information in the Knowledge Bank fits with the purpose of the Civil Protection Act, which is to "protect life, health, the environment, material assets and critical infrastructure through the use of non-military force when the kingdom is at war, when war threatens, when the kingdom's independence or security is at risk, and in the event of unwanted incidents in peacetime."

DSB must support the Ministry of Justice and Emergency Management's coordination role within social security and emergency preparedness cf. Royal Decree of 24 June 20051. Through the collection of information, research and investigation activities, dialogue, advice and guidance, the Directorate shall lay the foundations for good and comprehensive preventive work and good emergency preparations within public administration and socially critical activities. The directorate shall further strive to have a comprehensive overview that provides opportunities to see preventive social security work and preparedness in all sectors together. The information processed in the Knowledge Bank will help to strengthen DSB's social mission in terms of preventive social security work and reduce the consequences of unwanted incidents. The information that is processed and made available through the Knowledge Bank will also strengthen the municipalities' work with risk and vulnerability analyses and plans in accordance with the Planning and Building Act and other sector regulations.

A new provision will be closely related to Section 14 of the Civil Protection Act, which regulates municipal preparedness obligations and risk and vulnerability analyses. However, the provision will not be part of the municipal emergency preparedness duty regulated in Chapter V of the Civil Protection

Act, and where the municipality is subject to the duty. The new provision gives authority to DSB and shall not regulate municipal duties. The Ministry therefore proposes that a new Chapter V A be created in the Civil Protection Act entitled "Processing of information as a result of unwanted incidents", and a new Section 15 a.

In the consultation, Oslo municipality has requested the ministry to consider the possibility that the municipalities should also be able to contribute relevant data to the Knowledge Bank. The ministry believes this could be possible for further development of the Knowledge Bank. To the extent that the Knowledge Bank will contain data from the municipalities, this will be information that is already openly available and/or information that the municipalities consider to be non-confidential information. In order for the Knowledge Bank to function as intended, it is important to ensure that statutory confidentiality and personal information regulations do not prevent the necessary sharing of damage data between various bodies that work to prevent damage as a result of unwanted incidents. When it is necessary to prevent and reduce the consequences of unwanted incidents, DSB must therefore be given a sufficient legal basis to obtain claims data from insurance companies and public insurance schemes, analyze and compile the information, including personal data, and through the Knowledge Bank make this available to the municipalities and other public bodies.

The ministry therefore proposes that in the proposal for new section 15 a, first paragraph, authority is given for DSB to obtain, assess, analyse, compile and otherwise process personal data and other information, when this is necessary to prevent and reduce the consequences of unwanted incidents, including to support the municipalities' work with risk and vulnerability analyses. The knowledge bank will initially focus on data on natural hazards.

However, the Ministry proposes that the law uses the term "unwanted incidents", which is also defined in the Civil Protection Act § 3 letter a. "Unwanted events" cover natural hazards, but also allows for information on areas other than natural hazards to be included. The ministry believes that this is an appropriate solution to ensure any further development of the Knowledge Bank.

The new provision shall give DSB clear authority to be able to demand information about damages and claims settlements as a result of unwanted events from insurance companies and public insurance schemes, without being hindered by statutory confidentiality obligations, cf. proposal for new section 15 a second paragraph. The Ministry proposes that the obligation to provide information be limited to information that is necessary to prevent and reduce the consequences of unwanted incidents, including to support the municipalities' work with risk and vulnerability analyses.

In the new provision, the ministry proposes that DSB can *make personal data and other information from the Knowledge Bank available to other public bodies without hindrance of statutory confidentiality, when this is necessary to prevent and reduce the consequences of unwanted incidents, including to support the municipalities' work with risk and vulnerability analyses*. The ministry points out that those who will be given access to the information through the Knowledge Bank are public bodies that all have roles and responsibilities within preventive social security. The municipality's responsibility for preparing risk and vulnerability analyzes follows from § 14 of the Civil Protection Act, the county governor's responsibility for preparing risk and vulnerability analysis at county level (county ROS), follows from the County Governor's social security instructions chapter IV no. 1.

The municipality also has a responsibility to prepare plans in accordance with the Planning and Building Act and to see the risk and vulnerability analysis in connection with these plans cf. Civil Protection Act § 14 second paragraph. The county governor is the supervisory authority for the municipalities' work with risk and vulnerability analyzes according to the Civil Protection Act, and objection authority for the municipality's plans according to the Planning and Building Act. Other professional authorities have also been identified as possible users of claims data. This applies, for example, to NVE, which provides assistance to municipalities and society in general with expertise and resources related to floods and landslides. More concretely, this means, among other things, that NVE provides assistance for investigation, planning and implementation of security measures and advice and guidance in the work of assessing flood and landslide risk in municipal spatial plans.

