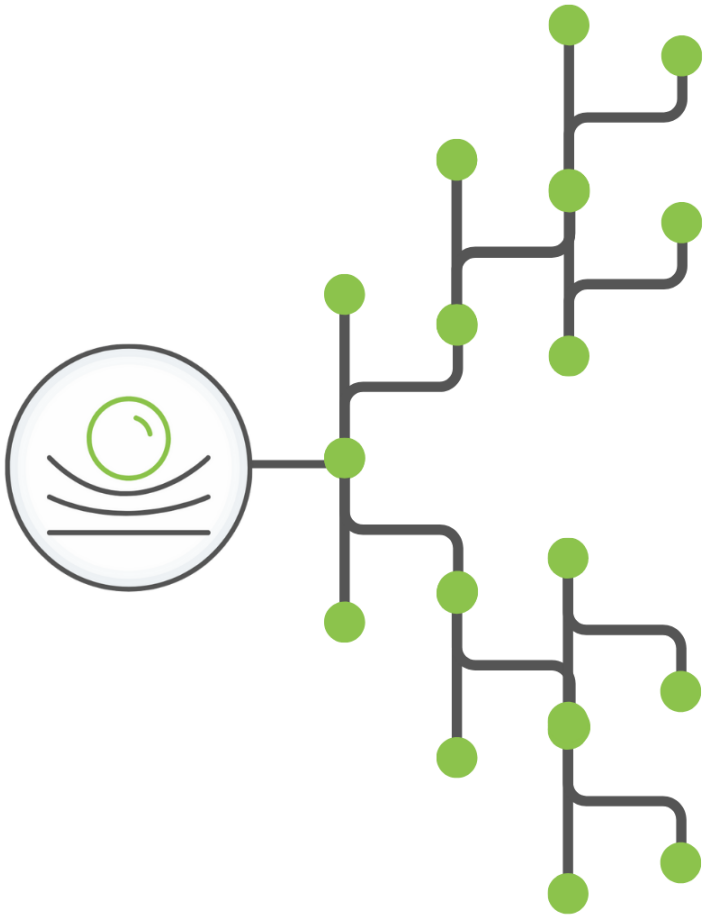
REGILIENCE

Regional Pathways to Climate Resilience



# D3.1 Structured overview of activities in Innovation Packages

JANUARY 2022

www.regilience.eu

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| **Dissemination Level** | |
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| **X** | PU - Public |
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# About

REGILIENCE aims to foster the adoption and wide dissemination of regional climate resilience pathways, following a demand-driven approach and bearing in mind the expertise and knowledge acquired, as well as the solutions available from Innovation Packages and other sources. The project aims to support the Green Deal targets and communication by implementing Innovation Packages that will address key community systems and comprises the adaptation solutions and pathways deemed essential for climate and social resilience in the specific regional contexts and the set timeline. The REGILIENCE project aims to facilitate the replication of Innovation Packages in 10 vulnerable and low-capacity regions, additional to those targeted by the Innovation Package projects, after a selection process and the signature of a workplan agreement. This ambition is aligned with the Horizon Europe's proposed Mission "Prepare Europe for climate disruptions and accelerate the transformation to a climate-resilient and just Europe by 2030". It will implement the LC-GD-1-3-2020 RIA project results on the Innovation Packages.

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036560.

# Project partners

# Table of Contents



# List of Figures



# List of Tables

# 1 Introduction

As Coordination and Support Action, REGILIENCE is working closely with three sister projects (Innovation Actions) to amplify the reach and impact of results, coordinate actions and maximise benefits for communities impacted by climate change. The three projects are

- ARSINOE – Climate resilient regions through systemic solutions and innovations (Grant ID: 101037424), https://cordis.europa.eu/project/id/101037424
- IMPETUS – Turning climate commitments into action (Grant ID: 101037084), https://cordis.europa.eu/project/id/101037084 and
- TransformAr – Accelerating and upscaling transformational adaptation in Europe: demonstration of water-related innovation packages (Grant ID: 101036683), https://cordis.europa.eu/project/id/101036683

Monitoring outcomes and impacts is one of the topics on which REGILIENCE is coordinating and supporting activities between these three projects. As a starting point for this work, we designed an overview on the resilience strengthening activities that the three Innovation Action projects are implementing in their target regions. In the following, the Innovation Action projects will be referred to as "IAs" or "the projects". At earlier stages, they were often referred to as the "Innovation Packages", hence the official title of this deliverable.

There are no impact targets or Key Performance Indicators (KPI) directly related to this activity/task, even if the indicators are an important tool to assess climate resilience pathways.

This section outlines the purposes of this report and how it was developed. The subsequent sections consist of the overview on the activities, structured in different ways.

The purpose of an overview on the activities of the IAs in their target regions can be best explained in the context of the work of REGILIENCE on monitoring (WP 3). A key goal of REGILIENCE is the development of indicators which can a) support the monitoring of climate resilience in European regions and b) support the analysis of the impacts of the IAs' activities on climate resilience in the regions in which they are operating. In order to develop such indicators, it is important to have an overview on what types of activities the IAs are actually planning to implement.

There are no immediate implications from the overview, but it will serve as an important reference point for the development of the indicators in the coming months.

The information on the IAs activities was gathered from two sources: We analysed the responses that the projects had sent to a survey of REGILIENCE and we combed through project documents that the IAs had kindly provided REGILIENCE with. In some instances, we were provided with information from the IAs via direct communication in online meetings.

# 2 Overview on activities of the IAs in the regions

## 2.1 Geographic overview

The map below shows the 22 target areas in which the three projects are implementing activities. For an overview on the regions in the format of a table, please refer to the Annex I: Target areas in the three IAs. For setting the focus for the work on indicators a few things should be noted:

1. Most of the target areas are regions, six are cities and three are ports.
2. The majority of the target areas have a coastline, only eight do not.
3. There are three areas where more than one project is implementing activities: Western England, Sardinia and the area of Athens and its surroundings.

