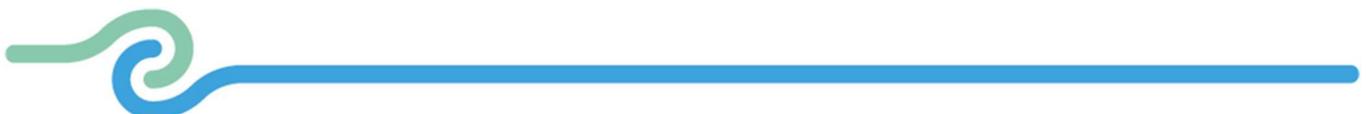




D.1.4.2

Public Climate Change Database



Italy – Croatia



Project acronym	STRENGTH
Project full title	STRategies for assessing climate change and natural hazards' impact on urban ecosystems, increasing resilience to ENvironmental hazards, and promoting territorial GrowTH
Programme	Interreg Italy-Croatia 2021-2027
Start date	01/04/2024
End date	30/09/2026
Project ID	ITHR0200318

Deliverable Title	D.1.4.2 - Public Climate Change Database
Activity	1.4
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WP Leading Partner	UNIFE
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Dissemination level	Public
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2. Public Databases on Climate Change: A Comparative Report on Italy and Croatia

Climate change presents one of the most pressing global challenges, and access to reliable, public climate data is critical for informed decision-making, policy development, and public awareness. This report explores the publicly available climate-related databases in Italy and Croatia, analyzing their scope, accessibility, and role in national and international climate efforts.

Climate data and modeling are essential tools in understanding the complexities of climate change, assessing its impacts, and formulating effective policies. They provide the scientific foundation for international agreements such as the Paris Agreement, the United Nations Framework Convention on Climate Change (UNFCCC), and the European Union's Green Deal.

Public Databases play a crucial role in Climate Modeling, Impact Assessment, and Policy Formulation. Climate models simulate the Earth's climate systems, enabling scientists to project future climate scenarios under various greenhouse gas emission trajectories. These projections inform impact assessments, which evaluate potential consequences on ecosystems, economies, and societies. Policymakers rely on these assessments to develop strategies for mitigation and adaptation, ensuring that policies are grounded in scientific evidence.

Data bases are importance for Scientists, Policymakers, NGOs, and the Public. Scientists utilize climate data to advance research, validate models, and understand climate dynamics. Policymakers depend on accurate data to craft legislation, set emission targets, and allocate resources effectively. Non-Governmental Organizations (NGOs) leverage climate information to advocate for environmental protection and to educate communities about climate risks. The Public benefits from accessible climate data to make informed decisions, engage in civic discourse, and participate in sustainability initiatives.

Accurate and transparent climate data reporting is vital for compliance with international frameworks. UNFCCC and Paris Agreement: Countries submit Nationally Determined Contributions (NDCs) outlining their emission reduction commitments. The Enhanced Transparency Framework ensures accountability by requiring regular reporting on progress. According to the European Union's Green Deal, the EU aims to become climate-neutral by



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2050. This ambitious goal necessitates comprehensive climate data to monitor progress, inform policy adjustments, and ensure alignment with broader sustainability objectives.

In summary, robust climate data and modeling are indispensable for understanding climate change, guiding policy decisions, and fulfilling international commitments. They empower various stakeholders to collaborate effectively in addressing the global climate crisis.

2.1. Italy

Italy and Croatia have established comprehensive systems for collecting and disseminating climate-related data, involving various national and regional institutions.

In Italy, the Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) serves as the central authority for environmental data collection and analysis. ISPRA compiles the National Greenhouse Gas Inventory, aligning with United Nations Framework Convention on Climate Change (UNFCCC) and European Union (EU) requirements. Additionally, ISPRA provides extensive datasets on climate indicators and environmental trends through its official website (ISPRA). Complementing these efforts, the Agenzie Regionali per la Protezione Ambientale (ARPA), such as ARPA Lombardia and ARPA Veneto, offer localized data on air quality, temperature, and precipitation (Wikipedia). For instance, ARPA Lombardia provides detailed air quality maps and data accessible via their platform. The Dipartimento della Protezione Civile (DPC) manages disaster risk information, including historical data on floods and landslides, contributing to national emergency preparedness and response strategies. Italy also actively participates in international climate data initiatives, contributing to the Copernicus Climate Data Store and submitting national reports to the UNFCCC (Wikipedia).