As stated above, the proposal for a *new provision shall provide authority for the processing (collection, processing and making available) of personal data and other information, and exemptions from the statutory duty of confidentiality*. The rules on grounds for processing in the *Personal Data Protection Regulation article 6 no. 1 letter e* gives access to the processing of personal data when this is necessary to carry out a task in the public interest or to exercise public authority that the controller is required to do. Processing of personal data in the work with social security, including facilitating the preparation of risk and vulnerability analyzes and plans in accordance with the Planning and Building Act, can be linked both to carrying out a task in the public interest and to the exercise of public authority. Processing of personal data pursuant to this provision requires a supplementary legal basis in Union law or national law, cf. article 6 no. 3.2 *The Ministry's proposal for new § 15 a shall provide such a supplementary legal basis for the processing of personal data in connection with the Knowledge Bank, cf. article 6 no. 3 letter b.*

In addition, the ministry's proposal for new § 15 a shall provide a legal basis for further processing in cases where the collection and other processing of personal data in the Knowledge Bank is incompatible with the purposes for which the data was originally collected, *cf. article 6 no. 4.* The Ministry believes that such further processing will generally be a necessary and proportionate measure in a democratic society to ensure public safety, including the protection of human life, particularly as a result of natural disasters, *cf. the regulation article 23 no. 1 letter c and clause 73*.

If the processing of personal data or exemptions from the duty of confidentiality constitutes an intrusion into the right to privacy according to Section 102 of the Constitution and Article 8 of the ECHR, these provisions, as well as the principle of legality in Section 113 of the Constitution, also require the supplementary legal basis. Section 102 of the Constitution has clear similarities with Article 8 of the ECHR and must be interpreted in the light of this. The right to respect for privacy according to Article 8 of the ECHR is central in relation to the exceptions that can be made from the duty of confidentiality and for the processing of personal data, as the disclosure and further processing of personal data must be assumed to be an intrusion into the individual's privacy, cf. EMF Article 8 no. 1. This means that a provision to hand over and further process personal data in the interest of public bodies must meet the requirements in Article 8 no. 2. More specifically, there are requirements for a legal basis, including that the legal basis must be sufficiently precise and predictable, that the provision contributes to promoting one of the exhaustive legitimate purposes listed in Article 8 no. 2, and that the intervention in the right to privacy must be necessary in a democratic society.

The purpose of collecting, collating the damage data and making it available to relevant actors through the Knowledge Bank is to prevent the consequences of unwanted incidents, which must be considered a legitimate purpose according to Art. 8.

…

The Ministry would like to emphasize that § 15 a does not authorize the processing of special categories of personal data according to the Personal Data Protection Ordinance, Articles 9 and 10. Furthermore, in the last paragraph of § 15 a, the Ministry has specified that it may be specified in regulations which personal data can be processed. If, in the course of further development of the Knowledge Bank, there should be a need to process personal data other than personal data related to the cause of damage, time of damage and compensation amount at address level, the purpose and which personal data this applies must be further specified. *A separate regulatory provision* is therefore proposed which gives the opportunity to provide more detailed provisions on the purpose of the processing of personal data and which personal data can be processed in accordance with section 15 a.

With regard to the necessity of the bill, the ministry points out that the Finanstilsynet has assumed that information identifying a property with natural damage is not covered by the obligation of confidentiality in the Financial Enterprises Act, as natural damage will be visible to the public. However, Finanstilsynet considers information about compensation payments from an insurance company to be personal matters that are subject to confidentiality. The ministry considers it unlikely that exceptions to the duty of confidentiality will have significant negative consequences for those whom the duty of confidentiality is supposed to protect. However, a prerequisite for this assessment is that the information is only used for the purpose for which it was provided, and that unauthorized persons do not gain access to the information. The ministry proposes that the public bodies that can gain access to injury data through the Knowledge Bank are set out in regulations. These public bodies will be subject to a duty of confidentiality according to Section 13 of the Public Administration Act.

FinansNorge has maintained that privacy consequences for the data subject should be assessed in the draft law. The ministry refers to the personal data protection regulation article 35 no. 1, where it is stated that the controller is obliged to make an assessment of the consequences a planned treatment will have for the protection of personal data, if it is likely that the treatment, especially when using new technology, will entail "a high risk for the rights and freedoms of natural persons". According to point 76 of the foreword, it appears that how likely and serious the risk to the data subject's rights and freedoms is, should be determined based on the nature, scope, purpose and context of the processing. Certain types of processing of personal data are considered to involve a more serious interference with privacy than others, this because the personal data that is processed is of a particularly sensitive nature, and/or the way in which the personal data is processed constitutes a special interference with the rights and freedoms of the data subjects. The personal information to be processed in the Knowledge Bank is not of such a particularly sensitive nature, and the manner in which the information is to be processed does not initially constitute a special intervention either. This is because the processing does not have a control purpose or a purpose to make decisions about individuals, or to make decisions that have significance for the registered person.

In the ministry's view, this speaks against the fact that the processing of personal data in the Knowledge Bank will entail a "high risk for the rights and freedoms of natural persons", and that there

is a requirement for an assessment of privacy consequences. Regulation article 35 no. 3 letter a to c, lists cases where an assessment of the privacy consequences is particularly necessary. In the ministry's view, it is clear that the processing of claims data etc. in the Knowledge Bank is not covered by the processing that appears in no. letter 3 a to c. In accordance with Article 35, the Norwegian Data Protection Authority has 4 prepared a list of different types of processing activities (criteria) which must always be covered by the requirement for assessment of privacy consequences. The ministry has reviewed the criteria and assessed whether the processing of personal data in the Knowledge Bank involves matching or compilation of data sets. The Norwegian Data Protection Authority's guidance states the following about the matching or compilation of data sets: "This may, for example, originate from two or more data processing operations that are carried out for different purposes and/or by different data controllers in a way that exceeds the data subject's reasonable expectations". The Ministry believes that the processing of personal data in the Knowledge Bank falls outside this. The data processing operations carried out in the Knowledge Bank are carried out for the same purpose, which is to prevent and reduce the consequences of unwanted incidents, including to support the municipalities' work with risk and vulnerability analyses.