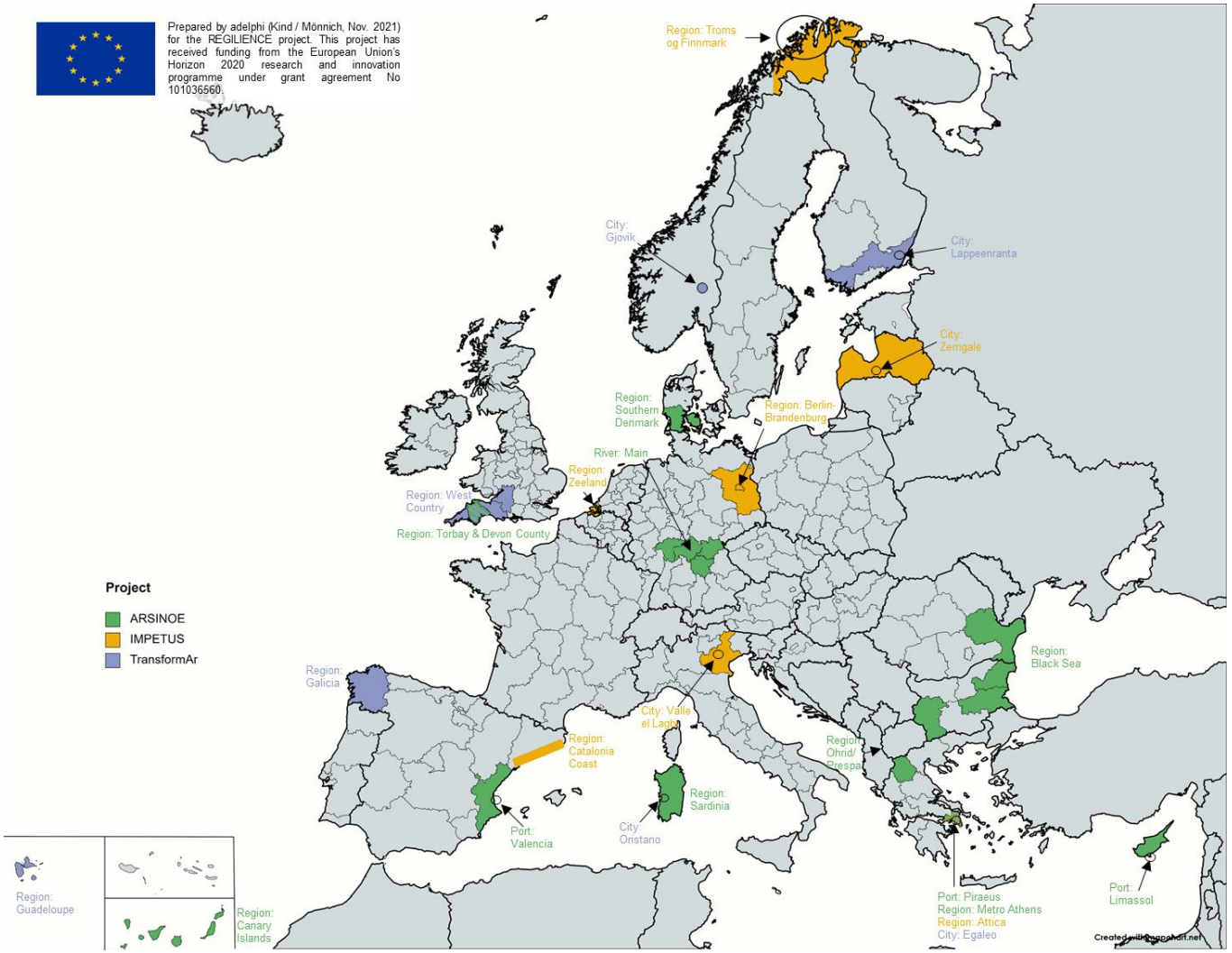


***Figure 1: Overview on the target regions of the IAs***

## 2.2 Types of activities

In sum, the IAs mention 68 distinct activities that they will be implementing in their target areas. The overview of activities by project can be found in the Annex II: Overview of activities by project. To get an overview on the nature of these activities, we created types or categories of activities and added each activity to up to three types. “Creating a citizen app” for example is an activity that we added to the type “Inform” and to “Create Software”.

The types can be described as follows:

- Analyse: Activities that focus on analysing states or developments, e.g. a vulnerability assessment for a city;
- Inform: Activities that focus on delivering information to target groups, e.g. setting up a climate innovation hub;
- Infrastructure & Management – Water: Activities that deal with building or upgrading water-related infrastructure or with water management, e.g. implementing a stormwater management system;
- Monitor: Activities that focus on collecting and analysing data for monitoring purposes, e.g. monitoring flow rates and water quality in a river;
- Infrastructure & Management – Soil: Activities that deal with building or upgrading soil-related infrastructure or with soil management, e.g. treating soil to reduce its salinity;
- Create software: Programming apps, websites or any other software, e.g. creating a citizen app with information on climate impacts;
- Create / nurture networks: Activities that focus on establishing, strengthening or widening any networks of people, e.g. creating an alliance for a resilient coast;
- Map: Activities concerned with mapping information onto a geographical space, e.g. creating a map with heatwave hot spots for a municipality;
- Provide access to capital: Activities that focus on providing access to financing for climate-related actions, e.g. setting up a regional fund where small-scale projects can apply for funding;
- Develop plan / strategy: Activities concerned with drafting plans or strategies on how to deal with impacts of climate change or strengthen resilience, e.g. developing an adaptation strategy for a coastal region;
- Install sensors: Activities that deal with installing equipment for the purposes of data collection, e.g. installing a sensor that measures nutrient levels in a lake.

The figure below shows how many activities are connected with which types: The category with the most activities is “Analyse”, second in line is “Inform”. Thus, we see a focus here that is very traditional for EU-funded research projects: producing insights and informing different actors about them.

