Updated (2nd version) Implementation status and monitoring of the roadmap for the activities and actions at the Case Studies

Deliverable 6.2

WP6: Case studies: Coordination and implementation activities

Authors: J. van den Broeke, L.S. Vamvakeridou-Lyroudia, C. Laspidou, G. Adamos, A. Spyropoulou, D. Kofinas, N. Mellios, K. Ziliaskopoulos, A. Ioannou, S. Papageorgiou, L. Avrami, A. Zafeiropoulos, N.-E. Votsi, S. Liñan, E. Athanasopoulou, P. Koundouri, L.C.F. Michel, S. Dimitris, M. De Juan Muñoyerro, A. Charalambides, T. Perez-Ciria, R. Wood, R. Ludwig, M. Zilker, G. Braun, D. Likar, S. Kasovska Georgieva, S. Trajkovska, O. Rpusos, N. Lalaj, G. Limani, N. Cruz Pérez, J.C. Santamarta, J.S. Rodríguez Alcántara, N. Theodissiou, C. Stavridis, D. Frysali, E. Mamut, Y. Zdrakov, M. Paraschiv, M. Yücel, M. Gül, P.Z. Uygurer, B. Ankjær Nielsen, M. Drews, D. Stewart, M. Wood, M. Khoury, B. Evans, K. Baker, O. Chen, A. Chen, N. Mustafee, G. Lewis, A. Chatzistefanou, S. Ward, M. Dettori, V. Mereu, G. Carboni, G. Urracci, M. Marroccu, G. Pusceddu, L. Massidda, E. Cristiano, F. Viola, R. Deidda, A. Delogu

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Primary Contact and Email	J. van den Broeke (joep.van.den.broeke@kwrwater.nl) and L.S. Vamvakeridou-Lyroudia (Lydia.vamvakeridou-lyroudia@kwrwater.nl)
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EXECUTIVE SUMMARY

ARSINOE develops the methodological framework for the combination of System Innovation Approach (SIA) with the Climate Innovation Window (CIW) to create an ecosystem for climate change adaptation solutions. The work in ARSINOE resolves around nine Case Studies (CSs), where the implementation will of the SIA takes place. The case studies represent a range of environments and collections of (local and regional) stakeholders that are the target for the implementation of the innovation package for resilience against climate change developed in ARSINOE.

This deliverable D6.2 presents a summary of the activities in WP6 over the period M5 – M18, which are related to the organization, coordination and execution of the activities related to these nine case studies. This deliverable is an updated version of Deliverable 6.1, which reported on the initial activities in WP6 during the first four months of the project. Later in the project, newer (updated) versions of this document will be submitted (M36-M48). The deliverable is a living document, reporting (a) an updated description of each CS; (b) the stakeholder engagement activities (meetings, actions, etc) within the CSs; (c) the organisation of actions for the implementation of stakeholder participation and modelling activities for the SIA and the technical activities; (d) the organisation of a monitoring mechanism and plan for all these activities.

During the reporting period the focus has been on the execution of the systems innovation approach (Task 6.2) and on preparations for the modelling and data collection activities and data collection and initial modelling tasks (Task 6.3). The main achievements from task 6.2 were the successful organisation of the living labs for each case study. The living labs are instrumental in the implementation of the system innovation approach and are the place where the projects interacts with the stakeholders from the case studies, and the direction of the case studies is determined in co-creation with the stakeholders. All case studies have successfully organised their first and second living lab workshops and are in preparation of the 3rd workshop.

In the actions under Task 6.3, the data collection and modelling activities have been initiated. In the ARSINOE case studies, stakeholders from diverse backgrounds and disciplines are brought together to co-design an accepted vision of the future. The objective is to enable project partners from diverse disciplines to converge on a unified view, before implementing resilience modelling and assessment frameworks using multi-disciplinary modelling methods. To define the context and map out all relevant aspects, each case study developed a conceptual model of the types of technical/modelling activities that they envisage for their CS. These conceptual models form the basis for all modelling activities. Alongside the conceptual model definition, the case studies selected climate projections and scenarios that can be used horizontally across all case studies, as well as the time frame for these selections for the risk assessments. The outcome was reported in Deliverable 3.4.

The various resolutions and disciplines required for the modelling, including supporting activities to connect the modelling work to the stakeholders and their environment are brought together in a framework referred to as the resilience wheel. The operationalisation of this framework will be performed in each case study. To gain experience, CS1 (Athens) and CS8 (Torbay) act as frontrunners in this implementation and first preparations have taken place.

Finally, all case studies have performed the preparing activities for their case specific data acquisition and modelling actions. Available datasets have been identified, and their specifics are described to aid data management. Where data needs to be acquired from the field, the necessary tools have been developed

and the first monitoring campaigns have been started. Most cases have initiated first modelling studies, which will be further calibrated and validated in the coming reporting period.

A number of Open Tenders for Innovations have been initiated as a means to identify promising or mature innovations to be included in ARSINOE's Portfolio of Innovations. The process is undertaken in three phases: i) stocktaking for the identification of relevant solutions well adapted to each local context, ii) preparation and publication of the Open Tenders, and iii) the evaluation and selection of the solutions to be supported. Three case studies decided they were ready to participate in the first round of the open tender, and all documents for publication were prepared. Publication of the open call was scheduled for Q1 in 2023.

Weekly teleconferences for WP6 in which progress and issues from all case studies and actions related to the other work packages are discussed have been continued. These meetings are a constant fixture in the ARSINOE execution, and allows close monitoring of progress and any issues that might occur. It also provides all case studies insight into the activities in their fellow case studies in ARSINOE and support the community building within the project consortium.

In the coming period we will continue the work started in the reporting period, in particular the preparations for the 3rd living lab workshops, the modelling work and the data collection. This is in preparation for the development and implementation of the innovation package, which is due to start in M25, a scheduled.

The document includes as Annex C the detailed minutes of all the meetings that took place in this reporting within Task 6.1.

Wider contribution to EU Policies: This Deliverable, in its final version (M48) aims to provide detailed information and experience-based knowledge from the (diverse) Case Studies, which is expected to contribute to regional decisions and EU policies for the implementation of actions leading to enhanced resilience to climate change at regional level.

<u>Related Deliverables</u>: Deliverable 6.5 (M18) for a detailed report on the SIA implementation in the living labs and Deliverable 3.4 (M12) for the climate projections and scenarios and model selection. The previous version of this deliverable is D6.1 (M4).

LIST OF ABBREVIATIONS

ABS	Agent Based Simulation
AMA	Athens Metropolitan Area
C2S	Copernicus Climate Change Service
CIW	Climate Innovation Window
CLMS	Copernicus Land Monitoring Service
CS	Case Study
D	Deliverable, e.g. D6.1 is ARSINOE deliverable 6.1
DCAM	Damage Cost Assessment and Modelling tool
DES	Discrete Event Simulation
DMRM&AF	Dynamic Multi-Sectoral Resilience Modelling and Assessment Framework
GA	Grant Agreement
GCM	Global Climate Model
GIS	geographic information system
IDB	Index Database
KPI	Key Performance Indicators
LL	Living Lab
M	Month as counted in the duration of the project, M1 being the starting month of the project
ML	Machine Learning
MODIS	Moderate Resolution Imaging Spectroradiometer
MSDMF	Multi-System Dynamic Resilience Modelling Framework
MSPA	Morphological Pattern Analysis
Nbs	Nature Based Solutions
RCM	Regional Climate Model
ROI	Region of Interest
SD	System Dynamics
SDG	Sustainable Development Goal
SIA	System Innovation Approach
SLR	Sea Level Rise
T4T	Training for Trainers
WP	Work Package
WRF	Weather Research and Forecasting

1.0 INTRODUCTION

1.1 Scope of this deliverable

The work in ARSINOE resolves around nine Case Studies (CSs). The case studies represent a range of environments and collections of local and regional stakeholders that are the target for the implementation of the innovation package for resilience and climate change developed in ARSINOE. This package may be designed for implementation in specific region, but its building blocks are transferable and re-usable. In each case study, a number of activities and actions need to take place connected to the development and implementation of the innovation package. Furthermore, there are horizontal activities across the case studies. To ensure a concerted and coordinated action, and sharing of experience and knowledge between the case studies, all case studies are coordinated in Work Package (WP) 6. The overall objectives of WP6 are to:

- (i) develop a roadmap of actions for all the CSs;
- (ii) coordinate the activities and actions in all the Case Studies;
- (iii) guide and monitor the implementation of the stakeholder engagement, the resilience assessment and the innovation packages at the CSs throughout the project;
- (iv) develop and monitor Key Performance Indicators (KPI)s;
- (v) develop and coordinate the validation procedures for the innovation packages in all the CSs;
- (vi) provide evidence-based knowledge and recommendations at EU level.

Figure 1-1 shows schematically the methodological approach and the research areas to be followed in ARSINOE at a higher and comprehensive level, demonstrating the main methodological approach for the project overall.

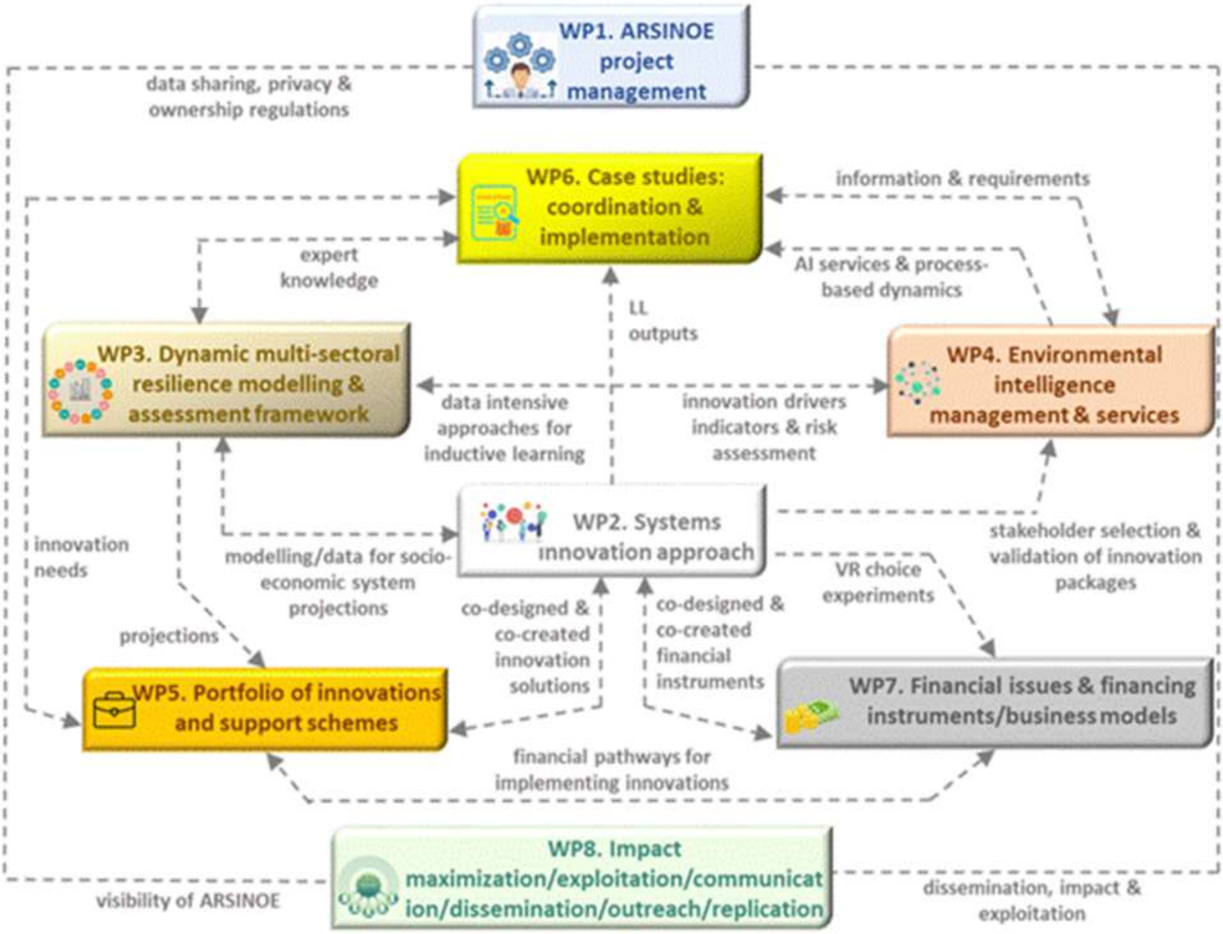

Figure 1-1: Schematic representation of the interlinkages between WP6 and the other WPs.

WP6 is dedicated to coordinating, planning, assisting and monitoring the implementation of this approach for the CS. WP6 is structured in five Tasks, encompassing all the above objectives.

Task 6.1 Development and monitoring of a roadmap of actions in all the case studies
Task 6.1 develops a roadmap for the collaboration and coordination of the activities for each CS for the implementation of the SIA. It assists and guides the implementation of the activities related to all the WPs linked to the CSs, mapping all necessary activities and timeline for implementation. An initial roadmap was developed in the first 4 months of the project and reported in deliverable D6.1. It also developed a monitoring plan for the activities. The roadmap and monitoring plan are a living document, which will be updated throughout the project.

Task 6.2 Implementation of the System Innovation Approach in each case study.
This task will focus on the implementation of the System Innovation Approach for all the CSs. In particular this task will identify stakeholders through a dynamic stakeholder mapping and will implement the stakeholder engagement activities for co-creation developed in WP2 at each CS. This task will also develop specific KPIs for monitoring the progress of each CS, in collaboration with the stakeholders. The outcome of this Task will be a deliverable detailing the implementation of the SIA is each CS (D6.5 and updated version thereof in D6.6).

Task 6.3 Resilience Framework implementation in each case study.
Task 6.3 will guide and coordinate the implementation of modelling activities required in each case study for the resilience modelling framework (WP3) and the implementation of the Environmental Intelligence Services (WP4). Each CS has a different content in terms of modelling requirements for the implementation of the resilience framework. Consequently, in every CS modelling activities will include (apart from the generic tools detailed in WP3, WP4) additional case-specific modelling activities. All these actions will be implemented and reported within this task.

Task 6.4 Innovation packages development and validation in each case study
This task will identify the innovations needed for each CS in collaboration with WP5, so as to form a specific innovation package for each CS, which will be validated by stakeholders.

(This task will start in M25)

Task 6.5 Lessons learned-evidence based recommendations
In this task, experiences from the work in the CSs from T6.2, T6.3 and T6.4 will be synthesised and based on this, general lessons learnt, and best practices (evidence-based) will be identified to structure and support recommendations for implementing the ARSINOE approach in a multidisciplinary process of co-creation.

(This task will start in M37)

The monitoring performed as part of Task 6.1 is reported in a series of deliverables. This deliverable, D6.2, is produced as part of this ongoing monitoring and is an updated version of D6.1. Newer (updated) versions of this document will be submitted (M36 and M48). This second version of the deliverable focuses mostly on the actions performed in M5 – M18 with regards to the activities connected to WP3 (conceptual model, resilience wheel, modelling and data collection), and WP4 (data hub, visualisation tools) and to a lesser extent on activities related to WP2 (reported separately in D6.5) and WP5.

1.2 Structure of this document

The deliverable is organised as follows: Chapter 2 describes the organisation of the work package and its monitoring, and presents an updated overview of all the CS. This is followed by a summary of the activities in M5 - M18 in the nine case studies in chapters 3, 4, 5 and 6. Because the activities are strongly linked to the activities in the work packages 2, 3, 4 and 5, this deliverable has grouped the reported progress in chapters dealing with actions connected to the particular work package. Chapter 3 summarises the stakeholder engagement activities (meetings, actions etc) within the CSs that are contributing to (especially) WP2, Chapter 4 describes the implementation of data acquisition modelling activities contributing to WP3, Chapter 5 the implementation of the modelling and data management activities connected to WP4 and finally Chapter 6 summarises contributions to the open tender for innovations work in WP5. Chapter 7 presents the planning for the coming 18 months and finally chapter 8 presents a short discussion and conclusions on the progress in the case studies up to M18.