2.2. Croatia

In Croatia, the Državni hidrometeorološki zavod (DHMZ) serves as the primary institution for meteorological and climate data. DHMZ maintains an extensive archive of meteorological observations, climate projections, and historical climate trends, all accessible through their website (Meteo.hr). The Ministry of Economy and Sustainable Development oversees national climate policy documents, greenhouse gas inventories, and climate action strategies, ensuring alignment with international commitments. The Hrvatska agencija za okoliš i prirodu (HAOP) provides environmental indicators, including data on climate impacts, through a data portal that aligns with the European Environment Agency (EEA) and the European Environment Information and Observation Network (EIONET) (MINGOR). Croatia contributes to EU and international climate databases, utilizing resources from Copernicus

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and the Intergovernmental Panel on Climate Change (IPCC) for national reporting and policy development.

Both countries demonstrate a commitment to transparent and accessible climate data, supporting research, policy-making, and public awareness in addressing climate change challenges.

3. Data sets references

Publicly available resources and datasets focusing on floods, droughts, and coastal erosion in Italy and Croatia, along with their respective website addresses:

Italy and Croatia are increasingly experiencing the impacts of climate change, particularly in the form of floods, droughts, and coastal erosion.

In May 2023, the Emilia-Romagna region of Italy faced devastating floods due to unprecedented rainfall that caused 23 rivers to overflow. The disaster resulted in at least 15 fatalities, displaced over 50,000 people, and caused damages exceeding €10 billions.

To mitigate such events, Italy has developed high-precision predictive flood maps and property-level flood risk data, which are crucial for minimizing the consequences of flooding . Additionally, studies using tools like CoastSat have investigated the evolution of Italy's sandy coastlines from 1984 to 2024, highlighting critical challenges in river delta management and coastal erosion .

The G20 Climate Risk Atlas projects that, under a medium emissions scenario, the population in Italy exposed to annual coastal flood levels is expected to increase from 430,000 to 480,000 by 2050, emphasizing the need for proactive climate adaptation measures.

In Croatia, the capital city Zagreb experienced a severe flash flood in July 2020, where intense rainfall overwhelmed the city's sewer system, leading to significant flooding and property damage.

Sea-level rise poses significant risks to Croatia's low-lying coastal areas, including towns like Rovinj, Pula, and Split. These areas are vulnerable to storm surges and river floods, necessitating comprehensive coastal management strategies.

Droughts occur every three to five years in Croatia, severely impacting agriculture. Water stress during critical growth phases can reduce crop yields by up to 92%, depending on the severity .

The World Bank's Climate Change Knowledge Portal indicates that Croatia faces risks from decreased precipitation and increased extreme weather events, affecting agriculture and water resources .



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Research suggests that a sea-level rise of 86 cm could significantly impact coastal flood risk in Croatia, particularly affecting areas like the western Istrian coast and the Neretva River delta .

These datasets and reports are invaluable for scientists, policymakers, NGOs, and the public to understand and address the impacts of climate change in Italy and Croatia. They provide the foundation for developing effective adaptation and mitigation strategies in the face of increasing climate-related risks.

3.1. 1. ISPRA (2024) – Climate Reports (Italy)

Website: <https://www.isprambiente.gov.it>

- National Inventory Report 2024:
<https://www.isprambiente.gov.it/en/publications/reports/italian-greenhouse-gas-inventory-1990-2022-national-inventory-report-2024>
- Informative Inventory Report 2024:
<https://www.isprambiente.gov.it/en/publications/reports/italian-emission-inventory-1990-2022-informative-inventory-report-2024>
- Atlas of Environmental Data 2024:
<https://www.isprambiente.gov.it/en/publications/luxury-publications/atlas-of-environmental-data-edition-2024>
- Environmental Data Yearbook 2024:
<https://www.isprambiente.gov.it/en/publications/state-of-the-environment/environment-in-italy-an-overview-2024-environmental-data-yearbook>
- ISPRA Report: Landslides and Floods in Italy – Hazard and Risk Indicators (2021 Edition)
This report provides an updated overview of landslide and flood hazards, including coastal erosion, and presents risk indicators related to population, buildings, and cultural heritage.
<https://www.isprambiente.gov.it/en/publications/reports/landslides-and-floods-in-italy-hazard-and-risk-indicators-2021-edition>
- An interactive platform by ISPRA offering access to data and maps on landslide and flood hazards across Italy.
<https://idrogeo.isprambiente.it/app/>
- ISPRA Drought Bulletin: Provides monthly-updated maps of the Standardized Precipitation Index (SPI) over various timescales, monitoring drought conditions across Italy.
https://www.isprambiente.gov.it/pre_meteo/siccitas/index_en.html,
Coastal Erosion