Activities that can have a more direct impact on resilience and physical surroundings can be found in mostly in the categories “Infrastructure & Management: …" (e.g. efficient purification of stormwater runoff, or improved soil management in wetlands, greening roofs or installing a smart sea-opening system).

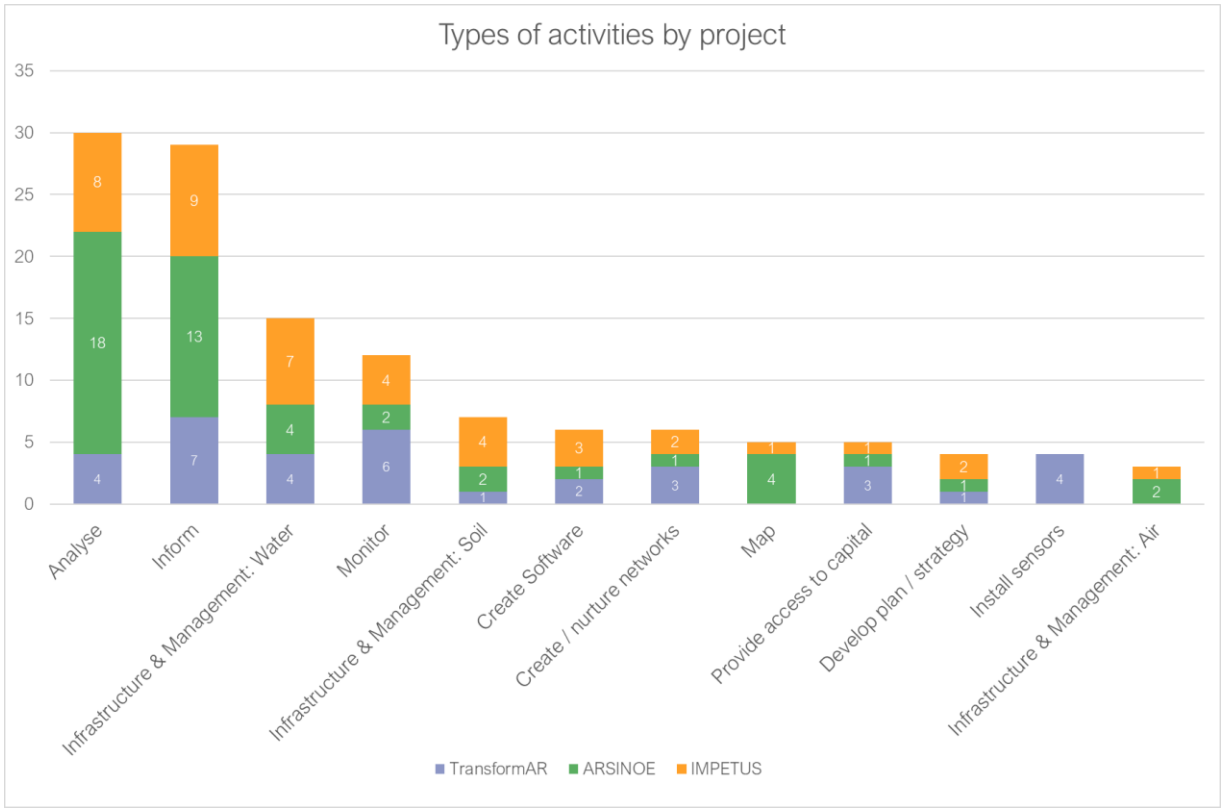


***Figure 2: Types of activities by project***

## 2.3 Climate-related hazards

Figure 3 shows which number of activities are addressing which climate-related hazards. The list of hazards that we used is inspired by an overview from the EU Taxonomy[1]. Linking the activities to hazards was a very subjective exercise as many activities can often be linked with a multitude of impacts, e. g. the activity "Evaluate and monitor changes in the spatial distribution of species" relates in equal parts to how changing air temperature is affecting species on land and to how changing marine temperature is affecting underwater species.

Still, a couple of things can be noted here: Coastal and marine issues seem to be the ones that are addressed by the largest number of activities (which might be expected given the geographic distribution of target areas, see 2.1). In a rough ranking of importance, the topics of drought and heavy precipitation and river floods would be next, then the cluster of extreme heat and air temperature changes. 28 activities are addressing a broad range or unspecific hazards. For two activities, it was not possible to link them to any climate-related hazards ("Develop and carry out youth assemblies and training for trainers" and "Carry out demand analysis for social services/infrastructures").