Natural events cause large losses of social values. Extreme weather events affect large areas, necessary infrastructure and critical social functions and many people, and annually require large resources for handling and reconstruction. A good database is important in order to carry out reliable cost/benefit analyzes and risk and vulnerability analyzes in order to find the best preventive measures against natural hazards. Investing in preventive measures in infrastructure such as water and sewage networks, power networks, electronic communications and roads is costly, and difficult to prioritize when you do not know with certainty whether, where and how an incident may strike. Through DSB making damage data available in the Knowledge Bank, it will be possible for the municipalities and other relevant public bodies to identify where there is the greatest risk, and which values are most vulnerable, so that preventive and preparedness measures are as targeted as possible. As a result of climate change, there will probably be more and more serious natural events in the future, and there are significant advantages in being able to prevent damage from occurring to a greater extent, rather than repairing damage. Disclosure of damage data can thereby have a significant social benefit, and is considered necessary in a democratic society.

The Ministry proposes that further provisions can be made in regulations regarding the collection, making available and other processing of personal data and other information. Provisions can be made below on how information is to be handed over to DSB, for example through requirements for data quality, format and interval for transferring information to DSB. This will facilitate the administrative work and help ensure that the Knowledge Bank has up-to-date information. It is also proposed that the public bodies that can gain access to personal data through the Knowledge Bank are specified in more detail in regulations. Pursuant to § 2 of the Civil Protection Act, regulations can be issued on the provision's application to Svalbard.

In its consultation input, Oslo municipality has stated a need to gain access to raw data and datasets from the Knowledge Bank, so that these can be used in further analyzes in the municipality. Including structured information about the cause of damage and good location fixing for use in maps. The ministry points out that this need can be assessed in connection with provisions on data quality and availability in regulations pursuant to section 15 a.

Footnotes

1. Royal Decree 24.06.2005 The Directorate for Public Safety and Emergency Preparedness - the general coordination responsibility and the responsibility for coordinating the supervision of activities, objects and operations with the potential for major accidents.
2. Prop. 56 LS (2017–2018) point 6.3.2, page 33.

The provision

§ 15 a. The Directorate for Community Security and Emergency Preparedness's right to process information

The Directorate for Social Security and Emergency Preparedness can obtain, carry out assessments, analyzes and compilations of and otherwise process personal data and other information, when this is necessary to prevent and reduce the consequences of unwanted incidents, including to support the municipalities' work with risk and vulnerability analysis in accordance with § 14.

Following an order from the Directorate for Social Security and Emergency Preparedness, insurance companies and bodies that administer public insurance schemes are obliged, without hindrance of confidentiality, to provide the Directorate for Social Security and Emergency Preparedness with personal data and other information about damages and claims settlement as a result of unwanted incidents. The obligation to provide information only applies to information that is necessary for the purpose stated in the first paragraph.

The Directorate for Public Security and Emergency Preparedness can make information obtained under the second paragraph available to other public bodies without being hindered by statutory confidentiality obligations, when this is necessary for the purpose stated in the first paragraph.

The Ministry can issue regulations on the collection, making available and other processing of information in accordance with the provisions here. Among other things, regulations may be issued on which personal data and other information can be required from insurance companies and bodies that administer public insurance schemes, which personal data can be processed, the purpose of the processing, how personal data and other information must be disclosed and processed, and which public bodies can gain access to personal data and other information.

0 Added by Act 16 April 2021 no. 20 (with effect from 1 May 2021 according to res. 16 April 2021 no. 1174).

…

Regulations on the processing of information on natural and water damage in the Knowledge Bank (knowledge bank regulations)

Date FOR-2022-06-01-954 / Ministry of Justice and Emergency Preparedness/Entry into force 01.07.2022

Short title: Knowledge bank regulations

Authority: Established by the **The Norwegian Directorate for Civil Protection (DSB)** on 1 June 2022 based on Act 25 June 2010 no. 45 on municipal preparedness duty, civil protection measures and Civil Defense (Civil Protection Act) § 15a, cf. delegation resolution 16 April 2021 no. 1175.

Chapter 1. Scope and definitions

§ 1. Scope

The regulation applies

a. processing of personal data and other information in the Knowledge Bank,
b. collection of personal data and other information from insurance companies for use in the Knowledge Bank,
c. making personal data and other information available in the Knowledge Bank.

§ 2. Definitions

In this regulation is meant

a. The Knowledge Bank: The Directorate for Social Security and Emergency Preparedness's computer system for collecting, collating and making available data on risk and vulnerability.
b. API (Application Programming Interface): a tool that makes it possible to transfer information from one computer system to another.