2.0 CASE STUDIES

Adaptation to climate change refers to all approaches taken to adjust, prepare for, and accommodate new conditions that are created by changing climates. Adaptations may be cultural and societal, or financial solutions. As climate change is complex and interconnected with other global challenges, such as food security, water scarcity, biodiversity depletion and environmental degradation, it is insufficient to use traditional approaches to innovation that focus on one aspect of the problem.

ARSINOE develops the methodological framework for the combination of **System Innovation Approach** (SIA) with the **Climate Innovation Window** (CIW) to create an ecosystem for climate change adaptation solutions. ARSINOE creates this ecosystem with a three-tier, approach: (a) using SIA it integrates multi-faceted technological, digital, business, governance and environmental aspects with social innovation for the development of adaptation pathways to climate change, to meet EU Green Deal targets for specific regions; (b) it links with CIW to form innovation packages by matching innovators with end-users/regions via for specific regions; (c) it fosters the ecosystem sustainability and growth with cross-fertilization and replication across scales, at European level and beyond, using specific business models, exploitation and outreach actions. The ARSINOE three-tier approach is show-cased in nine widely varied regions across Europe (case studies), as a proof-of-concept with regards to its applicability, replicability, potential and efficacy.

The nine Case Studies cover a vast area of the European Continent, ranging from Spain to the Black Sea and from Greece to Denmark. In terms of systems complexity, they also cover a wide range including health, energy, transport, forestry, fisheries, farmland, and wetlands, which face challenges such as biodiversity loss, floods, water scarcity, and heatwaves in escalating severity depending on the region. The main challenges and key thematic issues, related to resilience to climate change, addressed for each case study are shown in Figure 2-1.

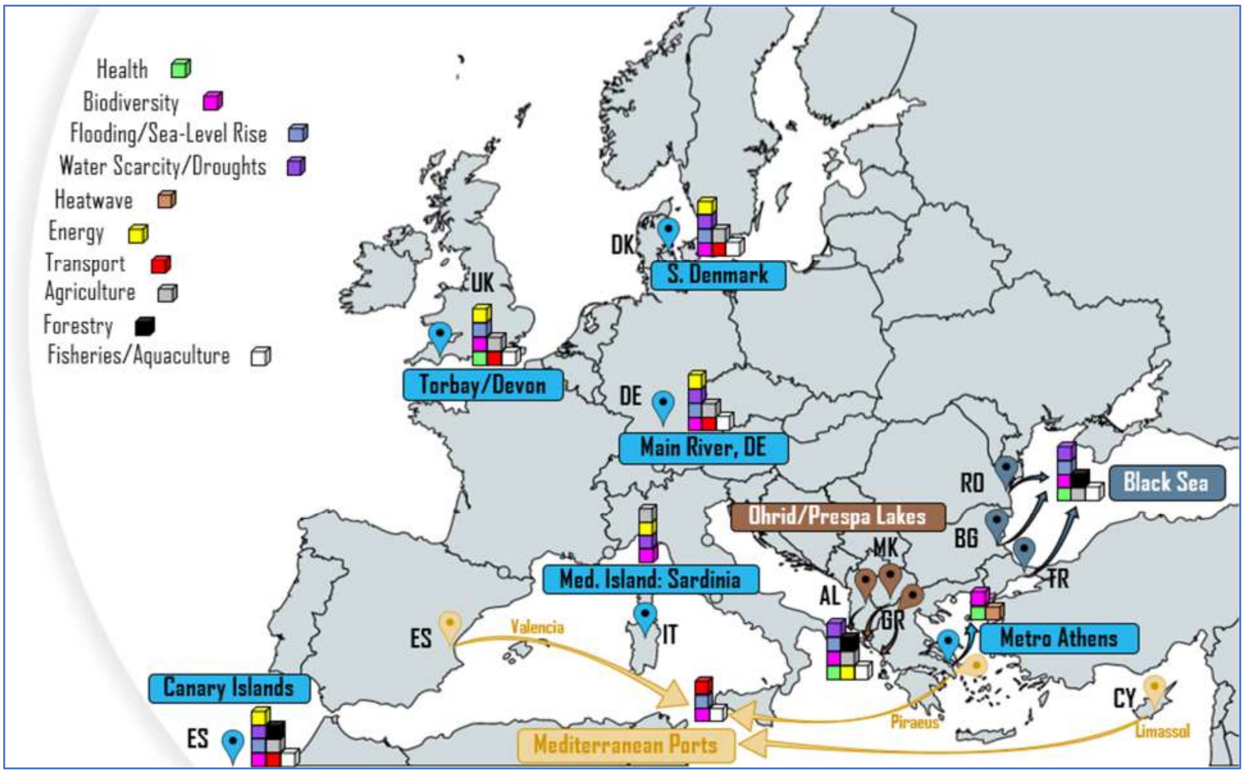

Figure 2-1: Location and key thematic issues/systems addressed by the CS.

2.1 Organisation and coordination of the CS activities

Practically all the project partners are involved in activities related to the CS in WP6 and in Task 6.1, which coordinates, monitors and guides them. Moreover, the necessary actions for the implementation of the SIA for each CS are complex and diverse, due to the different key issues of all the CS, but also due to the interlinkages of this WP with all the other WP in the project, which are shown in Figure 1-1.

Specifically, activities in WP6 are related to:

- WP2 for actions related to stakeholder engagement and the SIA, including activities related to the Living Labs.
- WP3 for specific modelling and data purposes related to the CS.
- WP4 for the co-design of the environmental intelligence tools and visualisation requirements.
- WP5 for the development of specific innovation packages for each CS.
- WP7 for the development of specific business models and instruments for each CS.
- WP8 for outreach and dissemination.

Consequently, regular recurrent virtual meetings, to organise and monitor the actions, were established by the project coordinator (UTH) and the WP6 Leader (KWR). Participation to these meetings is required for:

(i) at least one representative for each CS;

(ii) at least one representative for each of the other WP6 tasks (Task 6.2, Task 6.3, Task 6.4);

(iii) at least one representative from WP2, WP3, WP4, WP5, WP7 and WP8.

These meetings started in M1 of the project and will continue on a weekly basis for the entire duration of the project. The regular weekly meetings occur every Thursday at 14.00 CET. Duration 1 hour. The purpose of the meetings is to record the progress of each CS, foster exchange among case studies and any issues that may arise related to WP6 activities, as well as any changes with regards to the Grant Agreement (GA), related to the CS. The meetings take place in Microsoft Teams, organised by KWR (Lydia Vamvakeridou-Lyroudia and Joep van den Broeke). The invitation list is wider than the persons mentioned in Table 2-1. At present the invitation to the weekly meetings is being sent to 42 people within the project partners. More may be added as needed.

The standard agenda for every meeting is:

1. Update from the project coordinator and the WP leader (KWR, UTH) to all (5min)
2. Case Studies: Each CS in turn updates about their activities and issues – 5 min each. No presentations are required.
3. KWR-Summing up (5min)
4. AOB

Minutes are kept in an online document, which has been placed at the common Microsoft Teams space. All the participants are free to see the minutes and edit them, as needed (edit mode). Thus access, openness and constant update is available for all the persons involved in the project. The participation of the representatives from the other WPS is also very important, because specific issues, organisational or technical can be discussed and resolved during these meetings. The **detailed minutes** for of M1-M4 were included in Deliverable 6.1 Annex C. The minutes for M5 – M18 are included for information in Annex C of this report.

The list of the required participants is given in Table 2-1. It should be pointed out that these meetings are open to all project members. For each CS and WP there are at least two persons designated as the main contacts. The request is for at least one of them to be present in the meetings, to update the others about issues related to each CS. This has been successfully continued in M5-M18.

A concise, updated, description of the content and challenges for each CS follows in Table 2-2.

Table 2-1: Participants in the weekly meetings for the CS activities.

Title	Main partner	Other partner(s)	Key person(s) for the meetings
Task 6.1 (**Hosts and WP leaders**)	KWR		Lydia Vamvakeridou-Lyroudia, Joep van den Broeke, Alex Chatzistefanou
CS#1: Athens Metropolitan Area	UTH		Giannis Adamos, Chrysi Laspidou or Nikolaos Mellios or Dimitrios Kofinas or Alexandra Spyropoulou
CS#2: Mediterranean ports	AUEB		Conrad Landis, Alice Guittard or Phoebe Kountouri
CS#3: Main River (Germany)	LMU	VKU	Ralf Ludwig (LMU), Teresa Perez Ciria (LMU), Gunnar Braun (VKU), Marion Zilker (VKU)
CS#4: Ohrid/Prespa Lakes	IECE	NECCA	Dijana Likar (IECE), Maria Papadopoulou or Antigoni Voudouri (NECCA)
CS#5: Canary Islands	ULL		Juan Carlos Santamarta-, Noelia Cruz Pérez
CS#6: Black Sea	AUTH	CTBG	Nikos Theodossiou-(AUTH), Maryana Hamanova (CTBG)
CS#7: Southern Denmark	EM	TUD	Bodil Ankjær Nielsen (EM), Martin Drews (TUD)
CS#8: Torbay and Devon County	TC	UNEXE	Dave Stewart (TC), Albert Chen (UNEXE)
CS#9: Sardinia	AGRIS	UT, LMU	Marco Dettori (AGRIS), Isabelle LaJeunesse (UT)
Task 6.2	UT	AUEB	Isabelle La Jeunesse (UT), Ebun Akinsete (AUEB)
Task 6.3	UNEXE	TUD	Albert Chen (UNEXE), Martin Drews (TUD)
Task 6.4	AUEB		Conrad Landis, Alice Guittard
Task 6.5	KWR		Lydia Vamvakeridou-Lyroudia, Joep van den Broeke
WP2	UT	AUEB	Isabelle LaJeunesse (UT), Ebun Akinsete
WP3	TUD	LMU	Martin Drews (TUD), Ralf Ludwig (LMU)
WP4	UNEXE	ICCS	Albert Chen (UNEXE), Symeon Papavasileiou (ICCS)
WP5	BRC		Gloria Salmoral, Geraldo Anzaldua
WP7	AUEB		Alice Guittard, Conrad Landis
WP8	GAC		Svetlana Klessova, Lisa Pourcher

Table 2-2: Short updated descriptions of the nine case studies in ARSINOE.

CS1: Greening the Athens metropolitan area	Lead Partner: UTH

Short description: Athens is the capital and largest city of Greece. Athens Metropolitan Area (AMA) has 40 municipalities, 35 of which are referred to as Greater Athens municipalities and more than 40% of the national GDP is produced therein. Moreover, due to its geographical location and the port of Piraeus in each south-western part, Athens is also an area of particular importance for the Mediterranean area as well. The ongoing infrastructure projects, such as contemporary highways connecting Athens with the rest of Greece and Northern Europe through the Balkans, underpin the special role that Athens has as a Metropolitan Region, not only for Greece but also for the wider region. Attica, the wider region to which Athens belongs, is particularly exposed to extreme weather events. Almost every winter there is at least a heavy rainfall that causes damage to infrastructure, housing, businesses and crops in the suburbs, and cause problems in the traffic and the smooth functioning of the city in general. Wildfires that also occur almost annually during the summer months, in forested areas on the mountains surrounding Attica, further exacerbate the severity of the effects of rainfall and flooding.

Athens vulnerability to climate change effects will have serious negative consequence not only for the city itself but also for Greece as a whole. Therefore, the Athens region must be adequately shielded in terms of its resilience to climate change. ARSINOE project can help to this end, as the implementation of the systemic solutions and innovations developed during the project, will help the Civil Protection and Public Authorities to make timely and informed decisions, thus mitigating the effects of extreme weather events.
Athens is capable of adopting such solutions, considering also the explicit intention of the current leadership of the Municipality of Athens to set both the improvement of green infrastructure and the support of urban biodiversity as two of its Strategic Objectives.

ARSINOE's innovation package introduces a holistic approach to materialize the Athens Resilience Strategy, which was launched in 2017, including the city's **Climate Adaptation Action plan**. The Municipality of Athens is currently finalizing, with the support of C40, an update of its Climate Action Plan in accordance to its commitments to the Paris Agreement and the **Global Covenant of Mayors**.

The Municipality of Athens has started compiling existing data and combining them with new novel observational and modelling platforms (e.g. satellite data, Copernicus Services, Citizen Science). This allows the mapping of vulnerabilities across different activity sectors of Athens Metropolitan Area (AMA) and the identification of **hot spots** and their respective drivers (e.g. heat, flood, soil imperviousness, inadequate housing).

Appropriate indicators are utilized, and a novel methodology is developed to move from the vulnerability indicators to realistic measures and options and means to achieve them. Additionally, **financial instruments** will be mapped, to provide optimal options for investment and facilitate an efficient and timely decision chain, as well as **sustainability options** through connection with **smart and resilient city practices**.

Additionally, equally important is an organized effort to increase the active participation of and to train the new generation of citizens, and ARSINOE adopts three means: citizen science, **youth assemblies** to simulate **local Green Deal** processes and **curation of green practices**, and innovation and science into educational curricula.

Key systems addressed: The key systems addressed in this case study are **environment, health and infrastructure.** In particular, the Athens municipality has a strategic focus to **enhance green infrastructure** and **support urban biodiversity**, in order to best shield itself from, adapt to, and build resilience to Climate Change challenges (extreme heat and flash floods). Considering that Athens faces chronic urban growth issues that amplify climate change impacts, the above key systems are addressed and are expected to deliver several benefits in terms of the resilience of the city.

CS2: Mediterranean Ports	**Lead Partner: AUEB-RC**

Short description This transboundary CS, consists of the ports of Piraeus (Greece), Limassol (Cyprus), and Valencia (Spain). **Piraeus seaport** (partner PPA)—second maritime cluster globally—is one of the leading European seaports, in terms of coastal shipping, cruise and containerized cargo. Currently, 51% of the port belongs to the Chinese company COSCO, while it is involved in 14 EU-funded projects related to its intention and target to become a "green" and financially independent seaport. **Limassol seaport** handles 90% of the export and import volume of Cyprus and a lively Cyprus passenger traffic, including cruise ships and ferry connections with Greece, Israel, Egypt, and Lebanon. It is managed by DP World Limassol, P&O Maritime Cyprus Limited, and Eurogate. The **seaport of Valencia** is managed by the Port Authority of Valencia (PAV), which trades under the name of Valenciaport. This public body is responsible for running and managing three state-owned ports along an 80 km stretch of the Mediterranean coast in Eastern Spain: Valencia, Sagunto, and Gandía. It is Spain's leading Mediterranean port in terms of **commercial traffic**, mostly containerized cargo, due to its dynamic area of influence and an extensive network connecting it to major world ports. Valenciaport is also the maritime gateway for various **commercial activities** to and from the entire Iberian Peninsula. The port of Valencia is currently involved in over 40 EU projects (partner FV), most of which focusing on environmental impact of the seaport activity.
ARSINOE will assist seaports and adjacent communities to adapt in a changing climate by improving their resilience in a holistic manner: In particular, ARSINOE seeks to:

(i) conduct a vulnerability assessment for seaports since it is a prerequisite for enhancing resilience and develop adaptation actions;
(ii) identify adaptation priority actions;
(iii) 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. The vulnerability assessment and subsequent design of adaptation pathways require active stakeholders involvement, effected through the SIA and BRIGAID mechanisms, while existing financial resources and suggested financial instruments will be examined. Nevertheless, policies, as well as administrative adjustments to the designed pathways will be required to support this transformation.

Key systems addressed: Weather phenomena sharpened by climate change can cause extensive damage to **coastal infrastructure**. **Sea level rise** (SLR) coupled with more frequent and more **intense storm waves** are a menace for seaports and waterways globally; causing **submergence**, **flooding, and coastal erosion.** The occurrence of such incidents does not only have immense economic consequences to the local communities, but could **threaten human life.** Blue Economy with a turnover of €750 billion and 5 million people working in the maritime sector in 2018, is particularly important for the EU. Especially the countries of this CS (Cyprus, Greece, and Spain) have significant **tourism**, fishing, shipping, etc. In Greece, **maritime transport** is a viability prerequisite due to its insularism.