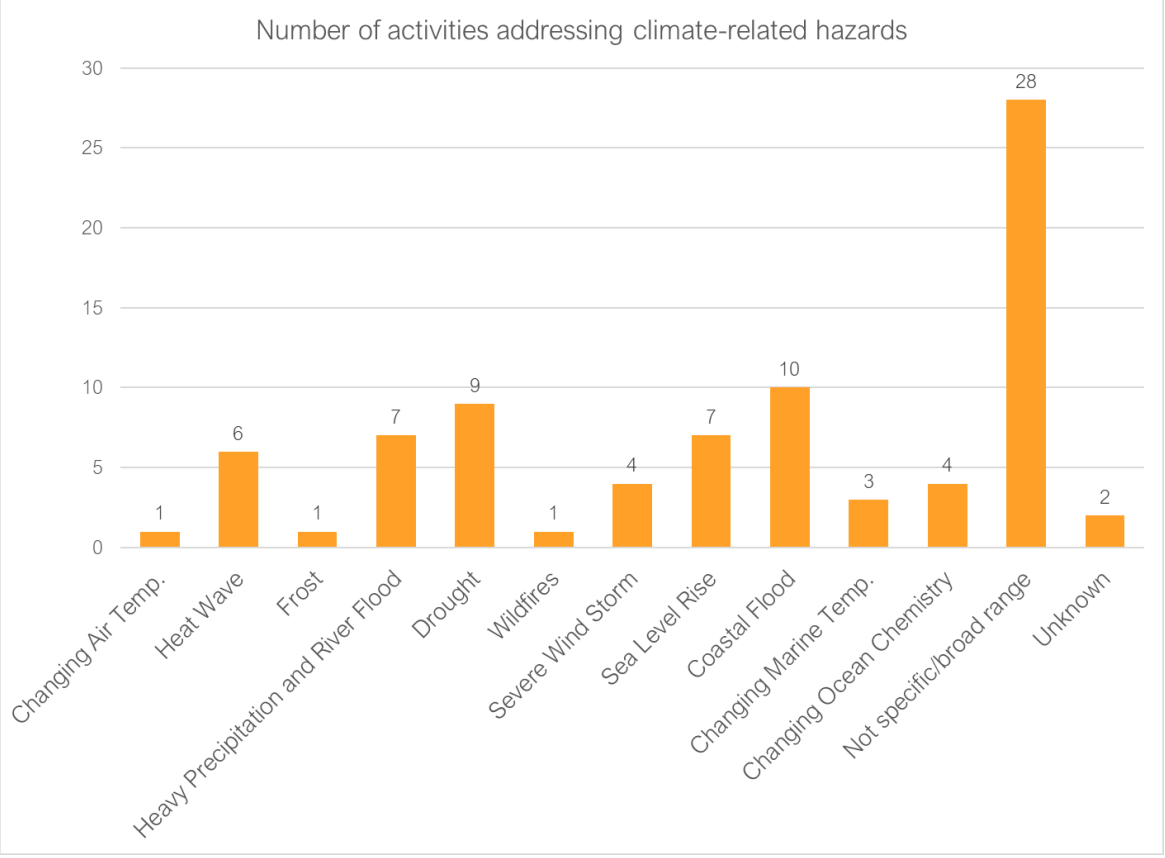


***Figure 3: Number of activities addressing climate-related hazards (one activity can address more than one hazard)***

[1] https://eur-lex.europa.eu/resource.html?uri=cellar:d84ec73c-c773-11eb-a925-01aa75ed71a1.0021.02/DOC_2&format=PDF (p. 190),

# Annex I: Target areas in the three IAs

The table presents an overview on the target areas in the three IAs.

*Table 1: Overview on target areas of the three IAs*

| Target area | Geographic Type | Country |
|---|---|---|
| **Arctic** | Region | NO |
| **Athens Metropolitan Area** | City | EL |
| **Atlantic** | Region | various |
| **Black Sea** | Region | various |
| **Canary Islands** | Region | ES |
| **Coastal** | Region | various |
| **Egaleo** | City | EL |
| **Galicia** | Region | ES |
| **Guadeloupe Archipelago** | Region | FR |
| **Lappeenranta** | City | FI |
| **Main River** | Region | DE |
| **Mediterranean** | Region | various |
| **Mountain** | Region | various |
| **Ohrid/Prespa lakes** | Region | MKD, ALB |
| **Oristano** | City | IT |
| **Piraeus, Limassol and Valencia** | Port | EL, CYP, ES |
| **Piraeus, Limassol and Valencia** | Port | EL, CYP, ES |
| **Sardina** | Region | IT |
| **Southern Denmark** | Region | DNK |
| **Torbay and Devon County** | Region | UK |
| **West country** | Region | UK |

# Annex II: Overview of activities by project

The annex shows the activities of all three projects in detail.

***Table 22: Overview of activities of the TransformAr project in its target regions***

| Activity | Description | Target area | Geographic Type | Country | Type of activity | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Build / plant | Install sensors | Monitor | Analyse | Map | Inform | Create/nurture networks | Provide access to capital | Train | Programme | Manage / treat resources | Develop plan / strategy |
| Implement a stormwater management system | New, modular treatment system for cost-efficient and replicable stormwater treatment. Adapts conventional, underground waste collection containers to purify stormwaters with integrated replaceable filter bags and adsorbent beds. Low footprint at high capacity serves the need of urban stormwater treatment before discharge to the environment | Lappeenranta | City | FI | 1 | | | | | | | | | | 1 | |

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| Conduct digital monitoring | Monitoring system with simple probes to monitor flow rates and water quality through individual modules. The monitoring user interface will be made visual and browser-based, enabling access from any smartphone or laptop. Publicly displayed information will be accessible to all | Lappeenranta | City | FI | | 1 | 1 | | | | | | | | | |
| Build smart climate stations | To acquire a detailed view of the micro-climatic conditions, with focus on better understating of the fine scale flows and heat exchanges leading to urban heat island, its diurnal variation and supporting studies apportioning its origins and determination factors. Data will be used in addition to existing environmental, transport, energy data from the city forming a city-wide IoT to be used in other relevant action | Egaleo | City | EL | | 1 | 1 | | | | | | | | | |
| Conduct mussel raft monitoring | Environmental and hydrodynamic sensors based on the implementation of IoT solutions powered by solar and wind energy. Digitalization will allow knowing in | Galicia | Region | ES | | 1 | 1 | | | | | | | | | |

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| | real-time the state of the platform, alarms in case of risky water conditions and the construction of a comprehensive database | | | | | | | | | | | | | | | |
| Facilitate intertidal monitoring | To improve the knowledge of environment behaviour and numerical modelling to predict banks response under changing environmental conditions | Galicia | Region | ES | | | 1 | | | | | | | | | |
| Conduct ICW monitoring | Sensors installed to monitor nutrient loading | West country | Region | UK | | 1 | 1 | | | | | | | | | |
| Implement integrated Constructed wetlands | Nutrient and soil management measures to demonstrably control farmyard run-off by catching nutrients, sequestering carbon and creating additional water for farmers | West country | Region | UK | 1 | | | | | | | | | | 1 | |
| Integrate NBS for urban stormwater management | Part of the urban run-off system. New plants, greeneries and green roofs | Lappeenranta | City | FI | 1 | | | | | | | | | | | |
| Implement Smart Grid for | Smart sea-opening system using rapid unhooking grid and gates for | Oristano | City | IT | 1 | | | | | | | | | | | |