Chapter 2. Processing of information in the Knowledge Bank

§ 3. Processing of personal data in the Knowledge Bank

DSB is responsible for processing the personal data that is processed in the Knowledge Bank.

DSB can process personal data in the Knowledge Bank when necessary to prevent and reduce the consequences of unwanted incidents, including to support the municipalities' and Longyearbyen local government's work with risk and vulnerability analyzes in accordance with Section 14 of the Civil Protection Act.

DSB can obtain personal information from insurance companies and the Norwegian Natural Disaster Scheme, and collate this with other information from internal and external data sources. DSB can also carry out assessments, analyzes and otherwise process the personal data in the Knowledge Bank.

Chapter 3. Collection of information from insurance companies to the Knowledge Bank

§ 4. Insurance companies that are obliged to provide information to the Knowledge Bank

The rules in this chapter apply to insurance companies that are participants in the Norwegian Natural Damage Pool (NP) according to regulations on instructions for the Norwegian Natural Damage Pool § 1, and which have been granted permission to operate non-life insurance in Mainland Norway or on Svalbard, or through a branch established in Mainland Norway or on Svalbard.

§ 5. Collection of information from insurance companies

Insurance companies must hand over personal data and other information about natural and water damage to the Directorate for Social Security and Emergency Preparedness. The obligation to provide information on natural and water damage applies to damage reported to the Norwegian Natural Damage Pool, other weather-related water damage, and interruption losses related to these. The obligation to provide information only applies to insurance products for which a natural damage premium is required.

The insurance companies must hand over information about natural and water damage to DSB in accordance with this table:

§ 6. The insurance companies' data processor

The insurance companies must hand over the information in § 5 to DSB through a joint data processor.

The insurance companies must enable the data processor to hand over the information in § 5 to the Directorate for Social Security and Emergency Preparedness in line with the format requirements.

The insurance companies must ensure that the data processor compiles and makes the information in § 5 available to the Directorate for Social Security and Emergency Preparedness through a common API.

The insurance companies must ensure that the information provided to the data processor in accordance with § 5 is as up-to-date as possible, and that the data processor makes the information available to the DSB through the common API at least once per month.

The insurance companies must provide an appropriate arrangement for the distribution of costs related to the data processor's tasks.

Chapter 4. Access to information in the Knowledge Bank

Section 7. Public bodies that are given access to information in the Knowledge Bank

The following public bodies are given access to and can process personal data in the Knowledge Bank, when this is necessary to prevent and reduce the consequences of natural and water damage, including to support the work with risk and vulnerability analysis in accordance with Section 14 of the Civil Protection Act:

a. the municipalities,
b. Longyearbyen local government,
c. the state administrators,
d. The Governor of Svalbard,
e. the county municipalities and
f. Norwegian Directorate of Water Resources and Energy (NVE).

ANNEX V: Questionnaire no. 1 - June 2024

Target group

- Case study leaders as first contact point for the three main CS/pilot regions (Valencia, West-Athens and Gabrovo). The CL must contribute to the process to follow up both timewise and if the region needs help with answering the questions.
- The three main regions/CS. The CS shall answer on behalf of the regions and the municipalities in their region, and must therefore coordinate the answers with the relevant/specific economic sector in the municipalities (Planning dept/offices, Water management & sanitation, Civil protection/emergency etc.).

Background and information to the questionnaire

1. SOTERIA objectives connected to regulation and use of climate-related risk and loss data

One of SOTERIA ´s main objectives is to understand the climate resilience in regions, local authorities, and communities and their methods and use of information, and data in climate adaptation and disaster risk reduction work (e.g. risk assessment/risk and vulnerability assessments).

SOTERIA shall also identify legal frameworks and legal barriers to use or share climate-related risk and loss data, (e.g insurance loss data which is done in Norway). We also identify if, and how differences in policies and regulations in different regions can hinder and/or slow the development, integration, validation and post-project exploitation of the SOTERIA innovative insurance solutions.

2. Concrete tasks to fulfil the objectives

We shall both map the current mechanism our pilots/pilot regions use to record, collect, and share climate-related risk data and losses data, and explore current local barriers and drivers to integrate this data.

Based on this information, we will develop 3 pilots as Regional Data Hubs in Valencia, Gabrovo and Athens.

This means we need to:

- identify existing legislative obligations and understand the legal requirements, guidelines, and best practices.

- understand the need for climate-related risk and loss data, as how they are valuable for various stakeholders, (local, regional and national authorities, policymakers, risk management professionals, insurance companies, and researchers), as it can inform decision-making processes, risk mitigation strategies, and resource allocation.

- assess utility and management for the potential uses and applications of the collected risk and loss data, considering its relevance and value for regional stakeholders.

- identify data sources and providers to determine the specific sources from which the risk and loss data is obtained, as well as the entities, organisations or administrations responsible for providing this information (including mapping out the data flow and identifying the level of detail and granularity available in the data).

- identify barriers and challenges that may hinder access to the risk and loss data or impede its subsequent use. These barriers could include legal restrictions, data privacy concerns, technical limitations, information gaps, or organisational silos, among others.