Therefore, short sea shipping is also very important. It is crucial that seaport and waterway operators will **strengthen resilience** and adaptation. Natural and human systems need to adjust to new conditions taking advantage of existing competitive advantages. ARSINOE will directly address **infrastructure and maritime transportation** by improving their resilience, **health and well-being** by avoiding **cascading effects** of climate change on human communities, including risk of mortality and relocation. ARSINOE will also indirectly address **primary production**, by improving transportation related to fisheries and aquaculture as well as **environment**, including **biodiversity** adjacent to seaports considered. This case study will consider NBSs as alternative or complement to conventional adaptation measures. Blue carbon approaches, namely seagrass and salt marsh restoration and/or cultivation will be examined in the context of designing tailored adaptation pathways against erosion and flooding.

CS3: Main River, Germany	**Lead Partner: LMU**

Short description: The Main is the Rhine rivers' largest right tributary, located right in the centre of Europe and stretching East-West from the mid-altitude mountain ridges of Upper Franconia in the Northeast and the Franconian Alb region in the South towards Frankfurt in the West, covering a total of 27.292km². The river basin is characterized by intense topographic gradient and covers various meteorologically and ecologically diverse regions. The river has a complex runoff regime. Human settlements, infrastructure and economy are historically acquainted to this habitat in stable climatic conditions. Germany's federalism has established strong municipal responsibilities including infrastructures of services for the public. These take the challenge and the chances to adapt in self-response of local governance to expected climate change.

Naturally, all floods occur in winter and early spring, due to snowmelt and prolonged precipitation, while in the summer and early fall, low flows or even droughts are recorded, such as the record-breaking drought event in the summer of 2015. According to the available climate projections for the region, an intensification of the present climatic variability is expected, i.e., moderately increasing temperatures with stronger precipitation in the winter and reduced precipitation in the summer.

The diverse topographic and climatic conditions have led to heterogeneous land use patterns. While Upper Franconia, due to its mountainous character and adverse climatic conditions, is characterized by over 60% forest cover, Middle and Lower Franconia is characterized by intense and very diverse agricultural use. Especially Lower Franconia, with its warm and relatively dry climatic conditions, has become a centre of specialized cultivation, including productive and prestigious viniculture, horticulture or hop growing, including its specific effects on natural habitats, groundwater and alternative land use. The regions along the Main river contribute to electricity supply (22%, Middle Franconia to 28%, Lower Franconia) from renewable energy sources (photovoltaic, wind and biomass installations (www.energymap.info)) in the German/Bavarian Energiewende (energy transition).

The Main River is currently widely used for transcontinental industrial and touristic navigation from the Black Sea to the North Sea, thus, necessary infrastructure is built along the river, such as inland ports, weirs, and locks, equipped with an installed hydroelectric capacity of 127 MW. The Rhine-Main-Danube Canal, which is part of the Franconian Water Transfer System, employs a complex network of artificial reservoirs and rivers to transfer on average 150 Mm³ per year from the Danube river to augment low flow conditions and related water quality and navigation problems in the Main river system.

There is strong growth in the region, especially in transitioning the energy system towards renewables, which causes substantial conflict and competition for land resources. The River basin already experienced major dependency on Danube water (via the Main-Danube canal) to avoid water scarcity and pollution - this is quite exceptional for Central Europe; projections for intensified winter floods and particularly extreme summer drought are severe and will be troublesome and a real challenge for all "areal" economies (e.g. agriculture, forestry, water resources management); on addition, the urban centres in the basin are not prepared for the expected heatwaves. Despite a generally high adaptive capacity, the region is at risk for being pushed beyond its resilience threshold and will need a new level of responsiveness to cope with climate change. Given the recent climate and socio-economic projections, the expected industrial and domestic water demand (and already licensed water withdrawal from the river) will very soon exceed the continuously diminishing water supply in the basin, turning the Main region from a formerly resilient to a highly exposed and vulnerable climate change hot spot in the heart of Europe and across the European watershed divide.

Key systems addressed: The Main river basin is considered highly vulnerable to the unavoidable effects of climate change. Combined approaches may open windows of opportunity to respond to climate change. ARSINOE will provide the required innovation to build multi-sectoral resilience and adaptive capacity to reach the ambitious emission reduction targets while establishing and maintaining water-energy-food security and ecosystem integrity. Regarding CS3, 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 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.

CS4: Ohrid/Prespa lakes	**Lead Partner: IECE**

Short description: Lake Ohrid is located in the southwest part of the Republic of North Macedonia, on the border with the Republic of Albania. Approximately two-thirds of the lake area belongs to North Macedonia and one-third to Albania. The Prespa lakes system are two freshwater lakes, with the larger shared between North Macedonia, Albania, and Greece, and the smaller shared between Greece and Albania. The two lakes are recognized amongst the most ecologically valuable aquatic regions in Europe. The transboundary area includes six protected areas, three internationally recognized wetlands and a UNESCO Biosphere Reserve. The Ohrid/Prespa lakes form a rare natural interconnected hydraulic system in which the water from Prespa Lake drains into Ohrid Lake. The cascade large hydropower power plants (HPPs) Globocica and Shpilje utilize water from the Crn Drim River, which flows into Lake Ohrid. The hydropower energy production continues downstream, in three cascade HPPs in Albania. Ohrid/Prespa touristic region represents a modern and attractive area for all types of tourism. Special landmark of the region is the large number (over 360) of churches and monasteries from mid-age centuries. Industry consists mostly of textile, food, tobacco and construction materials SMEs. All socio-economic sectors are highly dependent on the water regime of the greater Ohrid/Prespa region and therefore highly sensitive to water scarcity induced by climate change. Existing studies and management plans for the greater region have identified the need for adaptation to climate change impacts and foreseen urgent actions for improvement of quality and quantity of surface and sub-surface water, based on a sustainable and efficient use of water, supported by the appropriate water governance solutions. The 3 countries have an excellent collaboration and experience in common planning and coordination of actions.

The Ohrid / Prespa lakes are recognized as a representative case study for ARSINOE, taking in consideration the following facts:

- the problem of depletion of surface and groundwater bodies, that has been identified and explored for several years, by government bodies, experts and wide social community of the three neighbouring countries sharing the water resources of Ohrid and Prespa Lakes; observations and studies alert that the problem will further expand in severe climate scenarios, along with growth forecasts, unless appropriate measures are undertaken,
- high level of exposure to climate risks, thus vulnerability, of multiple sectors dependent on water: valuable environmental ecosystems (internationally recognized and protected), as well as economy in the region - tourism, fishery, agriculture, small processing industries, hydropower; identified adaptive capacity thereof, by implementation of rational, smart and long term actions,
- need for integrated and coordinated cross sectoral, transboundary and multi stakeholders inclusive actions, to improve climate resilience of the coupled environmental, economy and social sectors.

Deployment of ARSIONE innovative approach in this case study, will result in a resilient, climate adaptive regional water management and governance system, for all stakeholders' benefit, solving the problem of water scarcity and climate vulnerability in this region, being one of the most appreciated environmental and social (ancient cultural and historical heritage) systems in Europe, and on the other hand, mostly affected by the COVID 19 pandemic, due to the composition of economic sectors.

Key systems addressed: This CS aims at improving climate resilience of environmental, economic and social sectors related to water use, having 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 interests in order to improve human health, food production, conservation of natural environmental systems, clean energy production and sustainable growth of all sectors. Primary production and terrestrial biodiversity in the wider transboundary region of the lakes Ohrid/Prespa, will be analysed to propose a new water governance management framework, adapted to climate change challenges. This CS will contribute to secure a balanced use of available water resources and bridge the gap between social and economic aspect facing the climate changes impacts on a transboundary surface water ecosystem of Ohrid and Prespa lakes. Aquatic and terrestrial ecosystems featured with rare biodiversity species will be encompassed in this transboundary water governance solution. Clean energy production from five hydropower plants on the Drin River (two in North Macedonia, three in Albania) will be included in the analysis for optimal water allocation and climate adapted usage and management thereof.

CS5: Canary Islands	Lead Partner: ULL

Short description: The Canary Islands are an outermost region of the European Union belonging to Spain, located approximately 2000 km from the Iberian Peninsula. Due to their insular condition, they are characterised by limited resources and high dependence on the outside world. On the other hand, they are islands rich in renewable energy sources such as wind, sea, geothermal energy or the sun. This archipelago must develop and implement an ecological transition on the islands, so that life on them can develop in a sustainable way in the future. This is key in a region where the population is growing annually and where a large part of the water resources come from the subsoil and from seawater desalination, all framed in a scenario of climate change.

Climate change predicts an increase in temperatures as well as a variation in rainfall patterns, so that without early action, there is a risk of depleting the aquifers' reserves, putting them in a vulnerable situation. All this would lead the archipelago to increase the use of desalination, which has positioned itself as one of the largest consumers of electricity. Therefore, improving the quantitative and qualitative status of groundwater in the Canary Islands is therefore essential for sustainable development in the archipelago.

To establish the starting point of the Canarian archipelago with respect to the vulnerability produced in the insular aquifer by agriculture and livestock, and to define and quantify the limits that should not be crossed in the islands in this aspect. In addition, the energy impact of this nexus on the Canary Islands will also be established, so that it may also be the starting point for reducing emissions related to agriculture in the Canary Islands. In this way, the Canary Islands seek to lead the way in water and energy saving in the agricultural sector, within the Macaronesia region (formed by the Azores, Madeira, Cape Verde and the Canary Islands).

The specific goals are:

1. The analysis of the water cycle (from collection to treatment) in the archipelago linked to fossil energy, thus the carbon footprint of this sector will be established
2. The analysis of the irrigation systems used in the agricultural sector in the Canary Islands and the exploration of new natural purification systems that can be used as irrigation water
3. Since the hydrological cycle and agriculture in the archipelago of the Canaries will be studied, maps of the vulnerability of groundwater due precisely to the use of fertilizers in agriculture and livestock in the archipelago will be created in El Hierro and La Palma
4. The water footprint and carbon footprint of the main crops in the Canary Islands, such as bananas, potatoes, tomatoes and vines
5. All the information gathered in the project will be made available to society through scientific publications in journals, dissemination materials will be created and participation in conferences and seminars presenting the results of the project

Key systems addressed: Regarding the Canary Islands, ARSINOE will focus on the ***ecological transition and vulnerability of aquifers in volcanic islands and will put further efforts to the primary production including agriculture, forestry, water management and clean energy infrastructure.*** ARSINOE will consider 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 will positively affect the agricultural sector and, therefore, the water and energy situation of the archipelago.

Sustainability has three dimensions: ecological, economic and social. The ***Intelligent Specialization Strategy of the Canary Islands (RIS3)*** has green growth and sustainability as one of its priorities, as outlined in the following objectives: Low-carbon economy, industrial development and energy efficiency; Ecoinnovation, agriculture, fishing and environmental protection; Bioeconomy based on Canarian biodiversity; Integration of renewable energies; and Canary Islands Natural Laboratory.

The Canary Islands are immersed in a process of Ecological Transition, where establishing the starting point from the energy point of view of the main sectors of the archipelago is key to implementing measures that affect in a transversal way. Therefore, the calculation of the carbon footprint and water footprint of the agricultural sector in the Canary Islands as well as the water sector, favours the knowledge of the energy situation in the archipelago to be able to establish effective measures of sustainable governance. In addition, a new challenge is opening up in the Canary Islands in terms of water and agriculture. Furthermore, the implication of a volcanic eruption (2021) on the island of La Palma on the island's aquifer (and, therefore, on the availability of water resources) and on agriculture, including banana plantations and livestock farms, will be assessed.

CS6: Black Sea case study	Lead Partner: AUTH

Short description: The Black Sea is a unique sea basin that is rich in biodiversity, and natural resources. But it is under increasing pressure from human activities and the effects of climate change, causing the Black Sea marine ecosystem to deteriorate, undergone drastic changes since the early 1970s. The extended watersheds draining into the sea provide nutrients and pollutants, but also transfer the impacts of climate change from the watersheds to the Black Sea itself.

The Black Sea case study comprises elements from different locations placing them within a virtual watershed with distinct Black Sea characteristics, in such a way, that it can easily be expanded and adjusted to similar study areas. Following a “from source to sea” approach, ARSINOE proposes three sub-studies: the headwater, the riverine and the coastal ecosystems, providing a holistic and integrated approach that connects upstream land use with the coastal ecosystems, focusing on climate change adaptation and mitigation measures. NBSs—low-cost, easy to build constructions, compatible with the surrounding environment, with significant results and minimum environmental impacts—will be introduced across the watershed, in order to enhance the protection from soil erosion, river and sea water pollution, flood protection, groundwater replenishment and coastal zone erosion. In the Ropotamo river complex wetland in Bulgaria, the creation and demonstration of an innovative system for constant monitoring of the functional and spatial structure of the formed complex geosystem, will be implemented. In the Danubian Delta, ARSINOE will assess wetland biofiltration capacity, as well as the role that transitional regions such as delta is playing in the river-sea system management in terms of complex processes aggregating hydrology-nutrients-biomass-biodiversity-economics and social behaviours. The Danubian Delta activities will also further develop and assess Innovative methods for farming on salted soils. Altogether, the CS will aim to provide a holistic regional view of how the region will adapt to climate change, realize its GD transformation and fulfil SDGs with a strong inclusion of state of marine basin - watershed integrative assessments and predictions.

Key systems addressed: The CS aims focuses on the connection between upstream land uses and the **coastal and marine ecosystems** of the Black sea, including the Danube delta, and connections to the western Black Sea marine basin, under climate change and bring out innovative approaches including NBSs. ARSINOE intends to follow an integrated watershed management approach —**from source to open sea**—and provide climate resilient good practices, that will enhance the adaptive capacity of ecosystems and the local communities involved. This CS will comprise elements from different locations placing them within a virtual watershed with distinct Black Sea characteristics. 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. Building on a long history of initiatives for Black Sea marine ecosystem, Blue Growth Initiative for R&I in the Black Sea develops a Joint R&I agenda to guide National and EU policy makers. CS marine responsible partner, METU, has led the drafting of the Strategic R&I Agenda (SRIA) and now coordinates the H2020 CSA Black Sea CONNECT towards SRIA implementation involving multiple stakeholders. BRIDGE-BS (METU leads & AEUB is a 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.

CS7: Southern Denmark **Lead Partner: DTU**

Short description: The Region of Southern Denmark is one of five administrative regions in Denmark with ~1.2 million inhabitants. It covers the island of Funen (Fyn), a number of small islands south of Funen and the southernmost part of Jutland (Jylland), when it borders with the northernmost state of Schleswig Holstein in Germany. Coastal areas dominate the region, which connects to the North Sea, the Baltic Sea and the Inner Danish Waters. All of the major cities in the region are coastal, including the historic city of Odense, one of the most important and third-largest city in Denmark. Other important cities include Esbjerg and its major port, which features high-value industry and serves as a hub for vessels deploying and servicing wind turbines in the North Sea (as well as oil and gas extraction); Ribe, which is Denmark’s oldest town and home to irreplaceable cultural heritage; and Vejle, which houses the regional capital. Key primary production in the region includes fisheries, agriculture, and aquaculture. The Wadden Sea is a transboundary region in the North Sea that is classified as UNESCO World Heritage for its globally unique geological and ecological values, and extends from north of Esbjerg along the Danish, German and Dutch coastlines, covering a total of some 500 km, connecting four of the municipalities in the Region of Southern Region. This area is jointly managed by Denmark, Germany and the Netherlands through the Trilateral Wadden Sea Cooperation

Climate change seriously affects Southern Denmark in almost every possible way. Flooding from coastal, riverine, pluvial sources and groundwater, including compound events, is a critical issue across almost all of the region. Likewise, sea level rise, storms and drought have proven to be a serious issue for many socio-economic sectors. Meanwhile, there are many places both rural and urban, where adaptation is currently constrained by conflicting sectoral, institutional and/ or economic interests, physical conditions, lack of knowledge and technological solutions, as well as national and international policies and legislation (e.g., the Wadden Sea area). Also, institutional frameworks are currently less developed than in other Danish regions. Combined, all of these factors make Southern Denmark extremely vulnerable to climate change.