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| coastal management | emergency opening in case of extreme events | | | | | | | | | | | | | | | |
| Facilitate nudging | Nudge design and understanding the factor of personalisation (based upon VERHAERT's choice modelling technology Lytics). Personalisation will be elaborated in terms of motivation and ability; hence intervention design or nudges will become more appropriate | Guadeloupe Archipelago | Region | FR | | | | 1 | | 1 | | | | | | |
| Develop citizen app | Mobile application for crowd sensing and real time monitoring of extreme flooding events due to CC events by citizens | Lappeenranta | City | FI | | | | | | 1 | | | | 1 | | |
| Develop citizen app augmentation | Augmentation of existing app and web-portal for local citizens to conduct a vulnerability and resilience assessment to CC, using a holistic approach (accounting for carbon, environmental and energy footprint), potential exposure and vulnerabilities identification to CC | Egaleo | City | EL | | | | | | 1 | | | | 1 | | |

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| Carry out awareness-raising and behavioural change modules | Conducted throughout the duration of the project and will be utilised additionally to monitor the impact of the project activities on the local population | Egaleo | City | EL | | | | | | 1 | | | | | | |
| Develop Resilience Index | Provides Shellfish stakeholders along the value chain with an assessment of where is more strategic to focus the efforts. The sector has a low introduction of new technologies, where most of the mussel rafts are traditional family business with no-concern at all about CC and risks evaluation. However, smartphones are used and could be an easy enter-door to introduce these disruptive technologies to improve climate resilience. Assistance tool for policymakers in which recommendations are derived from the index above to define actions and a roadmap to improve resilience. For example, this solution will allow for decision of changes in the periods for seed collection, subsidies and/or | Galicia | Region | ES | | | 1 | | | 1 | | | | | | |

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| | insurances for extreme weather events | | | | | | | | | | | | | | | |
| Develop coastal contracts | Instrument for ensuring greater coordination between different levels of spatial planning and authorities in charge of coastal wetlands management, while limiting conflicts between preservation issues and economic activities. Promotes voluntary agreements between public institutions and private individuals, new forms of institutional cooperation, new ways of integrating the different practices of spatial and sectoral planning | Oristano | City | IT | | | | | | 1 | 1 | | | | | 1 |
| Carry out demand analysis for social services/infrastructures | Continuous assessment of climate "deep resilience" of SI, following H2020-EU-CIRCLE project methodology, creating stronger social networks and reducing inequality | Egaleo | City | EL | | | | 1 | | | | | | | | |
| Create Climate Innovation Hub | Within the existing Municipal Innovation Hub, promoting green, resilient and climate friendly entrepreneurship towards the | Egaleo | City | EL | | | | | | 1 | 1 | | | | | |

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| | creation of a Climate Innovation Hub | | | | | | | | | | | | | | | |
| Facilitate green bonds | In the UK demonstrator, the identification and use of change-agents as a broker between private buyers and private sellers that allow for complex and layered environmental goods and services to be transacted. The role of the change-agent is to pull together all stakeholders and seek agreement on the protocols needed to assess the costs and the benefits either to secure future public funding or the measurement, accounting and verification needed to make goods and services bankable | West country | Region | UK | | | | | | | 1 | 1 | | | | |

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| Facilitate Adaptation Fund | Various financial flows exist, from the French public agencies at local and national level, but also EU-wide. For investments at local level, in this case the overseas region of Guadeloupe, there is no harmonised vision on financing in climate change adaptation. A need exists for better cohesion to direct existing flows into specific types of adaptation's actions. Mechanisms will be setup, resulting in a fund, on how to bundle and catalyse financial flows in Guadeloupe with the specific aim of climate adaptation | Guadeloupe Archipelago | Region | FR | | | | | | | | 1 | | | | |
| Carry out choice experiment for investors | Choice experiments for stormwater management system upscaling | Lappeenranta | City | FI | | | | 1 | | | | | | | | |
| Develop insurance mechanism | Development and validation of damage functions, as part of climate proofing | All | | All | | | | 1 | | | | 1 | | | | |

*Table 33: Overview of activities of the ARSINOE project in its target regions*

| Activity | Description | Target area | Geographic Type | Country | Type of activity | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Build / plant | Install sensors | Monitor | Analyse | Map | Inform | Create/nurture networks | Provide access to capital | Train | Programme | Manage / treat resources | Develop plan / strategy |
| Develop a climate change base and Urban Heat Island layer<br><br>OR<br><br>Downscaling state-of-the-art climate projections for producing urban and health | Climatic indicators relevant to the urban environment and human health will be calculated. Such indicators indicatively include number of days classified according to temperature and humidity, discomfort indices, etc. using state of the art RCM/GCM pairs developed within the EURO-CORDEX initiative. Downscaling techniques will be implemented, in order to obtain the appropriate climatic data for Athens, at a higher horizontal resolution (typically in the order of 1-3km). To this aim, a high-resolution gridded dataset for temperatures and precipitation will be produced, using advanced interpolating methodologies. The UHI will be | Athens Metropolitan Area | City | EL | | | | 1 | 1 | 1 | | | | | | |

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| related indicators | mapped, as it has also been related to human health (and COVID) creating problems in sensitive populations, as it can increase the magnitude and duration of heatwaves in dense urban environments and thus lead to higher mortality rates. The surface UHI intensity will be assessed also in connection with the green infrastructure of the city | | | | | | | | | | | | | | | |
| Produce a baseline assessment of urban biodiversity and build on its enhancement | ARSINOE will develop a Citizen Observatory (CO), a community-based monitoring and information system that will build on novel observation applications. Species occurrence data, photographs, videos, audio recordings, images, soundscape recordings etc. will be collected via personal devices (smartphones, tablets, IT sensors), to complement a CO of urban biodiversity for Athens. Further, Citizen Science (SSc.) activities will be organized with the purpose of recording, geolocating and classifying trees in AMA, thus enriching the CO with a robust | Athens Metropolitan Area | City | EL | | | 1 | 1 | 1 | 1 | | | | | | |