3. EU regulation needs to be implemented by national authorises

The EU makes laws through directive and regulations which member states are required to implement. This questionnaire shall help us understand how your country (as an EU/EEA member state) has implemented some of the most relevant directives/regulations for climate change adaptation and disaster risk reduction.

EU Directive and Regulations explained

An EU *directive* gives each EU member states (incl. EEA member state) a *flexibility on how to implement* the directive into national law. A directive requires the member state (country) to achieve a certain result but leave them free to choose how to do so. The member states *must adopt measures* to incorporate them into national law (transpose) to achieve the objectives in the directive. National authorities must communicate these measures to the European Commission.

EU *regulations*, on the other hand, are legal acts that *apply automatically and uniformly* to all EU countries as soon as they enter into force, without needing to be *transposed into national law.* They are binding in their entirety on all EU (and EEA) countries.

4. Relevant EU legal framework for this questionnaire

There are several EU directives and regulations with the goal to provide important and authoritative information to the society, define and create common standards, make data open and accessible, etc.

Some of the main directive relating to climate change adaptation, climate-related risk and loss data are the European climate law, the Flood directive, the Water frame directive, and the General Data Protection Regulation (GDPR).

However, EU also offers “tools” to help national, regional and local authorities to understand the impact and support their work on climate change adaptation and risk reduction measures:

- Inspire (Infrastructure for Spatial Information in Europe),
- Copernicus Climate Change Service (C3S- supports society by providing authoritative information about the past, present and future climate in Europe) and the GreenData4All- initiative.
- EU Risk data Hub (RDH- is a GIS web-based collaborative platform used to look up, host, and share disaster risk and loss data which are crucial information to support disaster risk prevention and risk management)
- The Open Data Directive (includes a list of high-value datasets (HVDs) that organisations have to make available free of charge, in machine-readable format and via APIs, and, where relevant, as a bulk download. The list includes geospatial data (buildings and cadastral or agricultural parcels), earth observation and environmental data, meteorological data, statistics, mobility and inland waterways datasets.

In this *questionnaire* we focus on the ***European Climate Law*** and the ***Floods Directive*****.** Including information from article 6 of the EU ***Civil Protection Mechanism***. As these issues

are interconnected and therefore need to be looked at from a holistic approach - also in a municipality.

The EU *Climate law* is a regulation of 30 June 2021 establishing the framework for achieving climate neutrality and adaptation, Regulation - 2021/1119 - EN - EUR-Lex (europa.eu). It sets out (binding) rules for both climate mitigation and adaptation, and for the use of nature-based solutions (NBS). For NBS this is normally included in the land-use planning regulation and/or regulation on Nature's Diversity. Hence, the EU climate law regulation requires the member state to "promote nature-based solutions and ecosystem-based adaptation".

The EU *Floods Directive* entered into force on 26 November 2007, and it requires all EU countries to; (i) assess all areas where significant floods could take place, (ii) map the flood extent and assets and humans at risk in these areas, and (iii) take adequate and coordinated measures to reduce this flood risk. (Directive 2007/60/EC on the assessment and management of flood risks) Floods - European Commission (europa.eu)

The *EU Civil Protection mechanism* EU Civil Protection Mechanism aims to reduce the risk of disasters and promote actions to strengthen prevention and risk management. (A first progress report on the implementation of Article 6 was issued in March 2024.)

5. The regulation in NORWAY – as an example

As an example, with the aim to help you understand and to answer this questionnaire, we have included (and translated) some central parts of the two main regulations in Norway related to climate change adaptation and disaster risk reduction.

The work and regulation on planning and building activities in the future needs to be *separated* in how we address and work with exciting already built areas and buildings. We have therefore tried to mirror this in the questions.

1. Climate change adaptation

(Responsible for regulations and guidelines: Ministry of Environment and climate and the Directorate of Environment.)

The Planning and building act is the main act and “tool” for local authorities/municipalities in land-use planning and building, not existing built areas and buildings.

Geo maps: The act includes requirements on geo data, as they are a basic and essential information/tool to enable the local authorities to fulfil their legal obligation set out in this act. It is used for decision-making in the planning face, technical requirements and what conditions should be required of the builder in the application processes. Through a *geographic information system* (GIS), the municipality collects, analyses and visualises all types of geographic map information. decision-making depends on good, quality-assured data and good map analyses.

From the Planning and building act:

- Public maps: “The municipality must ensure that there is an updated public map base for the purposes dealt with in the act. The state must make available national map data for all municipalities. State, regional and municipal bodies must provide established information so that the information is easily accessible for use in planning and building proceedings. The map basis must also be able to be used for other public and private purposes.

- Updating plans: “Municipal and regional planning strategies must refer to the need for updating existing or drawing up new plans, in light of expected climate changes and previous undesirable natural events. In the planning strategy, an assessment must be made as to whether consideration of a changing climate implies a need for repeal or revision of current plans.”
- Exposure: “Areas considered to be used for development purposes in municipal and zoning plans may be exposed to hazards, such as floods and landslides. Development can also increase the stress on the areas below. To be able to prevent the loss of life, health, critical infrastructure and other material assets, it is necessary that, through risk and vulnerability analyses early in the planning process, it is assessed whether climate change results in a changed risk and vulnerability picture.”