Key systems addressed: Flooding caused by extreme sea levels, sea level rise, storms, extreme rainfall and runoff events severely affects most natural and human systems in Southern Denmark, which is a region dominated by low-lying coastal areas, coastal cities and vulnerable natural resources. 7 out of 14 national risk areas identified within the EU Floods Directive are located in Southern Denmark. Due to climate change, multi-hazards and their associated risks to key societal and natural systems are expected to increase. To build sustainable resilience to both direct and cascading impacts of flooding, ARSINOE will pursue and co-design systemic solutions involving different scales and socio-economic sectors that exploit intelligent water management and other innovative technologies, nature-based solutions, governance models, and financing instruments. Regarding **primary production**, ARSINOE will seek to identify pathways for exploiting the potential of the urban-rural nexus involving **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. The nearby port of Esbjerg is of international importance as a nexus for renewable and non-renewable **energy** infrastructure in the North Sea. Finally, ARSINOE will consider aspects of **cultural heritage, residential and commercial buildings, transport, and water and sewage infrastructure.**

CS8: Torbay and Devon County	**Lead Partner: UNEXE**

Short description: Torbay is located in South Devon (UK) and covers an area of approximately 62 km^2. 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 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 around the coast of Torquay, Paignton and Brixham during high tidal cycles when the capacity of the surface water outfalls discharging to coastal waters is impeded. In addition to the property flooding, during all of these flood events numerous roads have flooded to some extent, with some of the roads having to be closed to traffic until the flood water has subsided. As sea level is predicted to rise by over 1 m in Torbay over the next 100 years, the frequency and impact of overtopping of the sea defences will increase, resulting in more infrastructure and properties being affected by flooding.

Critical infrastructure (CI) together with many properties within Torbay and Devon are at risk from flooding from different sources including coastal flooding, sewer flooding, surface water run-off, watercourse flooding and main river flooding, affecting resilience to extreme events, due to Climate Change in the region. The objectives of this case study are to analyse the effects of coastal, pluvial and fluvial flooding on CI as a result of climate change over the next 100 years within both Torbay and Devon.

Key systems addressed: Health issues can be assessed to some degree within the case study by identifying residential properties at risk and assessing the effects of this flooding on health. Water will be assessed within the case study by looking at the effects of flooding on the water supply network. Environment, including biodiversity can be assessed as part of the study by investigating the effects of flooding on the local environment. Infrastructure including clean energy and transport will be assessed within the case study by assessing the effects of flooding on critical infrastructure including roads, railways, electric gas, water, telecommunications, etc.

CS9: Mediterranean island – Sardinia	Lead Partner: AGRIS

Short description: The Region of Southern Sardinia is divided between the metropolitan area of Cagliari (the capital of the Island), and the province of South Sardinia. This area accounts for 47.7% (total 1.64 million) and 32.3% (24,090 km²) of Sardinian population and surface, respectively (Source: Italian Institute of Statistics – ISTAT). The climate is typically Mediterranean with warm and dry summers and mild winters. The area can be classified as semi-arid owing to a total mean annual rainfall of about 450 mm, mostly concentrated between autumn and early spring. Climate change projections for this region forecast an increase of the average temperature, with longer hot and dry periods, alternated by short but intense rainfall events. **Water scarcity has always been a crucial issue in this region**. Therefore, satisfying the water demand of citizens, agriculture, industry and tourism and finding a balanced management of the water resource are big challenges that need to be addressed, especially considering the future climate conditions. Water supply in Sardinia derives in part from surface water, stored and regulated by several reservoirs spread all over the Island (57%), and in part from groundwater (43%): 17% of the withdrawn total water is supplied for industrial use, 37% for civil use and 46% for agricultural use. Regarding the latter, 30% comes from groundwater and 68% from surface water. About 45% of the total regional water resource is withdrawn in the metropolitan area of Cagliari and south Sardinia. (Source: ISRI – Institute of Industrial Relations Studies and ISTAT). The Region of Southern Sardinia is the main agricultural area of Sardinia, particularly in the Campidano plain (south-west Sardinia from Oristano to Cagliari). This plain shows a great land variability, due to its ancient geological origin, and a prevalence of alluvial soils with expandable grid clay in the most fertile areas and soils with variable texture in the less fertile ones. The main crops of the area are durum wheat and other cereals (barley and oats), legumes (fava bean), forage (clovers and lucerne) and artichoke and potato in the most fertile areas. Concerning trees, the most important are: vine, olive and almond trees. In terms of integrated productive systems, **the durum wheat chain is the most important in the Campidano plain**. This crop fuels several upstream activities, such as seed production, as well as downstream ones such as milling, bread- and pasta-making. However, durum wheat production and yield stability are seriously threatened by climate change, thus jeopardizing food security and social stability in the whole Mediterranean basin. Concerning Sardinia, a decreasing production trend has been registered due to: (i) the EU decoupling policies; (ii) low commodity price causing low profitability; (iii) unfavourable growing conditions caused by climate change, with projected average yield declines between 16% and 19% in the southern durum wheat growing areas. As a result, the average durum wheat production in Sardinia declined from about 140,000 tons in the 2006-2008 period to 54,000 tons in the 2018-2020 period. Given a demand of more than 160,000 tons, import of durum wheat is necessary. If this imbalance would occur in poor areas of the Mediterranean region, it could generate a **serious threat to food security and trigger migration processes.**

Due to its strategic position, Sardinia is a lab to assess a sustainable food production system based on: new BioFertilizers to preserve soil fertility; innovative use of irrigation and selected genotypes to stabilize yields; focus on local food chains to favour the development of rural areas. Emphasis on durum wheat, the main extensive crop in southern Europe, makes this model highly exportable to the whole Mediterranean areas.

Key systems addressed: ARSINOE’s key aspect in Southern Sardinia will be the Water-Food-Energy Nexus (WFE), aiming to enhance staple food production and yield stability in climate change-prone Mediterranean areas. Increasing air temperatures as well as decreasing and/or more erratic rainfall with increasing land degradation are projected for Sardinia and the Mediterranean Region. This will likely result in decreasing production and yields of the main crops grown in the area, particularly in rainfed conditions. These trends are very likely to negatively affect the stability of local food chains with detrimental effects not only on the primary sector but also on downstream correlated activities at both artisanal and industrial level (e.g. milling, bread-making, pasta-making and trade), including the agro-food sector in tourism. In the long term, even food and social security can be negatively affected, arising the risks of migratory waves from the south to the regions of northern Europe with correlated issues in social security. In this context, 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. Due to its agronomic and economic importance in Sardinia and the Mediterranean region, ARSINOE will focus **on durum wheat and its correlated local chains for bread and pasta production.**

Future climate scenarios forecast an increase of long hot and dry periods, with few short and intense rainfall events, and a reduction of the total water volume available. Water required for irrigation is projected to increase, causing groundwater depletion and salinization with detrimental effects on soil fertility in the medium- and long term. 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 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. Special emphasis will be given to durum wheat with the goal of: (1) optimizing the use of irrigation water in some critical stages of the plant growth by monitoring the vegetative state of the crop by means of remote sensing data and with the aid of medium and long-range probabilistic weather forecasts, with proper physical-statistical downscaling; (2) optimizing the use of energy required to move the water needed for irrigation in line with the water-energy nexus principles. This activity will be carried out using an existing hillside reservoir, but the experimental results related to water and energy fluxes will be used for the next point; (3) creating and sizing above-ground water reservoirs in order to develop an irrigation system totally powered by autonomous renewable sources and with green energy storage in order to strengthen the **water-energy nexus in relation to agriculture**. This system will enable to store water and derive energy from renewable sources at the same time. Extensive use of cropland for agricultural purposes may result in reduced land availability both for animal and plant wild species. In contrast, enhancing crop production in the most fertile agricultural areas will save land with beneficial effects for alternative uses of the soil resource. Moreover, the use of new Animal by-products N-fertilizers originating from a physical method based on the use of radio frequencies capable of rapidly changing the highly degradable organic biological material into a stabilized and sanitized product will allow the disposal of animal waste in a framework of sustainable and circular economy. The use of these new organic fertilizers will also enhance the **soil biodiversity** thus improving the environmental impact of agriculture. In this viewpoint, the next PAC 2021-27 will be strongly focused on soil carbon sequestration and ecosystem services.

3.0 Actions related to WP2 and the Systems Innovation Approach implementation

3.1 Living Lab workshops

ARSINOE develops a methodological framework for the combination of the System Innovation Approach (SIA) with the Climate Innovation Window (CIW) to create an ecosystem for climate change adaptation solutions. The SIA addresses the growing complexity, interdependencies and interconnectedness of modern societies and economies, focusing on the functions of the cross-sectoral system "as a whole" and on the variety of actors, instead of focusing on specific functions or individual/sectoral benefits.

The work in WP6 connected to the SIA focuses on implementing the roadmap developed in Task 6.1 for all Case Studies. In particular this task will see the identification of stakeholders through a dynamic stakeholder mapping and will implement the stakeholder engagement activities for co-creation developed in WP2 at each CS. Nine living labs (LLs) have been set up, one in each Case Study, implementing the SIA and effectively engaging the varies tiers of stakeholders. In the international case studies, additional national / regional livings labs have also been created.

During the reporting period all case studies organised their first and second Living Lab workshops (Table 3-1).

The first workshop focussed on 'Mapping, Scoping and Objective Setting', developing a mental map of the living lab systems. In addition, Workshop 1 saw the definition of the LL objectives as well as the identification of any potential unrepresented stakeholders within the LL. The second workshop subsequently validated the mental map and focussed on finding consensus on the problem statement. Furthermore, the in the second workshops the stakeholders worked on defining the guiding principles for the LL, which are derived from Sustainable Development Goal (SDG) targets. The stakeholders were challenged to envision a common future in 2050 by developing a future vision using the identified guiding principles.

For all the LLs, specific KPIs to measure their success were defined. These included no. of stakeholder attendees, main sectors identified, key challenges identified, key actors identified, key drivers identified, stakeholder gaps identified, relevant SDGs targets identified. The outcomes of the LL workshops 1 and 2, including the KPIs were collected in Workshop Reporting Templates (prepared by WP2). The outcomes and conclusions from the Living Lab workshops organised in the reporting period (M5-M18) are reported in detail in Deliverable 6.5 – 'Implementation of the System Innovation Approach in all the Case Studies - Intermediate report'.

Table 3-1: Overview of living lab workshops organized by the case studies and planning for next workshops.

CS	Living Lab Name	Living Lab focus	Date first LL	Date second LL	Date third LL
CS1	Athens	Mitigating urban heat through nature-based solutions	27/05/2022	6/12/2022	16/06/2023
CS2	Medit. Ports 1 - Piraeus LL	Port Climate change Resilience relative to its core Infrastructure, Operations and Socioeconomic Factors (Workers, Adjacent Communities)	06/09/2022	02/03/2023	Tbd
	Medit. Ports 2 - Valencia LL	Climate vulnerabilities on Valencia port	06/07/2022	06/03/2023	Tbd
	Medit. Ports 3 - Cyprus LL	Address stakeholder needs, identify how pollution affects the shipping sector	04/07/2022	27/02/2023	Tbd
	Medit. Ports 4 – Transboundary LL		After 2nd national LLs	After 3rd national LLs	-
CS3	Main River	Water-energy-food nexus	15/07/2022	18/11/2022	12/05/2023
CS4	Prespa / Ohrid Lakes 1 - North Macedonia	water scarcity in relation to agriculture & tourism & natural heritage	08/07/2022	25/01/2023	Tbd
	Prespa / Ohrid Lakes 2 - Albania	water scarcity in relation to agriculture & tourism & natural heritage	12/08/2022	31/01/2023	Tbd
	Prespa / Ohrid Lakes 3 - Greece	water scarcity in relation to agriculture & biodiversity	08/07/2022	03/02/2023	Tbd
	Prespa / Ohrid Lakes 4 - International	Impact of water scarcity on water levels in the two connected lakes	23/09/2022	24/02/2023	Tbd
CS5	Canary Islands	Impact of temperature raise on the water/food nexus	21/06/2022	24/01/2023	Tbd
CS6	Black Sea 1 - Bulgaria	Integrated water resources management from source to sea with a focus on the environment aspect of water management	09/09/2022	26/02/2023	Tbd
	Black Sea 2 - Romania		14/09/2022	27/02/2023	Tbd
	Black Sea 4 - Turkey combined with Istanbul BRIDGE LL		16/09/2022	17/03/2023	Tbd
	Black Sea 5 - International (lead by Greek team)		17/10/2022	Tbd	Tbd
CS7	Southern Denmark	Emergency preparedness plan in flooding extremes	11/10/2022	30/01/2023	June / August 2023
CS8	Torbay & Devon County	Cascading effects on infrastructures during flooding	22/09/2022	09/02/2023	Tbd
CS9	Sardinia	Transforming the food production system based on durum wheat	27/09/2022	Week of 6 - 10/03/2023	Tbd

3.2 Sustainable Development Goals

In the first Living Lab, each case study created a draft mental map in co-creation with participating stakeholders. This allowed the group to gain awareness of the system's boundaries and interconnected challenges. Subsequently, the system's main challenges were aligned with SDGs to guide each group toward the transformation of problems into opportunities (Figure 3-1). Using these SDGs as a framework, future visions are developed that respond to local challenges. The main outcomes of this action will be the future narratives that will serve as basis for developing the innovation pathways in the 3rd Living Lab workshops. This chapter presents the SDGs identified as relevant for each case study as identified by the stakeholders participating in each Living Lab.

Figure 3-1: SDGs that apply in the ARSINOE case studies.

3.2.1 CS1 – SDGs and connected KPIs

The Athens metropolitan area CS has defined the relevant SDGs and the corresponding specific targets that will be used as indicators. In Figure 3-2 the SDGs and the specific targets that apply in the CS are presented.

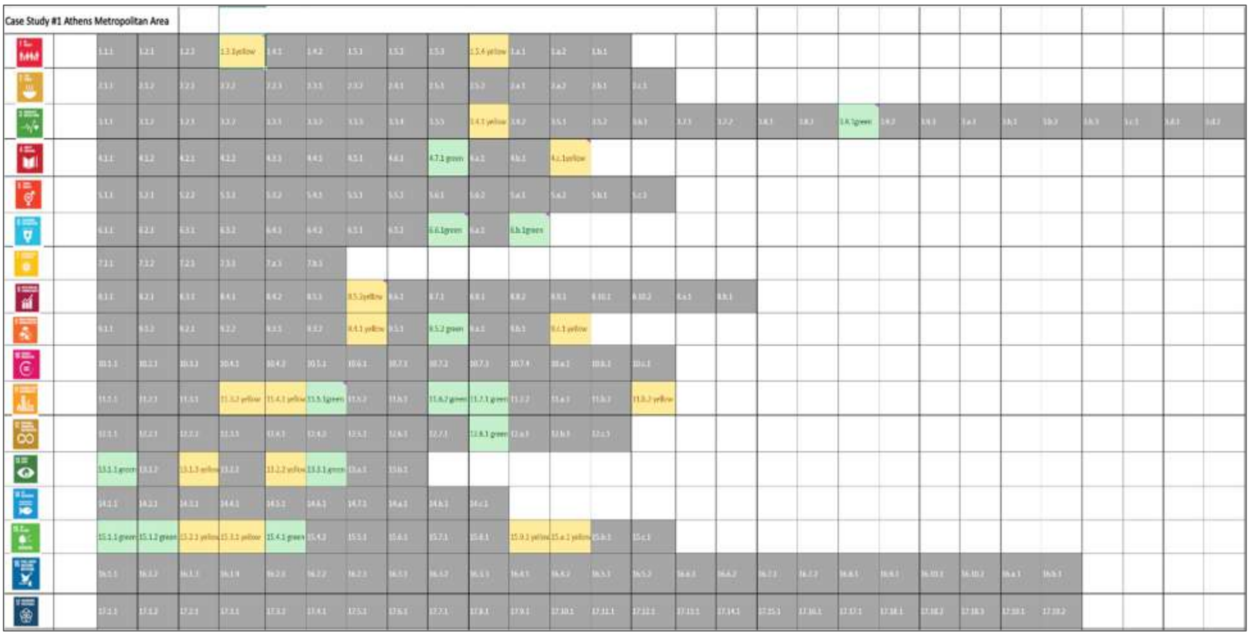

Figure 3-2: SDGs and sub-targets that apply in CS1: Athens Metropolitan area.

- **Goal 1. End poverty in all its forms everywhere**

1.3.1 Proportion of population covered by social protection floors/systems, by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, new-borns, work-injury victims and the poor and the vulnerable.

This indicator will be evaluated through the creation of green jobs in the CS that will affect the unemployment regime.