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| | inventory and the systematic monitoring of all urban trees | | | | | | | | | | | | | | | |
| Improve Green Infrastructure (mapping urban biodiversity elements in Athens) | Enable the identification of hotspots of Urban Green Spaces (UGSs). In order to evaluate the functionality of Green Spaces in Athens, two parameters are going to be investigated: i) accessibility: the concept of the 15-minute city will be utilized to ensure that all citizens meet their needs in terms of having access to parks and open-green spaces on foot or by bike, within 15 minutes, highlighting the comparative advantages with respect to traditional urban mobility means (i.e., cars, buses). This is aligned with ensuring social inclusion and connectivity of neighbourhoods, while at the same time improving urban biodiversity by addressing ecosystems' fragmentation and iii) biodiversity conservation | Athens Metropolitan Area | City | EL | | | | 1 | 1 | 1 | | | | | | |
| Evaluate the effectiveness of existing Nbs and | The identification of UGS hot spots will form the City Green Infrastructure as a dynamic tool to be included into city strategy to put | Athens Metropolitan Area | City | EL | | | | 1 | | | | | | | | |

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| propose new ones where suitable | urban biodiversity into practice, and to quantify scenario-based health co-benefits related to air quality | | | | | | | | | | | | | | | |
| Conduct a vulnerability assessment | The climate change risk assessment to human health will be based on the IPCC (AR5) framework. In order to depict the relationships between the concepts used in the framework, hazard, exposure and vulnerability, the concept of Impact Chains will be used. This methodology can be used for both high-level identification of key risks and more in-depth analysis of specific risks and adaptation strategies. The results will be presented through geospatial maps depicting the hot spots within the AMA, where appropriate green infrastructure measures will be proposed. | Athens Metropolitan Area | City | EL | | | | 1 | 1 | | | | | | | |
| Valuation of the state-of-the art adaptation options based on the | To increase the resilience of municipalities to climate change. Adaptation options will be categorized according to their type, i.e., grey/green infrastructure and soft measures. The adaptation options will be evaluated with multi- | Athens Metropolitan Area | City | EL | | | | 1 | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| vulnerability assessment | criteria analysis, assessing effectiveness, contribution to climate change adaptation, technical and economic viability and public acceptance. | | | | | | | | | | | | | | | |
| Develop and carry out youth assemblies and training for trainers | ARSINOE will develop the organization of youth assembly simulations, engaging secondary and tertiary education students, teachers and municipal employees for the deliberation and drafting of local and/or regional Green Deals. The specially designed local and/or regional simulations will foster dialogue and social consensus, offering participants the chance to gain first-hand experience on participatory decision-making processes, which can be used as innovative non-formal education tools, and eventually, offer practical bottom-up green solutions to identified problems, creating a spill-over effect. Secondary teachers will have the chance to attend the T4T seminars, which will complement and maximize the project's impact. During the T4T, secondary (teachers) | Athens Metropolitan Area | City | EL | | | | | | 1 | 1 | | 1 | | | |

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| | and tertiary (university professors) education trainers will be offered the chance to attend these tailor-made seminars and gain thorough knowledge on how to organise simulations on their own, hence acting as knowledge multipliers. Eventually, the Youth Assembly Simulations and T4T beneficiaries will (be able to) act as multipliers for their respective communities. The impact will be maximized by making this toolkit available online to all case studies and interested stakeholders, and eventually to the wider public. | | | | | | | | | | | | | | | |
| Improve education, outreach and innovation through Green Cross International | To complement the work of Youth Assemblies and increase the active participation of and to train the new generation of citizens, the Athens affiliate of Green Cross International (GCI) will get involved and will lead a series of innovative education and outreach activities for the youth. Specific to Greece, GCI is co-developing solutions through dialogue, mediation and co-operation with world-class | Athens Metropolitan Area | City | EL | | | | | | 1 | | | | | | |

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| | international non-profit and for-profit partners, including: EarthFund Global, EarthXTV, Solar Head of State, EarthIndex Inc., EIT-Climate KIC – Silicon Valley. Through these collaborations, GCI Athens will provide the program EarthOdyssey—an immersive, virtual educational experience in partnership with schools in the US and other countries with virtual immersion, art, field trips, modules and videos, with the goal to bring sustainable & smart energy curriculum to schools in Greece. Empowering curriculum to be brought forward to K-12 level students will be in the following areas: Climate Solutions Campaign, Air Quality Campaign, Toxins, Water, Waste, Clean renewable energy, Hydropower and Tidal Energy, Desalination, and Journalism through the Lens of Youth | | | | | | | | | | | | | | |

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| Conduct a vulnerability assessment for seaports | As a prerequisite for enhancing resilience and develop adaptation actions. The vulnerability assessment, which constitutes the first pillar of adaptation and is still pending for European seaports, due to lack of detailed information regarding the characteristics of each seaport considered, will be structured around the: (1) identification of the climate-related parameters that are critical for a seaport's infrastructure and operations. This will be the key input for modelling the effects of climate change on coastal-port environments at a local and regional scale. ARSINOE will examine seaports as a dynamic element at the land-sea interface and provide a holistic vulnerability assessment based on indicators development incorporating various dimensions of a seaport, namely (i) environment, (ii) operations, (iii) energy, (iv) core infrastructure, (v) socioeconomic and (vi) safety; (2) recognition of the infrastructural and operational | Piraeus, Limassol and Valencia | Port | EL, CYP, ES | | | | 1 | | 1 | | | | | | |