- *Nature-base solutions*

  The Planning and building act (also) regulates the use of nature-based solutions: "Preservation, restoration or establishment of nature-based solutions (such as existing wetlands and natural streams or new green roofs and walls, artificial streams and pools, etc.) should be considered. If other solutions are chosen, *an explanation must be given* as to why nature-based solutions have not been chosen".

- *Climate predictions*

  Regions and municipalities are required to use climate projections under the Planning and building act:
  “When the consequences of climate change are assessed, high alternatives from national climate projections must be used as a basis. This is explained in more detail in the guides and in the county-wise climate profiles that have been prepared. The climate profiles will be an important part of the knowledge base. The planning authority must itself assess the need to supplement national and regional information with knowledge of local conditions, including previous unwanted natural events. (Link to the norwegian regulation: Statlige planretningslinjer for klima- og energiplanlegging og klimatilpasning - Lovdata)

These climate predictions are provided by NCCS – the Norwegian centre for climate services

2. Disaster risk reduction (for existing buildings/areas)
(Responsible for regulation, and guidelines: The Ministry of Justice and the Directorate of Civil Protection.)

The Civil Protection Act is the main act and requires municipalities to make risk and vulnerability-analysis. From the regulation §14 and §15:

- “The municipality is *obliged to survey* which undesirable events may occur in the municipality, assess the likelihood of these events occurring and how they may affect the municipality if so. The result of this work must be assessed and compiled in an *overall risk and vulnerability analysis.*
- The risk and vulnerability analysis shall form the basis of the municipality's work with social security and preparedness, including when drawing up plans in accordance with planning and building proceedings (in the Planning and Building Act).
- The risk and vulnerability analysis must be updated in line with the revision of municipal sub-plans, on planning and building proceedings (in the Planning and Building Act) and otherwise in case of changes in the risk and vulnerability picture. (§14)

- Based on the risk and vulnerability analysis in § 14, the municipality must prepare a contingency plan. The emergency plan must contain an overview of the measures the municipality has prepared to deal with unwanted incidents." (§15)

Relevant take-out from the European climate law (adaptation part) and the EU Floods Directive

For you to understand the European regulation and background to our questions, we have extracted some of the key elements in these two frameworks.

1. The European Climate law (the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') Publications Office (europa.eu)

From the Preamble (on Adaptation):

(31) Adaptation is a key component of the long-term global response to climate change. The adverse effects of climate change can potentially exceed the adaptive capacities of Member States. Therefore, Member States and the Union should enhance their adaptive capacity, strengthen resilience and reduce vulnerability to climate change, as provided for in Article 7 of the Paris Agreement, as well as maximise the co-benefits with other policies and legislation.

The Commission should adopt a Union strategy on adaptation to climate change in line with the Paris Agreement. Member States should adopt comprehensive national **adaptation strategies and plans based on robust climate change and vulnerability analyses,** progress assessments and indicators, and guided by the best available and most recent scientific evidence.

The Union should seek to create a favourable regulatory environment for **national policies and measures put in place by Member States to adapt to climate change**. Improving climate resilience and adaptive capacities to climate change requires shared efforts by all sectors of the economy and society, as well as policy coherence and consistency in all relevant legislation and policies. (32) Ecosystems, people and economies in all regions of the Union will face major impacts from climate change, such as extreme heat, floods, droughts, water scarcity, sea level rise, thawing glaciers, forest fires, wind throws and agricultural losses.

Recent extreme events have already had substantial impacts on ecosystems, affecting carbon sequestration and storage capacities of forest and agricultural land. Enhancing adaptive capacities and resilience, taking into account the United Nations Sustainable Development Goals, help to minimise climate change impacts, to address unavoidable impacts in a socially balanced manner and to improve living conditions in impacted areas.

Preparing early for such impacts is cost-effective and can also bring considerable co-benefits for ecosystems, health and the economy. **Nature-based solutions** can benefit climate change mitigation, adaptation and biodiversity protection.

From Article 5 - Adaptation to climate change:

1. The relevant Union institutions and the Member States shall ensure **continuous progress** in enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in accordance with Article 7 of the Paris Agreement.

2. The Commission shall adopt a Union strategy on adaptation to climate change in line with the Paris Agreement and shall regularly review it in the context of the review provided for in point (b) of Article 6(2) of this Regulation.

3. The relevant Union institutions and the **Member States shall** also **ensure that policies on adaptation** in the Union and in Member States are coherent, mutually supportive, provide co-benefits for sectoral policies, and work towards better integration of adaptation to climate change in a consistent manner in all policy areas, including relevant socioeconomic and environmental policies and actions, where appropriate, as well as in the Union's external action. They shall focus, in particular, on the most vulnerable and impacted populations and sectors, and identify shortcomings in this regard in consultation with civil society.

4. **Member States shal**l adopt and implement national adaptation *strategies and plans,* taking into consideration the Union strategy on adaptation to climate change referred to in paragraph 2 of this Article and **based on robust climate change and vulnerability analyses,** progress assessments and indicators, and guided by the best available and most recent scientific evidence. In their national adaptation strategies, Member States shall take into account the particular **vulnerability** of the relevant sectors, inter alia, agriculture, and of water and food systems, as well as food security, and **promote nature-based solutions and ecosystem-based adaptation**. Member States shall regularly update the strategies and include the related updated information in the reports to be submitted under Article 19(1) of Regulation (EU) 2018/1999.