1.5.4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

The relevant data to support this indicator will come from the number of DRR strategies of each municipality and/or Region of Attica in line with National strategy (Sendai Framework Monitor).

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages**

3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease.

The relevant data to support this indicator will come from the number of deaths due to cardiovascular disease, cancer, diabetes or chronic respiratory disease per municipality.

3.9.1 Mortality rate attributed to household and ambient air pollution.

This indicator will be evaluated through the processes of air pollution removal (CO, NO2, O3, PM2.5, SO2), and oxygen production as a result of NBSs.

- **Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all**

4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

The relevant data to support this indicator will come from the Citizen Observatory (C0) to activate citizen awareness (number of users of the CO, number of projects of the CO).

4.c.1 Proportion of teachers with the minimum required qualifications, by education level.

This indicator will be evaluated through the recording of the qualification of teachers with environmental education aspects.

- **Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.6.1 Change in the extent of water-related ecosystems over time.

NBSs enhance groundwater levels by avoiding run-off.

6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management.

Through the stakeholder engagement a number of local institutions is expected to integrate NBSs friendly planning, which are crucial to the improvement of urban water management.

- **Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive *employment and decent work for all***

8.5.2 Unemployment rate, by sex, age and persons with disabilities.

This indicator will be evaluated through the creation of green jobs in the CS that will affect the unemployment regime.

- **Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

9.4.1 CO2 emission per unit of value added.

The relevant data to support this indicator will come from total CO2 emissions from fuel combustion, also disaggregated by sector at the municipality level.

9.5.2 Researchers (in full-time equivalent) per million inhabitants.

The relevant data to support this indicator will come from the number of researchers per municipality per million inhabitants.

9.c.1 Proportion of population covered by a mobile network, by technology.

This indicator is based on an internationally agreed definition and methodology, which has been developed under the coordination of ITU, through its Expert Groups and following an extensive consultation process with countries. It is also a core indicator of the Partnership on Measuring ICT for Development's Core List of Indicators, which has been endorsed by the UN Statistical Commission (last time in 2014). ITU collects data for this indicator through an annual questionnaire from national regulatory authorities or Information and Communication Technology Ministries, who collect the data from Internet service providers.

- **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically.

11.4.1 Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal).

The relevant data to support this indicator will come from the expenditure (in euros) by each municipality spent on preservation, protection and conservation of all cultural and natural heritage.

11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population.

NBSs are directly mitigating climate change induced disasters (floods, heats, etc).

11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted).

The relevant data to support this indicator will come from the concentration of PM2.5 (μgr/m3) per municipality.

11.7.1 Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities.

The relevant data to support this indicator will come from the percentage of open space for public use of the built-up area of each municipality.

11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

The relevant data to support this indicator will come from the number of DRR strategies of each municipality and/or Region of Attica in line with National strategy (Sendai Framework Monitor).

- **Goal 12. Ensure sustainable consumption and production patterns**

12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

The relevant data to support this indicator will come from the Citizen Observatory (C0) to activate citizen awareness (number of users of the CO, number of projects of the CO).

- **Goal 13. Take urgent action to combat climate change and its impacts**

13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population.

The relevant data to support this indicator will come from the number of deaths due to natural disasters per municipality.

13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

The relevant data to support this indicator will come from the number of DRR strategies of each municipality and/or Region of Attica in line with National strategy (Sendai Framework Monitor).

13.2.2 Total greenhouse gas emissions per year.

The relevant data to support this indicator will come from the annual GHG inventory submissions at municipality level.

13.3.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

The relevant data to support this indicator will come from the Citizen Observatory (C0) to activate citizen awareness (number of users of the CO, number of projects of the CO).

- **Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

15.1.1 Forest area as a proportion of total land area.

The relevant data to support this indicator will come from the percentage of forest area per municipality.

15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type.

The relevant data to support this indicator will come from the mean percentage of each terrestrial and freshwater Key Biodiversity Area covered by protected areas at municipality level.

15.2.1 Progress towards sustainable forest management.

The relevant data to support this indicator will come from the forest indicators (Annual forest area change rate, above-ground biomass stock in forest, proportion of forest area located within legally, proportion of forest area under a long-term forest management plan, forest area under an independently verified forest management certification scheme) established protect areas.

15.3.1 Proportion of land that is degraded over total land area.

The relevant data to support this indicator will come from the percentage of land that is degraded over total land area.

15.4.1 Coverage by protected areas of important sites for mountain biodiversity.

The relevant data to support this indicator will come from the mean percentage of each terrestrial and freshwater Key Biodiversity Area covered by protected areas at municipality level.

15.9.1 (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting.

The relevant data to support this indicator will come from the: (a) number of municipalities which have set national targets in relation to Aichi Biodiversity Target 2 Sub-indicator, and (b) number of municipalities.

3.2.2 CS2 – SDGs and connected KPIs

CS2 Partners have identified the relevant set of SDGs and KPIs to monitor the progress of the implementation of the SDGs in the Mediterranean Ports. Figure 3-3 presents the Global Indicator Framework for the Mediterranean Ports. Based on the identified relevant SDGs, underlines the connections between the SDGs and the mental map nodes presented in the section

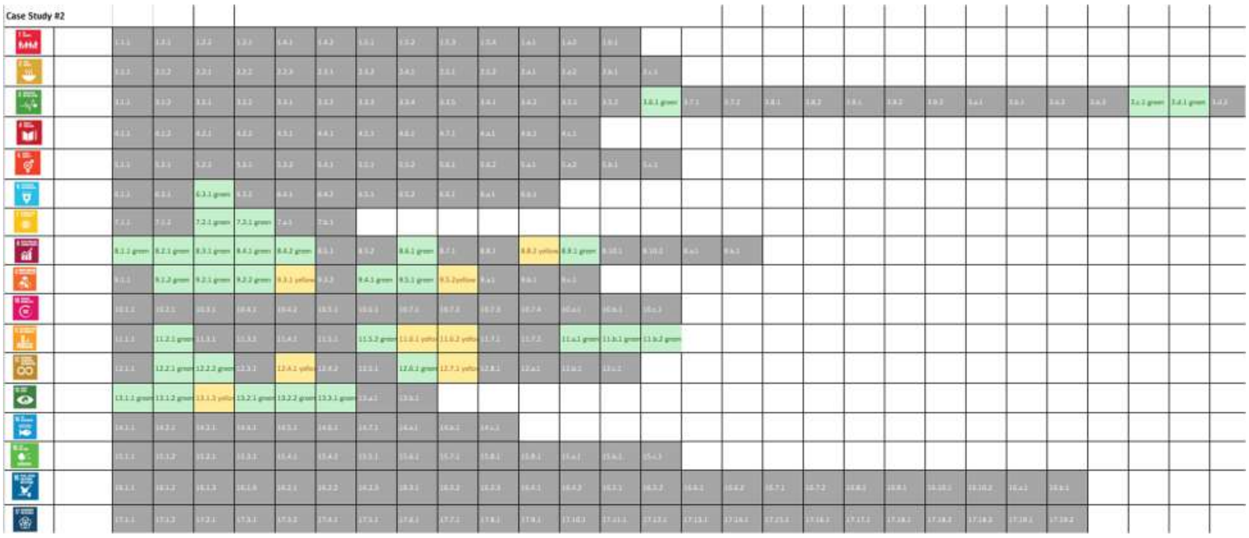

Figure 3-3: SDGs and sub-targets that apply in CS2.

For all the SDGs relevant for Mediterranean seaports, specific KPIs were identified.

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages**

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents.

3.6.1 Death rate due to road traffic injuries.

Number of Accidents.

3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States

3.c.1 Health worker density and distribution

3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

3.d.1 International Health Regulations (IHR) capacity and health emergency preparedness

Number of Work Leaves.

- **Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

6.3.1 Proportion of domestic and industrial wastewater flows safely treated

Proportion of industrial wastewater flows safely treated

- **Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all**

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.2.1 Renewable energy share in the total final energy consumption

Renewable energy share in the total final energy consumption.

7.3 By 2030, double the global rate of improvement in energy efficiency

7.3.1 Energy intensity measured in terms of primary energy and GDP

Fuel consumption.

- **Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**

8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries

8.1.1 Annual growth rate of real GDP per capita

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors

8.2.1 Annual growth rate of real GDP per employed person

8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services

8.3.1 Proportion of informal employment in total employment, by sector and sex

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead

8.4.1 Material footprint, material footprint per capita, and material footprint per GDP

8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

Port Closure to navigation, operations stopped, energy shutdowns, infrastructure damage.

8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment

8.8.2 Level of national compliance with labour rights (freedom of association and collective bargaining) based on International Labour Organization (ILO) textual sources and national legislation, by sex and migrant status

Labour rights compliance.

8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products

8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate

Tourism direct GDP as a proportion of total GDP and in growth rate.

- **Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

9.1.2 Passenger and freight volumes, by mode of transport

Passenger & freight volumes, by mode of transport.

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

9.5.1 Research and development expenditure as a proportion of GDP

Research and Development expenditure as a share to turnover.

- **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

11.5.2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters

Nº extreme events that stop rail operations/damage rail infrastructure (number of disruptions to basic services attributed to extreme climate events).

11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

- ***11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities***

Proportion of port solid waste collected and managed in controlled facilities out of total port waste generated.

11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

11.a.1 Number of countries that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels

11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

Transport logistic chain.

- **Goal 12. Ensure sustainable consumption and production patterns**

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

12.2.1 Material footprint, material footprint per capita, and material footprint per GDP

Natural Based Solutions and Recycled Material

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

12.6.1 Number of companies publishing sustainability reports

12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities

12.7.1 Degree of sustainable public procurement policies and action plan implementation

- **Goal 13. Take urgent action to combat climate change and its impacts**

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2 Integrate climate change measures into national policies, strategies and planning

13.2.2 Total greenhouse gas emissions per year

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

3.2.3 CS3 – SDGs and connected KPIs

Early in the project we selected a set of Sustainable Development Goals (SDGs) and indicators from the Global Indicator Framework, which could be applicable for the case study (Figure 3-4). This preliminary selection of potentially relevant SDGs and indicators was investigated in preparation for the first workshop in the Living Lab.

In addition to the Global Indicator Framework of the UN, information on additional SDG indicators was available for each Landkreis (district) in the Living Lab area through the Bertelsmann Stiftung (Bertelsmann 2023). These indicators for measuring SDGs differ from those used in the Global Indicator Framework. The indicators developed by the foundation were created to enable the measurement of SDGs by municipalities and districts and to enable municipalities to base strategic decisions about sustainability on the indicators and to measure evaluate progress towards sustainability. They differ from the indicators of the Global Indicator Framework because the former are designed to fit the needs and competences of municipalities rather than states or international organizations. The foundation preformed extensive checks to ensure that the indicators they chose were relevant to the situation of German municipalities (Bertelsmann 2022). Municipalities have limited resources and fields of influence. When indicators concerned fields of actions outside of the sphere of influence of a municipality a different indicator was chosen. Nevertheless, these indicators may offer valuable insight into the situation in the case study area.

A total of eight SDGs was selected initially. This broad selection of goals reflects the systemic perspective taken in ARSINOE and in the case study. Figure 3-4 gives an overview of the potentially applicable indicators in case study three that were chosen early in ARSINOE. As the work commenced and debates with stakeholders became more focused, it became clear that some SDGs were more relevant than others.

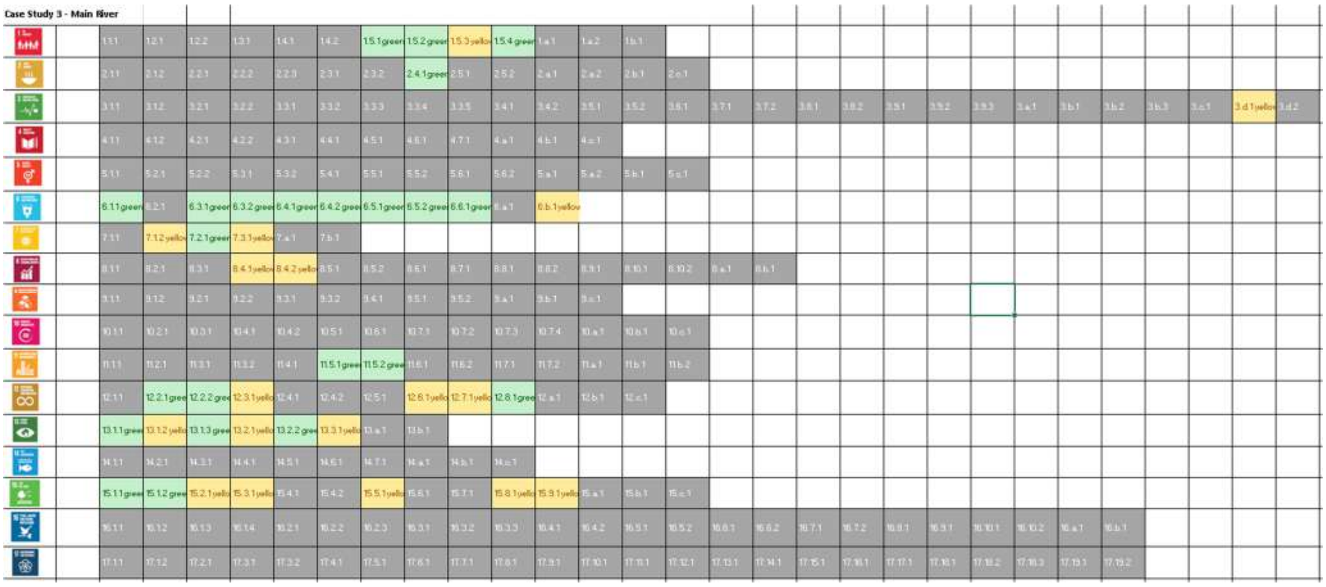

Figure 3-4: Applicable SDGs and sub-targets for Case Study 3.

In the following an overview is given of the initially selected SDGs and indicators. Additionally, some preliminary measurements of SDGs are presented. In some instances, maps have been created to visualize results. Each section starts by naming the SDG. Then related targets and indicators as defined in the Global Indicator Framework are named. Subsequently, an insight into how the SDG, targets or indicators were used for the case study is given. In some instances, a preliminary measurement is attempted either using data related to the indicators of the Global Indicator Framework or using the indicators and data provided by the Bertelsmann Foundation.

- **Goal 1. End poverty in all its forms everywhere**

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters

1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population

1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)

1.5.3 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030

1.5.4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

In the case study of the Main River, the vulnerability of the population to river flooding as well as low-flow water events will be assessed. In cooperation with stakeholders, possible consequences for the local economy, social implications and other stakeholders along the river are considered. Based on hydrological and climatological models, the future vulnerability and exposure can be estimated, and suitable adaptation strategies derived. Therefore, resilience and capacity building are at the heart of this case study. Working together with local actors and policy makers could further improve the proportion of local governments that adopt and implement local disaster risk reduction strategies. Therefore, a connection can be made between caste study three “Main River Basin” and SDG 1. So far, the SDG has not been measured for the case study region.

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages**

3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

3.d.1 International Health Regulations (IHR) capacity and health emergency preparedness

In case study three “Main River Basin” the vulnerability of the population to river flooding as well as low-flow water events will be assessed. In cooperation with stakeholders, possible consequences for the local economy, social implications and other stakeholders along the river are considered. Based on hydrological and climatological models, the future vulnerability and exposure can be estimated and suitable adaptation strategies derived. Therefore, resilience and capacity building are at the heart of this case study. Working together with local actors and policy makers could further improve the proportion of local governments that adopt and implement local disaster risk reduction strategies. As capacity-building is an element of the case study and of SDG 3 a connection was made early in the project. So far, the SDG has not been measured for the case study region.

- **Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.1.1 Proportion of population using safely managed drinking water services

The access to safe and affordable drinking water is very high in Germany and the case study region. The reason for this is that public water supply is a basic public service. The provision of these services is part of local self-government and safeguarded by the German constitution. Municipalities are responsible for the public water supply and must ensure the public water supply in their area. Public water supply includes the supply of drinking water and process water to end users. Municipalities are free in deciding how to set up and to run public services such as water supply. They can create municipal utility companies for this task. These public utilities are community-oriented assets created to serve the needs of their communities. Operating in the context of an economic system driven by competition, they serve the interests of citizens by maintaining a service structure that counteracts forms of market failures and sets up an integral part of Germany's social market economy. They are by design local and sustainable. A top priority of local public utilities is building up permanent structures, oriented towards the needs and future challenges of local and regional communities, their citizens and economy.