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| | features of seaports (Limassol, Piraeus, and Valencia) most vulnerable to climate change; (3) enabling analysis of impacts on seaports by systematically collecting the information required to quantify the impacts from climate change and those of disruptions | | | | | | | | | | | | | | | |
| Identify adaptation priority actions and design tailored adaptation pathways for the seaports considered | Ultimately, the conclusions will be translated into transformative interventions to enhance the resilience of seaports. The purpose of this case study is to incorporate existing mechanisms and tools developed by the port authorities while actively engaging stakeholders and incorporating financial instruments throughout the process. Policies, as well as administrative adjustments to the designed pathways will be required to support this transformation | Piraeus, Limassol and Valencia | Port | EL, CYP, ES | | | | 1 | | 1 | | | | | | 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Provide innovation to build multi-sectoral resilience and adaptive capacity | ARSINOE will focus on six topics: stream and groundwater quality and quantity, examining specifically the impact of anthropogenic activities such as agriculture, energy production, and waste management, on the hydrogeochemical pathways between the terrestrial and aquatic environments, on land resources competition and ecosystem services (air and water quality, habitat fragmentation, erosion), on water quality; land use change and conflicts, examining the effect of agricultural practices and competition with other economic uses, e.g. energy production; high frequency environmental monitoring, developing an intelligent monitoring system with adaptive sampling frequency – in-situ & remote sensing driven and aiming to improve the data availability for resilient infrastructure while supporting environment-aware decision making; hydroclimatic modelling of complex terrain aiming to improve projections, especially for | Main River | Region | GER | | | 1 | 1 | | | | | | | | |

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| | the dynamics of extreme events under climate change; integrated water resources management, assessing effects of climate change, land uses and forest and agricultural management practices, with its impacts on the development and maintenance of infrastructure and utilities; policy and governance analysis, identifying the relevant regional and local policies in place that determine land and water management, the status of related European Directives (e.g. WFD, FD) in the region and the main economic agents/sectors influencing land and water management policies and vice versa. | | | | | | | | | | | | | | | |
| Improving climate resilience of environmental, economic and social sectors related to water use | Respective sectors have the potential of affecting human health and vulnerability of all economic sectors. ARSINOE will achieve this aim by providing an intelligent comprehensive innovation set of long-term planning solutions, allocation and use of sufficient quantity and of adequate quality water for all users, respecting their | Ohrid/ Prespa lakes | Region | MKD, ALB | | | | 1 | | 1 | | | | | | |

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| | interests in order to improve human health, food production, conservation of natural environmental systems, clean energy production and sustainable growth of all sectors | | | | | | | | | | | | | | | |
| Support the ecological transition to reduce the vulnerability of aquifers in volcanic islands | ARSINOE will put further efforts to the primary production including agriculture, forestry, fisheries and aquaculture, water management and clean energy infrastructure. ARSINOE will take into account the interdependence between water and agriculture. The agricultural sector is the largest water user in the Canary Islands, where wine, potatoes and tomatoes are the main exports. Therefore, greater sustainability within the water sector (through the water footprint and the carbon footprint) will positively affect the agricultural sector and, therefore, the water and energy situation of the archipelago. | Canary Islands | Region | ES | | | | 1 | | 1 | | | | | | |

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| Provide climate resilient good practices, that will enhance the adaptive capacity of ecosystems and the local communities involved | Black Sea is a unique marine ecosystem that may face serious climate induced problems exacerbated by anthropogenic influences. The watersheds draining into the sea provide nutrients and pollutants including plastic litter. ARSINOE proposes three sub-studies: the headwater, the riverine and the coastal ecosystems. The upstream part introduces NBSs equipped with low-cost sensors, while the transition zone and the downstream parts involve monitoring of a Bulgarian wetland and climate resilient applications in the Danube delta from Romania. The Danube Delta Biosphere Reserve is the largest protected river-sea macro ecosystem. The Ropotamo Ramsar protected river complex in southern Bulgarian Black Sea coast includes a downstream stretch and estuary with a significant variety of biotopes. Thus, the wetland is very biodiverse and provides habitat for a number of threatened species. BRIDGE-BS (METU leads & AEUB is a | Black Sea | Region | BGR (Danube Delta) | | | | 1 | | 1 | | | | | | |

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| | partner) and DOORS (METU is a partner) are two additional H2020 projects for the acceleration of SRIA. ARSINOE pools and translates the results of these three projects for an integrated assessment and future pathways under climate and socioeconomic scenarios. | | | | | | | | | | | | | | | |
| Development and implementation of a specialized GIS-based platform | This platform will have two components: public (supplying real time information for the public, enhancing awareness and contributing to “behavioural change”) and specialized (acting as a decision-making tool for policy makers and responsible authorities, allowing testing and deployment of new sustainable finance tools and climate risk insurance instruments). | Black Sea | Region | BGR (Danube Delta) | | | | 1 | | 1 | | | | 1 | | |

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| Implement and demonstrate innovative technology for evaluating the resilience of biofiltration bacteria from Danube Delta | The technology is based on the investigation of the bacteria present in the Danube Delta, to identify those that have a selective biofiltration role. Models for this technology will be filled with existing data from an ongoing project financed by Romanian Structural Funds dedicated to the microbiota screening and monitoring in relation to nutrients and pollutants load on Low Danube – Danube delta – Black Sea system. ARSINOE will continue these activities allowing mid-term assessment of the wetland biofiltration capacity, as well as the role that transitional regions such as delta are playing in the river-sea system management in terms of complex processes aggregating hydrology-nutrients-biomass-biodiversity-economics and social behaviours | Black Sea | Region | BGR (Danube Delta) | 1 | | | 1 | | | | | | | 1 | |

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| Implement and demonstrate innovative farming on salted soils | the technology is based on the evaluation of the soils affected by high salinity and the complexity of abiotic factors as the level and composition of groundwater, soil composition, air flows, solar radiation and so on, that contribute to the plant behaviour during their lifetime (germination, growth, selective biological products). Based on the specific soil and weather conditions, halophyte local species with high adaptation capacity to those conditions are selected. The aim is to implement and demonstrate a technology, which has been already developed is at TRL 3-4. During the project implementation, an experimental field located near Murighiol, in the Danube Delta, will be used for organizing a DT application. The application will be used for fine tuning of the farming activities and maximizing the yields. Danube Delta farming lands resilience will be addressed. | Black Sea | Region | BGR (Danube Delta) | 1 | | | 1 | | | | | | | 1 | |