3. The EU Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) Directive 2007/60/EC of the European Parliament and of the Council on the assessment and management of flood risks — European Environment Agency (europa.eu)

The directive requires that member states to make r**isk assessment and flood models** on a national level, including:

- assess all areas where significant floods could take place,
- map the flood extent and assets and humans at risk in these areas,
- take adequate and coordinated measures to reduce this flood risk.

The rights of the public to access this information and to have a say in the planning process are also important elements of the Directive.

EU countries are *required* to create and update *Flood Hazard Maps and Flood Risk Maps*. Flood Hazard Maps should cover the geographical areas which could be flooded, and Flood Risk Maps show the potential adverse consequences associated with these flood scenarios. These maps form the basis for the drafting of flood risk management plans both on national and local level.

Flood risk management is an integral part of integrated river basin management. The Floods Directive is therefore closely coordinated with the Water Framework Directive. In particular, coordinating flood risk management plans, river basin management plans, and public participation procedures.

(Our in-put: The risk assessment can be delegated to national agencies/directorates and/or regional authorities.)

Questionnaire on regulations and data

A. Questions related to the **EU Climate law**

Member States shall adopt and implement national adaptation strategies and plans, (taking into consideration the Union strategy on adaptation to climate change referred to in paragraph 2 of this Article) and **based on robust climate change and vulnerability analyses, progress assessments and indicators**, and guided by the best available and most recent scientific evidence.

In their national adaptation strategies, Member States shall take into account the particular **vulnerability** of the relevant sectors, inter alia, agriculture, and of water and food systems, as well as food security, and **promote nature-based solutions and ecosystem-based adaptation**.

Questions:

1. Is this particular part of the **EU Climate law** implemented in your national *law*/regulation?
    a. Yes / No

    Please explain/Comments:

2. Is this particular part of the EU Climate law implemented in your regional/ municipal *law*/regulation?
    a. Yes / No

    Please explain/Comments:

3. Do you have a municipal/ regional climate change adaptation strategy/ action plan?
    a. Yes /No
4. What, if any, are the barriers to being able to carry out the measures in the action plan? Please explain/Comments:
5. What kind of data do you use to make these robust climate change analyses, and "progress assessment and assign values to the indicators" for the strategies/ plans?

6. Do you know what kind of data is used on the national level to make these robust climate change analyses, and "progress assessment and assign values to the indicators"?

7. What are the *barriers* to be able to carry out the mentioned analysis and assessments? (tick of all that apply)
    - No law/regulation is implemented on a national level
    - No law/regulation is implemented on regional level
    - Difficulties with interpreting national law and/or regional regulation
    - No clear or useable national guidelines
    - We do not have access to some types of climate related risk data (please, indicate which.....)
    - We do not have access to impact/loss data due to natural disaster/natural events
    - Lack or insufficient expertise in *the region* to be able to do the assessments

- Lack or insufficient of expertise in *the municipalities* to be able to carry out the assessments
- Insufficient funding and resources to conduct these analysis and assessment
- Others? Please explain:
- No barriers
- If others were selected - please add

Questions related to using **nature-based solutions:**

1. Does your national (and/or regional) law regulate the use of nature-based solutions and ecosystem-based adaptation? If so, how?

2. Does your national/ regional climate change adaptation strategy include measures related to nature-based solutions?
   If yes, please comment

3. What kind of data do you use, to be able to use nature-based solutions and ecosystem-based adaptation in your region, and in the municipalities (in your region)?

4. Is there data you do not have (i.e. not access to), that you need to be able to use nature-based solutions and ecosystem-based adaptation?

B. Questions related to the **EU flood directive**

The EU directive requires the member states have **risk assessment and flood models** on a national level, including:

- assess all areas where significant floods could take place,
- map the flood extent and assets and humans at risk in these areas,
- take adequate and coordinated measures to reduce this flood risk.

Questions:

1. Which institution on national, regional, local level makes these risk assessment and flood models
2. Are the risk assessment and flood (maps/models) used in your region to make the local climate change adaptation plans and measures? Please, explain how they are used
3. Are there barriers/ obstacles that hinder the use of these maps/ models or other information/ data?
   a. Yes / no. If yes, please explain
4. What are the barriers to collect and share this information/data (e.g. if the region makes them, but the municipalities do not use it, or they are not on a sufficient granular level etc.) Please explain

ANNEX VI: Questionnaire no. 2 - October 2024

Questionnaire:
Identifying needs for climate-related risk and loss data

Purpose:

As part of the European Horizon project SOTERIA, this questionnaire aims to gather insights from public authorities and key stakeholders regarding the collection, access, and use of climate-related risk and loss data.

This questionnaire explores your existing use of climate-related data, the gaps or challenges you face, and the functionalities you require in a user-friendly software platform for accessing and analyzing this data.