An increasing frequency of low-flow water events increases water stress and could have a negative impact on the access to water. Additionally, during times of extreme heat water demand increases. Coinciding low-flow events and heat over long periods of time can be challenges for water supply because they impact water availability, distribution and technical systems. The increase in air and soil temperature may lead to a long-term rise in the temperature of groundwater, which may have a negative effect on its quality. This is of particular importance for the supply of drinking water, most of which is obtained from groundwater in Bavaria. In addition to the mentioned climate risks related to groundwater level and quality, the quality of drinking water sources close to the surface can also be impaired by rising temperatures. Water-borne germs in drinking water pipes may become a more common threat due to expected warming and can worsen the water quality.

While public water supply is ensured within the region measures have to be taken to successfully adapt to climate change and maintain high security of supply.

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.3.1 Proportion of wastewater safely treated

6.3.2 Proportion of bodies of water with good ambient water quality

According to legal requirements, the municipalities are obliged to dispose of their wastewater. In fulfilling their duties, they are supported by the Bavarian Water Management Administration. Like water supply this is a basic public service. Therefore, the proportion of safely treated wastewater is very high. Notably, the Bertelsmann Foundation (2022) chose to not measure if wastewater is safely treated as an indicator for target 6.3. They rather focused on what methods are employed during wastewater treatment.

Moreover, the stream water quality in the districts was derived from the Bertelsmann Stiftung. While the Bertelsmann Stiftung allocated this indicator to SDG14, it also applies to indicator 6.3.2 of the UN Global Indicator Framework. The following Figure shows the percentage of the flowing waters in the municipality, whose ecological status are rated at least "good”.

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.4.1 Change in water-use efficiency over time

6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources

The case study directly assesses the potential future water stress in the region. The impact of climate change on available freshwater in the Main River and its management is a crucial element of our assessment and therefore, these indicators are directly affected by the work of this Case Study.

The above indicators from the Global Indicator Framework were not used by the project by the Bertelsman foundation (2022). The latter connects target 6.4 to four different indicators: The amount of drinking water consumed by private households (litres per day and person), the amount of drinking water consumed by businesses (litters per day and person), the percentage of businesses employing an environmental management system EMAS and the percentage of businesses employing another type of sustainability certification.

The indicators were mapped for the case study region. Below is an example for drinking water consumption in private households.

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.5.1 Degree of integrated water resources management implementation (0–100)

6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

This SDG was chosen in the initial phase of the project. Improved resource management is an important building block for improved climate resilience. In our region, we are connecting several stakeholders that are strongly affected by climate change and can influence the transition towards climate resilience. Water resources are a focal point of the work in case study three “Main River Basin” which is why this SDG was chosen.

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.6.1 Change in the extent of water-related ecosystems over time

This SDG was chosen in the initial phase of the project. Improved resource management is an important building block for improved climate resilience. In our region, we are connecting several stakeholders that are strongly affected by climate change and can influence the transition towards climate resilience. Water resources are a focal point of the work in case study three “Main River Basin” which is why this SDG was chosen.

6.b Support and strengthen the participation of local communities in improving water and sanitation management

6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

This SDG was chosen in the initial phase of the project. Improved resource management is an important building block for improved climate resilience. In our region, we are connecting several stakeholders that are strongly affected by climate change and can influence the transition towards climate resilience. It might include increased participation by local communities which is why this SDG was chosen. During our workshops in the case study region, we connect different stakeholders from state authorities, public utilities, civil society, agriculture, forestry, viticulture, shipping and fishing as well as civil society and debate questions of water management.

- **Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all**

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.1.2 Proportion of population with primary reliance on clean fuels and technology

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.2.1 Renewable energy share in the total final energy consumption

7.3 By 2030, double the global rate of improvement in energy efficiency

7.3.1 Energy intensity measured in terms of primary energy and GDP

This SDG was chosen in the initial phase of the project to allow for a more comprehensive view of sustainability (as defined by the SDGs) in the region. Considering the interconnections between the fields of water and energy, SDG 7 was included in the selection. There was no attempt to measure this SDG. Rather interconnections between water and energy were discussed e. g. in the Living Lab and with stakeholders.

- **Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead

8.4.1 Material footprint, material footprint per capita, and material footprint per GDP

8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

SDG 8 was included in the initial selection of SDGs because inclusive and sustainable economic growth and good labour conditions may be a key element of a transition towards a climate-resilient and sustainable future for the region. SDG 8 could maybe be connected to the work in WP5 on innovations and the work in WP7 on financial instruments.

- **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population

11.5.2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters

This SDG was chosen in the early phase of the project because it directly relates to the goal of ARSINOE: Improving climate-resilience in vulnerable regions. By providing information on future flood events and low flow-water through hydrological and climate models for the region, the risk of disasters and economic losses are investigated. With this information, we will support the region in their adaptation to the changing conditions and thus give a foundation for the adaptation decision making process. Hence, the risk of fatalities and direct economic losses attributed to disasters could be reduced. So far there has been no attempt to measure this SDG for the case study.

- **Goal 12. Ensure sustainable consumption and production patterns**

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

12.2.1 Material footprint, material footprint per capita, and material footprint per GDP

12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

12.6.1 Number of companies publishing sustainability reports

12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities

12.7.1 Number of countries implementing sustainable public procurement policies and action plans

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment

SDG 12 was included in the initial selection of SDGs because sustainable consumption and production patterns may be a key element of a transition towards a climate-resilient and sustainable future for the region. SDG 12 can be connected to the work in WP5 on innovations and the work in WP7 on financial instruments.

- **Goal 13. Take urgent action to combat climate change and its impacts**

13.1 Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries

13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population

13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030

13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

13.2 Integrate climate change measures into national policies, strategies and planning

13.2.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula

This SDG was chosen in the early phase of the project because it directly relates to the goal of ARSINOE: Improving climate-resilience in vulnerable regions. Assessing the impacts of climate change on water availability in the Main River Basin and collaborating with stakeholders on sustainable and innovative solutions is our main focus in the region.

- **Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.1.1 Forest area as a proportion of total land area

15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

15.2.1 Progress towards sustainable forest management

15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation neutral world

15.3.1 Proportion of land that is degraded over total land area

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

15.5.1 Red List Index

Goal 15 about live on land relates to the sustainable management of natural resources which is a focal point of case study three. Consequently, it was chosen in the early stages of the project. The condition and management of forests and soils can impact the water balance considerably. Since ARSINOE takes a systemic perspective, issues connected to SDG 15 have to be included in the analysis.

Supporting the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems is desirable for the Main river region. Besides the biodiversity benefits, this could also positively impact the water quality. Currently, the nature conservative areas within the living lab make up between 25 - 30% in the district of Würzburg and 15- 20% in the district of Schweinfurt. In the urban areas their share is of course notably smaller.

Biodiversity in the living lab area has been assessed using the so-called hemeroby-index. This index shows the degree of human intervention within a region with lower values assuming less intervention and thus, a higher landscape quality. Compared to the surrounding districts, the districts of Würzburg, Schweinfurt and Kitzingen have high values and hence a lower landscape quality.

3.2.4 CS4 – SDGs and connected KPIs

Case Study 4 has selected all the SDG indicators that are related to the Ohrid and Prespa lakes (Figure 3-5).

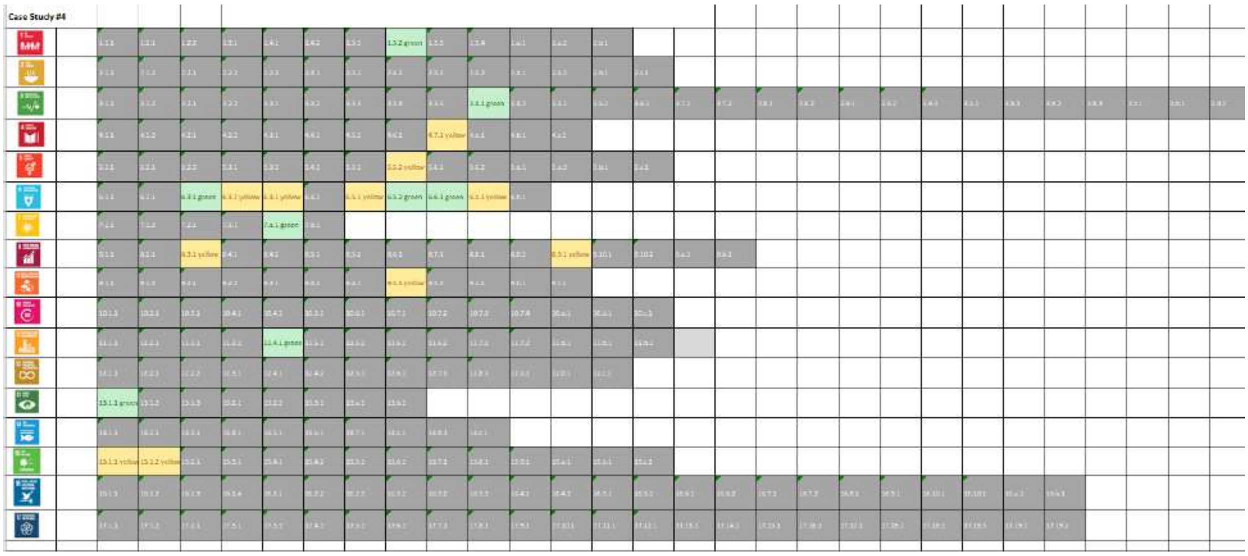

Figure 3-5: Applicable SDGs and sub-targets for Case Study 4.

- **Goal 1. End poverty in all its forms everywhere**

1.5.2 Direct disaster economic loss in relation to global gross domestic product (GDP)

Within the study and research in the Ohrid Prespa Region, we will make a research on the direct disaster economic loss in relation to GDP in the region of Ohrid Prespa Lakes

1.5.4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

The prevention of these problems should be studied by local entities, which are the ones that best understand the problems associated with a given area. Of course, local measures must be backed and supported by the rest of the national and European institutions.

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages.**

3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease

The prevention of these problems will be studied In the case study of the Ohrid and Prespa lakes.

- **Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.**

4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment

In the case of Ohrid and Prespa Lakes with the creation of the Living Lab, the active participation of citizens and stakeholders will be sought, we will be able to test the knowledge and concern of the local population on issues related to climate change and sustainable development in the region.

- **Goal 5. Achieve gender equality and empower all women and girls**

5.5.2 Proportion of women in managerial positions

Within the study linked to SMEs in the region, that we are going to conduct in the Ohrid Prespa Region, we will be able to see, in a superficial way, gender equality within the different sectors in the region.

- **Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.3.1 Proportion of domestic and industrial wastewater flows safely treated

With the groundwater monitoring network that we will create in Ohrid Prespa region, we will obtain information on water quality and quantity in the region.

6.3.2 Proportion of bodies of water with good ambient water quality

With the groundwater monitoring network that we will create in Ohrid Prespa region we will obtain information on water quality and availability.

6.5.1 Degree of integrated water resources management

Within the studies conducted in the region of Ohrid and Prespa lakes we will obtain information on integrated water resources management.

6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

Within the studies conducted in the region of Ohrid and Prespa Lakes we will obtain information on the proportion of transboundary basin area with an operational arrangement for water cooperation.

6.6.1 Change in the extent of water-related ecosystems over time

Within the studies conducted in the region of Ohrid and Prespa Lakes we will obtain information on the change in the extent of water –related ecosystems over time.

- **Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all**

7.a.1 International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems

By studying the water availability, and since energy is fully linked to drinking water production and wastewater treatment, as well as food production, we will be able to approximate the use of renewable energy in these sectors.

- **Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**

8.3.1 Proportion of informal employment in total employment, by sector and sex

Within the studies that we will conduct, we will receive information on the total employment, by sector and sex in the region of Ohrid and Prespa Lakes.

8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate

The importance of tourism in the Ohrid Prespa Lakes will be studied directly, by studying its impact on the availability of water, since tourism is a great demander of both resources.

- **Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

9.5.1 Research and development expenditure as a proportion of GDP

Within the research we will investigate the development expenditure as a proportion of GDP.

- **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.4.1 Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)

Within the study that will be done in the Ohrid Prespa region, we will investigate the expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of UNESCO heritage (cultural, natural) and level of government (national, regional, and local/municipal).

- **Goal 13. Take urgent action to combat climate change and its impacts**

13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030

The main outcome sought by the Sendai Framework is as follows:

"The substantial reduction of disaster risk and disaster losses, both in lives, livelihoods and health and in the economic, physical, social, social, cultural and environmental assets of individuals, businesses, communities and countries[1]."

The priorities are as follows:

- ✓ Priority 1: Understand disaster risk.
- ✓ Priority 2: Strengthen disaster risk governance to manage disaster risk.
- ✓ Priority 3: Invest in disaster risk reduction for resilience.
- ✓ Priority 4: Increase disaster preparedness for effective response and to "build back better" in the areas of recovery, rehabilitation and reconstruction.

- **Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

15.1.1 Forest area as a proportion of total land area

Within the study that will be done in the Ohrid Prespa region, we will determine the forest area as a proportion of total land area.

[1] Link to the document: https://www.unisdr.org/files/43291_spanishsendaiframeworkfordisasterri.pdf

15.4.1 Coverage by protected areas of important sites for mountain biodiversity

Within the study that will be done in the Ohrid Prespa region, we will determine the protected areas of important sites for mountain biodiversity in the region.

3.2.5 CS5 – SDGs and connected KPIs

Case Study 5 has selected all the SDG indicators that are related to the Canary Islands case (Figure 3-6).

Case Study #5 Canary Islands																				
1	1.1.1	1.2.1	1.2.2	1.3.1	1.4.1	1.4.2 (B)	1.5.1	1.5.2	1.5.3	1.5.4 (B)	1.a.1	1.a.2	1.a.3	1.b.1						
2	2.1.1	2.1.2	2.2.1	2.2.2	2.3.1	2.3.2	2.4.1 (B)	2.5.1 (B)	2.5.2	2.a.1	2.a.2	2.b.1	2.c.1							
3	3.1.1	3.1.2	3.2.1	3.2.2	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.4.1	3.4.2	3.5.1	3.5.2	3.6.1	3.7.1	3.7.2	3.8.1	3.8.2	3.9.1	3.9.2 (A)
4	4.1.1	4.2.1	4.2.2	4.3.1 (B)	4.4.1	4.5.1	4.6.1	4.7.1 (A)	4.a.1	4.b.1	4.c.1									
5	5.1.1	5.2.1	5.2.2	5.3.1	5.3.2	5.4.1	5.5.1	5.5.2	5.6.1	5.6.2	5.a.1 (B)	5.a.2	5.b.1	5.c.1						
6	6.1.1	6.2.1	6.3.1 (A)	6.3.2 (A)	6.4.1	6.4.2 (A)	6.5.1 (A)	6.5.2	6.6.1	6.a.1	6.b.1 (A)									
7	7.1.1	7.1.2	7.2.1 (B)	7.3.1	7.a.1	7.b.1														
8	8.1.1	8.2.1	8.3.1	8.4.1	8.4.2	8.5.1	8.5.2	8.6.1	8.7.1	8.8.1	8.8.2	8.9.1 (B)	8.9.2	8.10.1	8.10.2	8.a.1	8.b.1			
9	9.1.1	9.1.2	9.2.1	9.2.2	9.3.1	9.3.2	9.4.1 (B)	9.5.1	9.5.2	9.a.1	9.b.1	9.c.1								
10	10.1.1	10.2.1	10.3.1	10.4.1	10.5.1	10.6.1	10.7.1	10.7.2	10.a.1	10.b.1	10.c.1									
11	11.1.1	11.2.1	11.3.1	11.3.2 (A)	11.4.1	11.5.1	11.5.2 (A)	11.6.1	11.6.2	11.7.1	11.7.2	11.a.1	11.b.1	11.b.2 (A)	11.c.1					
12	12.1.1	12.2.1	12.2.2	12.3.1	12.4.1	12.4.2	12.5.1	12.6.1	12.7.1	12.8.1	12.a.1 (B)	12.b.1	12.c.1							
13	13.1.1	13.1.2 (A)	13.1.3 (A)	13.2.1 (B)	13.2.2 (B)	13.3.1	13.3.2	13.a.1	13.b.1											
14	14.1.1	14.2.1	14.3.1 (B)	14.4.1	14.5.1	14.6.1	14.7.1	14.a.1	14.b.1	14.c.1										
15	15.1.1	15.1.2	15.2.1 (A)	15.3.1	15.4.1	15.4.2	15.5.1	15.6.1	15.7.1	15.8.1	15.9.1	15.a.1 (B)	15.b.1	15.c.1						

Figure 3-6: Applicable SDGs and sub-targets for Case Study 5.