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| Pursue and co-design systemic solutions direct and cascading impacts of flooding | This involves different scales and socio-economic sectors that exploit intelligent water management and other innovative technologies, nature-based solutions, governance models, and financing instruments | Southern Denmark | Region | DNK | | | | 1 | | 1 | | | | | | |
| Identify pathways for exploiting the potential of the urban-rural nexus | Involvement of agriculture and horticulture in Southern Denmark. Fisheries and aquaculture could also be a factor. In the Wadden Sea region, the interplay between human activities, coastal protection and the preservation of the Wadden Sea's irreplaceable ecosystems and biodiversity for the benefit of present and future generations pose as a particular challenge | Southern Denmark | Region | DNK | | | | 1 | | 1 | | | | | | |
| Assess the effects of flooding on health, water supply networks, the local environment | The area has suffered from flooding over many years from a number of different sources, including surface water run-off, highway flooding, sewer flooding, main river and ordinary watercourse flooding during intense rainfall events. In addition, the coastal areas of Torbay | Torbay and Devon county | Region | UK | | | | 1 | | 1 | | | | | | |

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| and critical infrastructure | suffer coastal flooding due to overtopping of the sea defences during high tides that coincide with easterly winds. It should be noted that the surface water, highway, sewer, main river and watercourse flooding is exacerbated in the low-lying areas. | | | | | | | | | | | | | | | |
| Enhance staple food production and yield stability in climate change-prone Mediterranean areas | ARSINOE will apply an innovative use of water, implying low-input aid irrigation for rainfed extensive crops, coupled with a sustainable land management based on minimum tillage and/or sod seeding, in order to increase yields and stabilize staple food production in local food chains. ARSINOE will focus on the optimization of water and land management for agricultural use, in order to satisfy the different water demands of crops with special attention for durum wheat and preserve soil fertility. A rational and efficient use of water and soil resources, based on saving water for irrigated crops, low-input irrigation water for the rainfed ones and conservation agriculture, will allow | Sardina | Region | IT | | | | | | | | | | | 1 | |

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| | yield enhancement and stabilization in order to preserve crop production and soils, food security, groundwater level and water quality both for agricultural and civil uses. | | | | | | | | | | | | | | | |

*Table 44: Overview of activities of the IMPETUS project in its target regions*

| Activity | Description | Target area | Geographic Type | Country | Type of activity | | | | | | | | | | | |
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| | | | | | Build / plant | Install sensors | Monitor | Analyse | Map | Inform | Create/nurture networks | Provide access to capital | Train | Programme | Manage / treat resources | Develop plan / strategy |
| Implement below sea-level multifunctional wetlands | | Coastal | Region | | 1 | | | | | | | | | | 1 | |
| Create digital twins and advanced tools for climate adaptation | | Atlantic, Arctic, Boreal | Region | | | | | 1 | | 1 | | | | 1 | | |
| Facilitate decentralized circular-economy inspired water/energy/materials reuse innovations | | Coastal, Mediterranean | Region | | | | | | | | | | | | 1 | |

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| Implement controlled environmental agriculture solutions | | Mediterranean | Region | | | | | | | | | | | | 1 | |
| Develop a water-energy master plan and business plan for autonomous climate proof regions | | Mediterranean | Region | | | | | | | | | | | | | 1 |
| Develop and carry out decision theatre (DTh) for regional integrated water resource management | | Mediterranean | Region | | | | | | | | | | | | | |
| Develop and implement advanced tools for regional water management | | Continental | Region | | | | | | | 1 | | | | | | |

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| Improve sand dunes restoration techniques and monitoring | | Continental, Mountain Mediterranean | Region | | 1 | | 1 | | | | | | | | 1 | |
| Support sediment transportation through irrigation networks | | Coastal | Region | | 1 | | | | | | | | | | 1 | |
| Assess forest fires and restoration | | Coastal | Region | | | | 1 | 1 | | | | | | | | |
| Support reforestation and biodiversity | | Mediterranean | Region | | | | | | | 1 | | | | | 1 | |
| Evaluate and monitor changes in the spatial distribution of species | | Mediterranean | Region | | | | 1 | 1 | | | | | | | | |

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| Improving bathing water quality after extreme storm events | | Coastal | Region | | | | | | | | | | | | 1 | |
| Increasing resilience of water plants to water-borne pathogens | | Coastal | Region | | | | | | | | | | | | 1 | |
| Develop and implement a heat awareness system | | Atlantic | Region | | | | | | | 1 | | | | 1 | | |
| Develop a digital twin to co-design a Marine Spatial Planning framework | | Arctic | Region | | | | | 1 | | 1 | | | | 1 | | |
| Implement a bio-district to address altitudinal shifts of crops | | Mountain | Region | | | | | | | | 1 | | | | 1 | |

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| Develop and implement an early-warning and evacuation system for geological and avalanche risk sites | | Arctic | Region | | | | | | 1 | 1 | | | | | | |
| Assess the economic impacts of extreme storms on infrastructures | | Coastal | Region | | | | | | | | | | | | | |
| Create an alliance for a resilient coast | | Coastal | Region | | | | | | | | 1 | | | | | |
| Facilitate behavioural change for climate resilient tourism | | Coastal | Region | | | | | | | 1 | | | | | | |
| Develop innovative insurance products for | | Mountain | Region | | | | | | | 1 | | 1 | | | | |

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| agriculture, forestry, and hydropower energy production | | | | | | | | | | | | | | | | |
| Activate cultural heritage to enhance climate resilience | | Mountain | Region | | | | | | | 1 | | | | | | |
| Develop and implement a system monitoring dashboard to support climate change mitigation and adaptation strategies | | Atlantic | Region | | | | 1 | | | 1 | | | | | | |
| Develop a climate change adaptation governing plan | | Boreal | Region | | | | | | | | | | | | | 1 |

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| Assess economic impacts of physical climate risk across demo cases | | All | Region | | | | | 1 | | 1 | | | | | | |