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- ISPRA Coastal Areas Report assesses the state of Italian coastal areas, highlighting regions at high risk of erosion and providing maps of coastal risk.
<https://www.isprambiente.gov.it/en/archive/news-and-other-events/ispra-news/2023/11/climate-change-and-coastal-erosion-in-italy-54-coastal-municipalities-have-high-erosion-rates>
- ISPRA Geodatabase for Monitoring Italian Coasts
A geodatabase facilitating the monitoring and analysis of the state of Italian coasts, with applications to specific coastal areas.
https://www.researchgate.net/publication/369407199_The_ISPRA_geodatabase_for_monitoring_and_analysis_of_the_state_of_the_italian_coasts_an_example_of_its_application_to_the_Rocchette_-_Castiglione_della_Pescaia_coast_line

3.2. Climate Trends and Projections (Croatia)

- Website: <https://meteo.hr>
- Climate monitoring and projections section (Croatian only):
https://meteo.hr/klima.php?section=klima_hrvatska&lm=trendovi

3.3. EEA (2024) – Climate and Emissions Database

- Joint Research Centre's publications: <https://publications.jrc.ec.europa.eu/repository/>
- Website: <https://www.eea.europa.eu>
- GHG Policies and Measures Database: <https://pam.apps.eea.europa.eu>
- Total GHG Emissions and Removals: <https://www.eea.europa.eu/en/datahub/datahubitem-view/3b7fe76c-524a-439a-bfd2-a6e4046302a2>
- Trends and Projections in Europe 2024: <https://www.eea.europa.eu/en/analysis/publications/trends-and-projections-in-europe-2024>
- DHMZ VEPAR Project Aims to improve non-structural flood risk management measures in Croatia, including modernization of hydrological monitoring and flood forecasting systems.
https://meteo.hr/istrazivanje_e.php?el=VEPAR_e¶m=projekti_all§ion=projekti

3.4. UNFCCC – National Communications

Website: <https://unfccc.int>

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Reports repository (National Communications & Biennial Reports):
https://unfccc.int/reports?f%5B0%5D=corporate_author%3A95&f%5B1%5D=document_type%3A626

3.5. Copernicus CDS Portal – Climate Data Store

Website: <https://cds.climate.copernicus.eu>

- Main portal: <https://cds.climate.copernicus.eu>
- ERA5 Single Levels Reanalysis: <https://cds.climate.copernicus.eu/datasets/reanalysis-era5-single-levels?tab=download>
- CMIP6 Climate Projections: <https://cds.climate.copernicus.eu/datasets/projections-cmip6?tab=download>

Feature	Italy	Croatia
Main Climate Agency	ISPRA, ARPA	DHMZ, HAOP
GHG Inventory Access	Open, detailed reports	Open, via ministry & UNFCCC submissions
Localized Data	Strong regional coverage (via ARPA)	Centralized (DHMZ); less regional detail
EU Integration	High (EEA, Copernicus, UNFCCC)	High (EEA, Copernicus, UNFCCC)
Public Access/Usability	Generally accessible, some portals dated	Mixed accessibility, language barriers

3.6. The JRC datasets

The most pertinent Joint Research Centre (JRC) publications and datasets focusing on flood risks in Italy and Croatia, along with their direct web addresses:

1. Adapting to Rising River Flood Risk in the EU Under Climate Change (PESETA IV – Task 5)
This report assesses future river flood risks across the EU, including Italy and Croatia, under various climate change scenarios. It provides projections of flood impacts on populations and economic assets, aiding in the development of adaptation strategies.

Read the report at <https://publications.jrc.ec.europa.eu/repository/handle/JRC118425>.



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2. Flood Hazard Maps at European and Global Scale

This dataset offers high-resolution flood hazard maps for Europe and the Mediterranean Basin, including Italy and Croatia. It depicts flood-prone areas for various return periods, supporting flood risk assessments and management.