- **Goal 1. End poverty in all its forms everywhere**

1.4.2 Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure

Sea level rise is a matter of global concern. It is of particular importance in island territories, where the availability of available land is less than that of a continental territory. The coasts of the Canary Islands concentrate a large part of their population and of the hotel infrastructures that welcome tourism, which is always high and growing in the Canary Islands.

According to a 2016 study (Hansen et al., 2016), the increase in temperatures for the years 2065, 2080 and 2096, would result in a rise in sea level of 0.6, 1.7 and 5 meters respectively.

In this sense, it is logical to think that a rise in sea level will lead to a displacement of people to other territories, raising a series of scenarios that are difficult to resolve today: will migration occur within the island, or will people move to land that they consider less vulnerable to climate change? if people lose their land, will they be compensated for it as if it were a natural disaster? will there be guarantees and prevention plans for this problem before it happens?

1.5.4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

The prevention of these problems should be studied by local entities, which are the ones that best understand the problems associated with a given area. Of course, local measures must be backed and supported by the rest of the national and European institutions.

- **Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture**

2.4.1 Proportion of agricultural area under productive and sustainable agriculture

In the case study of the Canary Islands, we will study the carbon footprint and water footprint associated with priority crops in this archipelago, such as potatoes, tomatoes, bananas and avocados, among others. By obtaining data, we will know what proportion of the crops studied use organic farming, since we always ask about the use of fertilizers or not, as this affects the calculation of the grey water footprint.

2.5.1 Number of (a) plant and (b) animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities

Ensuring food sovereignty is an important issue in the Canary Islands. Indeed, on the island of El Hierro, we will study how sea level rise will affect the possible loss of the island's main crops, since most of them are concentrated in the same area, which is a valley with a very low altitude above sea level.

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages**

3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)

On the island of La Palma and the island of El Hierro we are going to create a groundwater monitoring network that will last for the 4 years of the project. This sensor network will provide information on the vulnerability of the aquifer, including water quality and salubriousness.

- **Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all**

4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex

With the creation of the Living Lab, where the active participation of citizens and stakeholders will be sought, we will be able to see how many young people and adults are interested in these non-compulsory training activities.

4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment

With the creation of the Living Lab, where the active participation of citizens and stakeholders will be sought, we will be able to test the knowledge and concern of the local population on issues related to climate change and sustainable development.

- **Goal 5. Achieve gender equality and empower all women and girls**

5.a.1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure

Within the study linked to agriculture that we are going to conduct in the Canary Islands, we will be able to see, in a superficial way, gender equality within the agricultural and livestock sector in the archipelago.

- **Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.3.1 Proportion of domestic and industrial wastewater flows safely treated

With the groundwater monitoring network that we will create in La Palma and El Hierro, we will obtain information on water quality and toxic spills, if any.

6.3.2 Proportion of bodies of water with good ambient water quality

With the groundwater monitoring network that we will create in La Palma and El Hierro, we will obtain information on water quality and availability.

6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources

With the groundwater monitoring network that we will create in La Palma and El Hierro, we will obtain information on water quality and availability.

6.5.1 Degree of integrated water resources management

With the groundwater monitoring network that we will create in La Palma and El Hierro, we will obtain information on water quality and availability.

6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

The data will be obtained through the sensor network and also through the local administrations, from where we will be able to know their wastewater treatment capacity.

- **Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all**

7.2.1 Renewable energy share in the total final energy consumption

By studying the carbon footprint and water availability, and since energy is fully linked to drinking water production and wastewater treatment, as well as food production, we will be able to approximate the use of renewable energy in these sectors.

- **Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**

8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate

The importance of tourism in the Canary Islands will be studied indirectly, by studying other sectors of special relevance such as agriculture and the availability of water, since tourism is a great demander of both resources.

- **Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

9.4.1 CO_2 emission per unit of value added

The CO2 emissions associated with the main crops of the Canary Islands will be studied, in addition, from a previous study the CO2 emissions linked to the integral water cycle in the Canary Islands are known.

- **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically

With the creation of the Living Lab, where the active participation of citizens and stakeholders will be sought, we will be able to test the knowledge and concern of the local population on issues related to climate change and sustainable development.

11.5.2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters

Sea level rise will pose the risk of damage to possible coastal infrastructures, such as ports, buildings, roads, etc. An attempt will be made to model sea level rise in various scenarios, to approximate these possible damages expected in two areas of the Canary Islands.

11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

The prevention of these problems should be studied by local entities, which are the ones that best understand the problems associated with a given area. Of course, local measures must be backed and supported by the rest of the national and European institutions.

- **Goal 12. Ensure sustainable consumption and production patterns**

12.a.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)

By studying the carbon footprint and water availability, and since energy is fully linked to drinking water production and wastewater treatment, as well as food production, we will be able to approximate the use of renewable energy in these sectors.

- **Goal 13. Take urgent action to combat climate change and its impacts**

13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030

The main outcome sought by the Sendai Framework is as follows:

"The substantial reduction of disaster risk and disaster losses, both in lives, livelihoods and health and in the economic, physical, social, social, cultural and environmental assets of individuals, businesses, communities and countries."[2]

The priorities are as follows:

[2] Link to the document: https://www.unisdr.org/files/43291_spanishsendaiframeworkfordisasterri.pdf

- ✓ Priority 1: Understand disaster risk.
- ✓ Priority 2: Strengthen disaster risk governance to manage disaster risk.
- ✓ Priority 3: Invest in disaster risk reduction for resilience.
- ✓ Priority 4: Increase disaster preparedness for effective response and to "build back better" in the areas of recovery, rehabilitation and reconstruction.

13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

The prevention of these problems should be studied by local entities, which are the ones that best understand the problems associated with a given area. Of course, local measures must be backed and supported by the rest of the national and European institutions.

- **Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development**

14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations

With the groundwater monitoring network that we will create in La Palma and El Hierro, we will obtain information on water quality in marine areas as well.

- **Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

15.2.1 Progress towards sustainable forest management

Given that we will be studying CO2 emissions associated with agriculture in the Canary Islands, it would be interesting to approximate the calculation of CO2 capture by the forest masses of El Hierro.

3.2.6 CS6 – SDGs and connected KPIs

The following SDGs were identified as relevant for CS6: Black Sea (Figure 3-7).

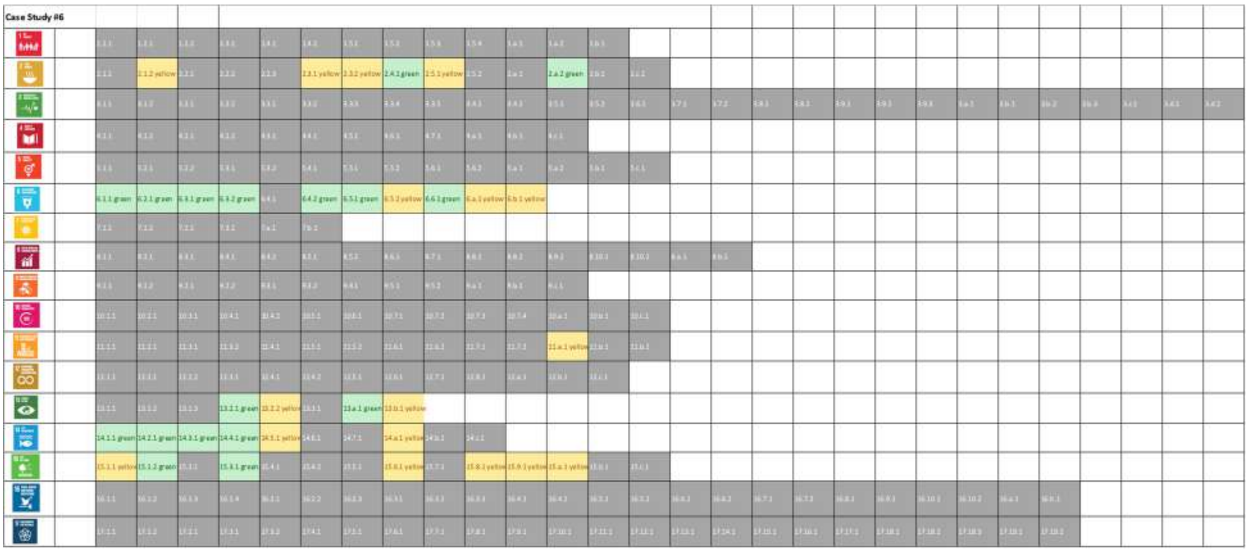

Figure 3-7: Applicable SDGs and sub-targets for Case Study 6.

- **SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture**

2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)

2.3.1 Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size

2.3.2 Average income of small-scale food producers, by sex and indigenous status

2.4.1 Proportion of agricultural area under productive and sustainable agriculture

2.5.1 Number of (a) plant and (b) animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities

2.a.2 Total official flows (official development assistance plus other official flows) to the agriculture sector

SDG 2 was identified as relevant to the Case Study, as it is both directly and indirectly addressed by the partners' activities. Specifically, the Danube Delta sub-Case Study in Romania, aims at studying the development and growth of plants on naturally salted soils. Since these plants can be used for medicinal purposes and as food for livestock, cultivating them on salted soils "frees" fertile soils to be used for agriculture, while it may lead to revealing practices on sustainable farming. Furthermore, water use in agriculture plays a major role in the Aliakmon River sub-Case Study, whereas land uses and use of fertilizers affect the quality of waters in the Western Black Sea Coast.

- **SDG 6: Ensure availability and sustainable management of water and sanitation for all**

6.1.1 Proportion of population using safely managed drinking water services

6.2.1 Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water

6.3.1 Proportion of domestic and industrial wastewater flows safely treated

6.3.2 Proportion of bodies of water with good ambient water quality

6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources

6.5.1 Degree of integrated water resources management

6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.6.1 Change in the extent of water-related ecosystems over time

6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan

6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

The aim of CS6 is the creation of a virtual watershed, in which water is managed sustainably. SDG6 plays a major role in all the sub-Case Studies, such as the management of the water discharge of Aliakmon River, the quality of the Ropotamo River and the Danube Delta inflow. Water quality and discharge naturally affects the quality of waters measured in the Western Coast of the Black Sea.

- **SDG 13: Take urgent action to combat climate change and its impacts**

13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change

13.2.2 Total greenhouse gas emissions per year

13.a.1 Amounts provided and mobilized in United States dollars per year in relation to the continued existing collective mobilization goal of the $100 billion commitment through to 2025

13.b.1 Number of least developed countries and small island developing States with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change

Climate change plays an important role in Case Study 6 as it leads to desertification and water temperature rise directly affecting the strata of the Black Sea and biodiversity in general. It also prolongs the tourist season, leading to intensified water and land pollution and to the to the disruption of land uses, as many acres of farming land are taken over for short accommodation. Climate Change was identified as a major challenge in all the Working Groups and in the International Living Lab, during the first implementation phase of WP2.

- **SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development**

14.1.1 (a) Index of coastal eutrophication; and (b) plastic debris density

14.2.1 Number of countries using ecosystem-based approaches to managing marine areas

14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations

14.4.1 Proportion of fish stocks within biologically sustainable levels

14.5.1 Coverage of protected areas in relation to marine areas

14.a.1 Proportion of total research budget allocated to research in the field of marine technology

SDG14 is of great importance for the Case Study, as "Life below water" is a major challenge in the Black Sea. The Black Sea is an almost closed sea with specific water stratification that results to anoxic conditions in the deeper water layers and to an aquatic ecosystem that is sustained in the upper layer that receives oxygen from the atmosphere. The semi-closed area is more prone to climate change, as temperature rise may lead to the disturbance of the strata, affecting its sensitive ecosystem. Furthermore, activities in the Black Sea, such as aquaculture, fishing and transportation, as well as land uses and activities on land, such as farming practices and water quality discharges, also have an important affect in the quality of waters.

- **SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

15.1.1 Forest area as a proportion of total land area

15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

15.3.1 Proportion of land that is degraded over total land area

15.6.1 Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits

15.8.1 Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species

15.9.1 (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting

15.a.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments

Land uses and biodiversity loss were identified as major challenges in the Working Groups and the Living Lab organized as part of the first phase of the implementation of WP2. Particularly, one of the main goals of the Ropotamo case study, is the monitoring of land uses and the protected area.

3.2.7 CS7 – SDGs and connected KPIs

Early in the project a preliminary set of SDGs and indicators from the Global Indicator Framework, which could be applicable for CS7, was selected. The most appropriate of these potentially relevant SDGs and indicators was selected as “LL guiding principles” on preparation for the second LL workshop (marked with ‘*’).

Case Study #7: Wadden Sea Region																											
	1.1.1	1.2.1	1.2.2	1.3.1	1.4.1	1.4.2	1.5.1	1.5.2	1.5.3	1.5.4	1.a.1	1.a.2	1.a.3	1.b.1													
	2.1.1	2.1.2	2.2.1	2.2.2	2.3.1	2.3.2	2.4.1	2.5.1	2.5.2	2.a.1	2.a.2	2.b.1	2.c.1														
	3.1.1	3.1.2	3.2.1	3.2.2	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.4.1	3.4.2	3.5.1	3.5.2	3.6.1	3.7.1	3.7.2	3.8.1	3.8.2	3.9.1	3.9.2	3.9.3	3.a.1	3.b.1	3.b.2	3.b.3	3.c.1	3.d.1
	4.1.1	4.2.1	4.2.2	4.3.1	4.4.1	4.5.1	4.6.1	4.7.1	4.a.1	4.b.1	4.c.1																
	5.1.1	5.2.1	5.2.2	5.3.1	5.3.2	5.4.1	5.5.1	5.5.2	5.6.1	5.6.2	5.a.1	5.a.2	5.b.1	5.c.1													
	6.1.1	6.2.1	6.3.1	6.3.2	6.4.1	6.4.2	6.5.1	6.5.2	6.6.1	6.a.1	6.b.1																
	7.1.1	7.1.2	7.2.1	7.3.1	7.a.1	7.b.1																					
	8.1.1	8.2.1	8.3.1	8.4.1	?	8.5.1	8.5.2	8.6.1	8.7.1	8.8.1	8.8.2	8.9.1	8.9.2	8.10.1	8.10.2	8.a.1	8.b.1										
	9.1.1	9.1.2	9.2.1	9.2.2	9.3.1	9.3.2	9.4.1	9.5.1	9.5.2	9.a.1	9.b.1	9.c.1															
	10.1.1	10.2.1	10.3.1	10.4.1	10.5.1	10.6.1	10.7.1	10.7.2	10.a.1	10.b.1	10.c.1																
	11.1.1	11.2.1	11.3.1	11.3.2	11.4.1	11.5.1	11.5.2	11.6.1	11.6.2	11.7.1	11.7.2	11.a.1	11.b.1	11.b.2	11.c.1												
	12.1.1	12.2.1	12.2.2	12.3.1	12.4.1	12.4.2	12.5.1	12.6.1	12.7.1	12.8.1	12.a.1	12.b.1	12.c.1														
	13.1.1	13.1.2	13.1.3	13.2.1	13.3.1	13.3.2	13.a.1	13.b.1																			
	14.1.1	14.2.1	14.3.1	14.4.1	14.5.1	14.6.1	14.7.1	14.a.1	14.b.1	14.c.1																	
	15.1.1	15.1.2	15.2.1	15.3.1	15.4.1	15.4.2	15.5.1	15.6.1	15.7.1	15.8.1	15.9.1	15.a.1	15.b.1	15.c.1													
	16.1.1	16.1.2	16.1.3	16.1.4	16.2.1	16.2.2	16.2.3	16.3.1	16.3.2	16.4.1	16.4.2	16.5.1	16.5.2	16.6.1	16.6.2	16.7.1	16.7.2	16.8.1	16.9.1	16.10.1	16.10.2	16.a.1	16.b.1				
	17.1.1	17.1.2	17.2.1	17.3.1	17.3.2	17.4.1	17.5.1	17.6.1	17.6.2	17.7.1	17.8.1	17.9.1	17.10.1	17.11.1	17.12.1	17.13.1	17.14.1	17.15.1	17.16.1	17.17.1	17.18.1	17.18.2	17.18.3	17.19.1	17.19.2		

Figure 3-8: Applicable SDGs and sub-targets for Case Study 3.