Context

Loss data is crucial for identifying areas vulnerable to and exposed to climate risks, enabling the planning and implementation of adaptation measures. For instance, Norway's Knowledge Bank has allowed municipalities to pinpoint highly vulnerable areas, supporting informed decisions on adaptation strategies. By understanding the costs of damages, countries can prioritize investments in risk reduction measures and risk transfer mechanisms, contributing to building climate resilience.

There are various types of risk and damage data (see annexes), some of which come from insurers who record and analyze damages. **This information is not only vital for local decision-making but also supports international frameworks** such as the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. The OECD highlights the importance of public-private collaboration in collecting and making available data on assets, vulnerabilities, and past losses. Consistent post-disaster loss assessments and the harmonization of data at national, regional, and international levels are essential for effectively managing disaster risks.

Questions

Job title:	Main functions:	Organization:

1. **Current use of climate-related risk data**

This section focuses on how you currently use climate-related risk and loss data in your work. We aim to understand the types of data you rely on, the specific purposes for which you use it, and any barriers you face in accessing, analyzing, or utilizing it. The insights gathered here will help us tailor the data hub to meet the real-world needs of stakeholders at various levels.

1. Do you work with climate risk and loss data?
    - Yes
    - No (If you select "No", it is not necessary to continue with the questionnaire.
2. What types of climate-related risk and loss data do you currently use in your work? (e.g., flood data, storms, economic damages, etc.)
3. What is the purpose of using this data? (e.g., policy formulation, risk assessment, disaster response, urban planning, etc.)
4. How often do you use climate risk-related data?

- Daily
- Weekly
- Monthly
- Occasionally

5. At what administrative level do you primarily focus on?
   - Asset level (infrastructure or properties)
   - Municipal
   - Regional
   - National
   - Global
6. What types of areas do you primarily work in?
   - Coastal areas
   - Urban areas
   - Rural or agricultural areas
   - Mountainous areas
   - Forest areas
   - Other: specify
7. What data sources and platforms do you use to access and visualize climate risk and loss information?

2. Data Needs

This section focuses on identifying barriers and the need for additional data, as well as understanding what would be useful to meet legal objectives.

8. What challenges or barriers do you face when accessing, interpreting, or using this data?
   - Formatting issues (e.g., compatibility problems, unreadable formats)
   - Technical limitations (e.g., software compatibility)
   - Licensing and regulatory restrictions
   - Political restrictions: How do existing policies influence the ability to use these data?
   - Trust and perception: Are there subjective barriers, such as concerns about data reliability or sources?
   - Other. (please specify)
9. Would you need additional data to comply with your legal obligations?
   - Yes
   - No (If you select "No", you can proceed to the next section.)
10. Are there specific data you need for particular geographic areas (e.g., certain municipalities or regions)? If so, what type of data is needed, and for which areas?
11. Do you need more detailed data (e.g., at a finer geographic scale, such as community, neighborhood, or asset level)? If so, what type of data and what level of detail is required?
12. Do you need projected data, such as long-term climate scenarios? If so, what specific data do you need and what time scale is required?
13. Do you find the data from insurers useful on the following aspects?
    - Cause of damage (e.g., type of hazard like storm, earthquake)
    - Natural damage (e.g., river floods, landslides)
    - Water-related damage (e.g., flash floods, sewage backups)
    - Economic losses (e.g., compensation paid to policyholders)
    - Business impacts (e.g., indirect economic costs due to interruptions)

- Date, time, and location of the damage

3. Need for a centralized climate Risk Data Platform

This section aims to understand the usefulness of developing a single platform or integrating climate risk data into an existing platform, similar to Norway's Knowledge Bank. This platform would provide local authorities and other relevant stakeholders with access to crucial climate risk data, including:

- *Database: Information on climate events, losses, and vulnerabilities.*
- *Interactive visualization: Maps and charts to identify vulnerable areas.*
- *Assessment tools: Analysis to help prioritize adaptation investments.*
- *Educational resources: Reports and case studies on adaptation strategies.*
- *Continuous updates: Regularly updated data*

14. Do you think it would be useful to have a single platform for various climate risk data? Do you already use or know of a similar platform?

15. Below is a list of suggested functionalities. What are your thoughts on these?
    - Do you think a tool that displays aggregated loss data by hazard type would be useful? If so, what types of hazards would be most relevant to include?

    - Would it be useful to have a platform that provides quick access to relevant public datasets for climate risk assessment, organized by hazard type? (e.g., tables or cards with quick access links)

Potential Interface features	

Loss Data Visualization
 	
• Feature: Display loss data per hazard type (adjusted to 2015 Euro values).
• Functionality:
  ○ Filter by region, year, and hazard type.
  ○ Aggregated loss data with regional breakdown.
• Download: Option to download filtered data in CSV/Excel.
• Visual Suggestion: Interactive map and bar charts for loss data comparison.
	Public Datasets for Risk Assessment
	
	• Feature: List of public datasets organized by hazard type.
	• Functionality:
	  ○ Links to dataset sources.
	  ○ Brief descriptions of each dataset and relevance for risk assessment.
	
	• Visual Suggestion: Table or cards with quick-access links.

4. Additional Suggestions

Do you have any additional suggestions, comments, or specific needs related to the use of climate-related risk and loss data that you'd like to share?

End Page

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