Access the dataset at <https://publications.jrc.ec.europa.eu/repository/handle/JRC103765>

3. Adapting to Rising Coastal Flood Risk in the EU Under Climate Change (PESETA IV – Task 6)

Focusing on coastal flood risks, this report evaluates the potential impacts of sea-level rise and extreme weather events on coastal regions, including those in Italy and Croatia. It emphasizes the importance of adaptation measures in mitigating these risks.

Read the report at <https://publications.jrc.ec.europa.eu/repository/handle/JRC118512>

4. Climate Change and Critical Infrastructure – Floods

This publication examines the vulnerability of critical infrastructure to flood risks exacerbated by climate change. It provides insights into how floods can impact essential services and infrastructure in European countries, including Italy and Croatia.

Read the report at <https://publications.jrc.ec.europa.eu/repository/handle/JRC109015>.

5. PESETA III – Task 7: River Floods

This report presents an assessment of river flood risks in Europe, investigating the potential impacts under different climate scenarios. It includes evaluations relevant to Italy and Croatia, aiding in understanding future flood hazards.

Read the report “PESETA III – Task 7: River Floods” at <https://publications.jrc.ec.europa.eu/repository/handle/JRC110308>.

6. Long-Term Impacts of Coastal Floods in Europe: A Probabilistic Analysis

This technical report provides a probabilistic analysis of long-term coastal flood impacts in Europe, considering factors like sea-level rise and socio-economic changes. It offers valuable insights for coastal regions in Italy and Croatia.

Read the report “Long-term impacts of coastal floods in Europe: a probabilistic analysis” at <https://publications.jrc.ec.europa.eu/repository/handle/JRC132103>.



3.7. -CLIMAXX

The CLIMAXX project provides a comprehensive workflow to assess flood risks, particularly emphasizing economic damage to buildings and the exposure and displacement of populations. This workflow integrates hazard data (flood maps), exposure data (buildings and population), and vulnerability data (damage curves) to estimate potential impacts of flooding events.

Key Components of the Workflow are:

- Hazard Data: Utilizes European-wide river flood hazard maps developed by the European Commission's Joint Research Centre (JRC). These maps cover various return periods (e.g., 10, 20, 50, 100, 200, and 500 years) at a resolution of 3 arc seconds, providing detailed flood depth information.
- Exposure Data: Incorporates building footprints and classifications from OpenStreetMap and population distribution data from the Global Human Settlement Layer (GHS-POP) R2023A dataset.
- Vulnerability Data: Applies damage curves to estimate economic losses to buildings based on flood depth and building characteristics.

The outputs are:

- Estimates of economic damage to buildings under various flood scenarios (handbook.climaax.eu)
- Identification of critical infrastructure impacted by flooding.
- Assessment of population exposure and estimates of displaced individuals due to flooding. (handbook.climaax.eu)

Detailed documentation and guidance on implementing the workflow can be found at:
http://handbook.climaax.eu/notebooks/workflows/FLOODS/03_Flood_damage_and_population_exposure/Risk_assessment_FLOOD_BUILDING_POPULATION.html
and:

GitHub Repository: The source code and related resources are available at:

<http://github.com/CLIMAXX/FLOODS>

This workflow is particularly useful for stakeholders involved in disaster risk reduction, urban planning, and climate adaptation strategies, providing a robust tool for assessing and mitigating flood risks.



4. Challenges and Opportunities

An analysis of the current climate data management landscape in Italy and Croatia follows, highlighting existing challenges and opportunities for improvement.

4.1. Italy: Fragmented Regional Systems and the Need for Integration

Italy's climate data infrastructure is characterized by a decentralized approach, with various regional agencies and institutions managing their own datasets. While this allows for region-specific data collection, it often leads to inconsistencies in data formats, accessibility, and comprehensiveness across regions.

Efforts have been made to centralize data access. For instance, the SCIA platform developed by the Italian Institute for Environmental Protection and Research (ISPRA) offers unified access to climate data. Additionally, high-resolution climate projections, such as the VHR-PRO\IT dataset, provide detailed climate information for Italy. However, these initiatives are not yet fully integrated into a single, cohesive national portal, making it challenging for users to access comprehensive climate data seamlessly.

4.2. Croatia: Centralized Data with Resolution Limitations

Croatia maintains a more centralized climate data system through the Croatian Meteorological and Hydrological Service (DHMZ). The DHMZ provides access to various climate datasets and has developed high-resolution monthly gridded datasets of homogenized surface air temperature. Despite these advancements, some datasets, such as those available on the World Bank's Climate Change Knowledge Portal, are presented at a coarser resolution (0.5° x 0.5°), which may not capture localized climate variations effectively.

To enhance data resolution and accessibility, Croatia has implemented projects like METMONIC, which deploys automatic meteorological systems and oceanographic buoys to deliver real-time, high-quality data on the country's atmosphere and sea.

4.3. Shared Challenges: Enhancing Data Visualization and User Interfaces

Both Italy and Croatia face challenges in presenting climate data in user-friendly formats. The existing platforms often lack intuitive interfaces and advanced visualization tools, making it difficult for non-expert users to interpret and utilize the data effectively. Improving



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data visualization and user interfaces is crucial to facilitate public engagement and informed decision-making regarding climate adaptation and mitigation strategies.

4.4. Opportunities: EU Support for Harmonization and Open Data Initiatives

The European Union offers significant support for harmonizing climate data and promoting open data initiatives. Programs like the Copernicus Climate Change Service (C3S) provide access to a wide range of climate data and tools. Additionally, the European Open Science Cloud (EOSC) aims to create a federated environment for sharing and analyzing research data across Europe.

Projects such as CLIMAAX are designed to contribute to the harmonization and consolidation of climate risk assessments across Europe, providing financial, analytical, and practical support to improve regional climate and emergency risk management plans.

Furthermore, the EU's Open Data Directive encourages member states to make public sector information more accessible and reusable, fostering transparency and innovation.

By addressing the fragmentation in Italy's regional systems, enhancing the resolution of Croatia's centralized data, and improving data visualization tools, both countries can significantly advance their climate data infrastructures. Leveraging EU support and open data initiatives will be instrumental in achieving these goals, promoting better climate resilience and informed policymaking across the region.

5. Conclusion and Recommendations

Public climate databases in Italy and Croatia are essential tools in the fight against climate change. While both countries maintain solid foundations, improvements in accessibility, data integration, and user engagement are needed.

To enhance climate resilience in the Adriatic region, particularly in Italy and Croatia, several strategic actions are recommended.

5.1. Develop Centralized, Multilingual Portals

While both Italy and Croatia have made strides in climate data management, their systems often remain fragmented or lack comprehensive integration. Initiatives like the ADRIADAPT project have introduced a multilingual adaptation platform to support municipalities along the Adriatic coast in developing climate adaptation strategies. This platform offers solutions



tailored to the region's specific needs, facilitating access to scientific data and adaptation plans.

Building upon such initiatives, establishing centralized portals that consolidate climate data and resources in multiple languages would enhance accessibility for policymakers, researchers, and the public across the region.

5.2. Improve Data Visualization and Interactivity

Effective communication of climate data is crucial for informed decision-making and public engagement. Projects like ADRIACLIM have focused on developing tools for monitoring and managing climate information, emphasizing the importance of user-friendly interfaces and interactive visualizations.

Enhancing these tools to include dynamic maps, scenario modelling, and interactive dashboards can make complex data more understandable and actionable for diverse audiences.

5.3. Ensure Regular Updates and Public Engagement Campaigns

Maintaining up-to-date climate data and actively engaging the public are essential for fostering a culture of resilience. Regularly updated platforms, coupled with public awareness campaigns, can educate communities about climate risks and adaptation strategies. Engaging citizens through workshops, educational programs, and participatory projects ensures that climate initiatives are grounded in local contexts and have broad support.

5.4. Foster Cross-Border Data Sharing (e.g., Adriatic Sea Climate Risks)

Climate change impacts transcend national boundaries, necessitating collaborative approaches. Cross-border projects like AdriaMORE have aimed to improve hydro-meteorological risk management in the Adriatic coastal areas of Italy and Croatia by enhancing existing monitoring platforms.

Expanding such collaborations to include shared databases, joint research initiatives, and harmonized policies can lead to more effective management of shared resources and risks in the Adriatic region.



By implementing these strategies, Italy and Croatia can strengthen their climate resilience, promote sustainable development, and serve as models for regional cooperation in addressing climate change.

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