- **SDG 6. Ensure availability and sustainable management of water and sanitation for all.**

Target 6.6. By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes.

6.6.1. Change in the extent of water-related ecosystems over time.

The Wadden Sea region is home to a number of very sensitive water-related ecosystems, including in the coastal zone. Several of these ecosystems, including Vidåen, drain into the Wadden Sea. The Wadden Sea is the largest tidal flats system in the world, where natural processes proceed largely undisturbed. It extends along the coasts of Denmark, Germany and the Netherlands. For its globally unique geological and ecological values, the Wadden Sea is listed by UNESCO as World Heritage. Within CS7, we specifically investigate the impacts of human activities, specifically agriculture, and climate change on water-related ecosystems over time. Using a modelling approach, we specifically assess the impact of single- and multi-year droughts and gradual climate change effects on water resources and ecosystem services in a historic and future context.

- **SDG 11. Make cities and human settlements inclusive, safe, resilient, and sustainable.**

Target 11.3*. By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management in all countries.

Target 11.4. Strengthen efforts to protect and safeguard the world's cultural and natural heritage.

Target 11.5*. By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused

by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.

Target 11.b*. By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.

11.b.2. Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

Esbjerg is the largest city in the Wadden Sea region and the fifth-largest town in Denmark. Other important cities include the municipal “capitals” of Nordby, Varde, and Tønder; and the historic city of Ribe which is the oldest city in Denmark (1300 years in 2010). Combined, these five urban areas are home to significant cultural, as well as the natural heritage values, including the Wadden Sea (UNESCO World Heritage), Tøndermarsken, Ribemarsken, and several red-listed species (Target 11.4).

The Wadden Sea region has historically been very flood-prone. The most severe storm surge events on record the so-called “Man Drownings” dating back to 1362 and 1634 caused extensive losses of lives and land. In a more recent event in 1981, a storm surge caused severe economic damage to and disruptions of different operations, in particular, in the port areas (Target 11.5).

Urban development is a high priority in the area, especially in Esbjerg, which is the regional centre for industry, education, various socio-economic and marine activities, including offshore energy (both renewable and non-renewable). Sustainable urbanization is a key priority for the region’s municipality.

We will monitor the historic and projected development of SDG 11 by interacting with stakeholders through our Living Lab, which is partly focused on innovative urban development and climate adaptation in Esbjerg. We will also collect information and indicators from past and present municipal development plans from all four municipalities located in the Wadden Sea region (CS7). The climate risks with and without adaptation will be monitored/assessed under past, current and future climates and (sustainable) urban development scenarios using an integrated modelling approach focused around the open-source Damage Cost and Adaptation Assessment Tool developed by ARSINOE partners from DTU and LNH Water.

- **SDG 13. Take urgent action to combat climate change and its impacts.**

Target 13.1* Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

13.1.1. Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population.

13.1.2. Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030.

13.1.3. Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

Target 13.3*. Improve education, awareness- raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

13.3.1. Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

Climate change adaptation to reduce the risk of flooding, considering both pluvial, fluvial, coastal and groundwater sources, including compound and cascading events, is the turning point for CS7. Target 13.1 will be monitored using the same modelling approach as described above. The climate risks with and without adaptation will be monitored/assessed under past, current and future climates using an integrated modelling approach focused around the open-source Damage Cost and Adaptation Assessment Tool developed by ARSINOE partners from DTU and LNH Water.

Target 13.3 is linked to our Living Lab and will be monitored by the involved stakeholders, which including education institutions.

- **SDG 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.**

Target 14.2. By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.

The connections between terrestrial and marine systems in the region will be monitored in the context of the protected status of the Wadden Sea. We collect existing indicators provided by local authorities and based thereupon we use models to estimate the future status of marine and coastal ecosystems as influenced by climate change and human activities on land, in particular agriculture (nutrients).

- **SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.**

Target 15.1. By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

15.1.1. Forest area as a proportion of total land area.

15.1.2. Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type.

The connections between terrestrial and freshwater systems in the region will be monitored in the context of, e.g., the EU Water Framework Directive. We collect existing data and indicators provided by local authorities and based thereupon we use models to estimate the current and future impact and status of associated wetlands and biodiversity under different scenarios proposed by stakeholders. For this purpose, we make use of specific machine learning models for assessing the impact of drought on freshwater systems and vulnerable species. Remote sensing techniques and GIS analyses will be involved in measuring the indicators linked to Target 15.1.

3.2.8 CS8 – SDGs and connected KPIs

This is a snapshot of the SDGs relevant for CS#8

Case Study #8: Torbay																											
	1.1.1	1.2.1	1.2.2	1.3.1	1.4.1	1.4.2	1.5.1	1.5.2	1.5.3	1.5.4	1.a.1	1.a.2	1.a.3	1.b.1													
	2.1.1	2.1.2	2.2.1	2.2.2	2.3.1	2.3.2	2.4.1	2.5.1	2.5.2	2.a.1	2.a.2	2.b.1	2.c.1														
	3.1.1	3.1.2	3.2.1	3.2.2	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.4.1	3.4.2	3.5.1	3.5.2	3.6.1	3.7.1	3.7.2	3.8.1	3.8.2	3.9.1	3.9.2	3.9.3	3.a.1	3.b.1	3.b.2	3.b.3	3.c.1	3.d.1
	4.1.1	4.2.1	4.2.2	4.3.1	4.4.1	4.5.1	4.6.1	4.7.1	4.a.1	4.b.1	4.c.1																
	5.1.1	5.2.1	5.2.2	5.3.1	5.3.2	5.4.1	5.5.1	5.5.2	5.6.1	5.6.2	5.a.1	5.a.2	5.b.1	5.c.1													
	6.1.1	6.2.1	6.3.1	6.3.2	6.4.1	6.4.2	6.5.1	6.5.2	6.6.1	6.a.1	6.b.1																
	7.1.1	7.1.2	7.2.1	7.3.1	7.a.1	7.b.1																					
	8.1.1	8.2.1	8.3.1	8.4.1	Y	8.5.1	8.5.2	8.6.1	8.7.1	8.8.1	8.8.2	8.9.1	8.9.2	8.10.1	8.10.2	8.a.1	8.b.1										
	9.1.1	9.1.2	9.2.1	9.2.2	9.3.1	9.3.2	9.4.1	9.5.1	9.5.2	9.a.1	9.b.1	9.c.1															
	10.1.1	10.2.1	10.3.1	10.4.1	10.5.1	10.6.1	10.7.1	10.7.2	10.a.1	10.b.1	10.c.1																
	11.1.1	11.2.1	11.3.1	11.3.2	11.4.1	11.5.1	11.5.2	11.6.1	11.6.2	11.7.1	11.7.2	11.a.1	11.b.1	11.b.2	11.c.1												
	12.1.1	12.2.1	12.2.2	12.3.1	12.4.1	12.4.2	12.5.1	12.6.1	12.7.1	12.8.1	12.a.1	12.b.1	12.c.1														
	13.1.1	13.1.2	13.1.3	13.2.1	13.3.1	13.3.2	13.a.1	13.b.1																			
	14.1.1	14.2.1	14.3.1	14.4.1	14.5.1	14.6.1	14.7.1	14.a.1	14.b.1	14.c.1																	
	15.1.1	15.1.2	15.2.1	15.3.1	15.4.1	15.4.2	15.5.1	15.6.1	15.7.1	15.8.1	15.9.1	15.a.1	15.b.1	15.c.1													
	16.1.1	16.1.2	16.1.3	16.1.4	16.2.1	16.2.2	16.2.3	16.3.1	16.3.2	16.4.1	16.4.2	16.5.1	16.5.2	16.6.1	16.6.2	16.7.1	16.7.2	16.8.1	16.9.1	16.10.1	16.10.2	16.a.1	16.b.1				
	17.1.1	17.1.2	17.2.1	17.3.1	17.3.2	17.4.1	17.5.1	17.6.1	17.6.2	17.7.1	17.8.1	17.9.1	17.10.1	17.11.1	17.12.1	17.13.1	17.14.1	17.15.1	17.16.1	17.17.1	17.18.1	17.18.2	17.18.3	17.19.1	17.19.2		

Figure 3-9: Applicable SDGs and sub-targets for Case Study 8.

The following SDG indicators were identified as having a close relevance with the work conducted in the Torbay case study. The indicators are presented ordered, from closest relevance to less close. These indicators are based on the Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development.

A brief description of the overarching sustainable development goals and the relevant indicators is provided below.

- **Goal 1. End poverty in all its forms everywhere**

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters

> ***1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population [Close relevance]***
>
> ***1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP) [Close relevance]***
>
> ***1.5.3 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 [Close relevance]***
>
> ***1.5.4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies [Close relevance]***

One of the key activities within the Torbay case study is the assessment of the resilience of infrastructure and communities to coastal, fluvial and pluvial flooding. With the aid of advanced modelling schemes and the input of local stakeholders, consequences of flooding and mitigation/

adaptation strategies are explored. As flooding constitutes one of the most significant natural hazards and contributes to disasters worldwide, the above SDG indicators are deemed relevant with the work being conducted.

- **Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.1.1 Proportion of population using safely managed drinking water services [Less close relevance]

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.2.1 Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water [Less close relevance]

6.b Support and strengthen the participation of local communities in improving water and sanitation management

6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management [Less close relevance]

Flooding events have the potential to increase stresses in water systems and could have a negative impact on water sources. Additionally, increasing frequency of heat events can increase water demand. As Torbay is a tourist destination the area experiences a population increase during the summer months which therefore increases water demand. When flooding events, heat and an increasing population combine over longer periods of time this can be challenging for the local water supply impacting water availability, distribution and technical systems. As part of the CS8, we are modelling cascading impact of infrastructure. This model will identify vulnerabilities and improve the resilience of critical infrastructures, such as water supply during flooding events.

- **Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

9.5.1 Research and development expenditure as a proportion of GDP [Close relevance]

9.5.2 Researchers (in full-time equivalent) per million inhabitants [Less close relevance]

Within the Torbay case study, a variety of innovative research methodologies, modelling approaches and technological innovations are being developed. These research activities aim to improve the resilience of communities and infrastructure to climate change, and particularly to flooding.

- **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically [Close relevance]

11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage

11.4.1 Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal) [Close relevance]

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population [Close relevance]

11.5.2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters [Close relevance]

11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

11.a.1 Number of countries that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space [Close relevance]

11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels

11.b.1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 [Close relevance]

11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies [Close relevance]

SDG 11 is highly relevant to the activities of the Torbay case study, and the overarching goal of ARSINOE in general by creating climate resilient-regions through systemic solutions and innovations. Providing flood risk information, investigating the consequences of it, investigating adaptation and mitigation measures as well as participation of local communities and stakeholders are within the key activities of CS8. The living lab workshops ensure that a variety of stakeholders can contribute to the discussions and design of the work with the ultimate goal of making Torbay more inclusive, safe, resilient and sustainable.

- **Goal 13. Take urgent action to combat climate change and its impacts**

13.1 Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries

13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population [Close relevance]

13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 [Close relevance]

13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies [Close relevance]

13.2 Integrate climate change measures into national policies, strategies and planning

13.2.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other) [Close relevance]

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula [Close relevance]

SDG 13 closely relates to the activities of the Torbay case study and the ARSINOE project in general. Assessing climate-change impacts on flooding within the Torbay area and collaborating with stakeholders on sustainable and innovative solutions is one of the main focus areas of the Torbay case study.

- **Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels**

16.6 Develop effective, accountable and transparent institutions at all levels

16.6.1 Primary government expenditures as a proportion of original approved budget, by sector (or by budget codes or similar) [Less close relevance]

16.6.2 Proportion of population satisfied with their last experience of public services [Less close relevance]

16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels

16.7.1 Proportions of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions, by sex, age, persons with disabilities and population groups [Less close relevance]

16.7.2 Proportion of population who believe decision-making is inclusive and responsive, by sex, age, disability and population group [Less close relevance]

Within the activities of the Torbay case study, local communities and stakeholders are included in the discussions. This is primarily through the LL. Stakeholder mapping was conducted prior to the development of the LL to ensure that there was a diverse mix of people and organisations involved. Equity, inclusion, and diversity is at the heart of the living lab sessions ensuring everyone has a voice and we have invited stakeholders who represent minority groups within Torbay to present their activities to ensure it is at the forefront of the project.

- **Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development Finance**

17.15 Respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development

17.15.1 Extent of use of country-owned results frameworks and planning tools by providers of development cooperation [Less close relevance]

17.16 Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries

17.16.1 Number of countries reporting progress in multi-stakeholder development effectiveness monitoring frameworks that support the achievement of the sustainable development goals [Close relevance]

17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

17.17.1 Amount in United States dollars committed to public-private partnerships for infrastructure [Less close relevance]

As previously mentioned, one of the main goals of the activities within Case study 8 referring to the Torbay area is to include local stakeholders in discussions, foster participation and collaboration and encourage innovation development. As such, SDG 17 sub-indicators were initially identified as less closely related indicators.

During the Living Labs, the above-mentioned SDGs were discussed and further elaborated with the stakeholders. The following table shows the outcome of these discussions, where the most relevant were discussed at higher level, selected and refined. For the purpose of a full report we present the initial selection (see Figure 3-9) and the final selection presented at LLWS2 (**Error! Reference source not found.**).

3.2.9 CS9 – SDGs and connected KPIs

The following SDGs were identified as relevant for CS9: Sardinia (Figure 3-10)

Case Study #9: Sardinia																										
1.1.1	1.2.1	1.2.2	1.3.1	1.4.1	1.4.2	1.5.1	1.5.2	1.5.3	1.5.4	1.a.1	1.a.2	1.a.3	1.b.1													
2.1.1	2.1.2	2.2.1	2.2.2	2.3.1	2.3.2	2.4.1	2.5.1	2.5.2	2.a.1	2.a.2	2.b.1	2.c.1														
3.1.1	3.1.2	3.2.1	3.2.2	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.4.1	3.4.2	3.5.1	3.5.2	3.6.1	3.7.1	3.7.2	3.8.1	3.8.2	3.9.1	3.9.2	3.9.3	3.a.1	3.b.1	3.b.2	3.b.3	3.c.1	3.d.1
4.1.1	4.2.1	4.2.2	4.3.1	4.4.1	4.5.1	4.6.1	4.7.1	4.a.1	4.b.1	4.c.1																
5.1.1	5.2.1	5.2.2	5.3.1	5.3.2	5.4.1	5.5.1	5.5.2	5.6.1	5.6.2	5.a.1	5.a.2	5.b.1	5.c.1													
6.1.1	6.2.1	6.3.1	6.3.2	6.4.1	6.4.2	6.5.1	6.5.2	6.6.1	6.a.1	6.b.1																
7.1.1	7.1.2	7.2.1	7.3.1	7.a.1	7.b.1																					
8.1.1	8.2.1	8.3.1	8.4.1	?	8.5.1	8.5.2	8.6.1	8.7.1	8.8.1	8.8.2	8.9.1	8.9.2	8.10.1	8.10.2	8.a.1	8.b.1										
9.1.1	9.1.2	9.2.1	9.2.2	9.3.1	9.3.2	9.4.1	9.5.1	9.5.2	9.a.1	9.b.1	9.c.1															
10.1.1	10.2.1	10.3.1	10.4.1	10.5.1	10.6.1	10.7.1	10.7.2	10.a.1	10.b.1	10.c.1																
11.1.1	11.2.1	11.3.1	11.3.2	11.4.1	11.5.1	11.5.2	11.6.1	11.6.2	11.7.1	11.7.2	11.a.1	11.b.1	11.b.2	11.c.1												
12.1.1	12.2.1	12.2.2	12.3.1	12.4.1	12.4.2	12.5.1	12.6.1	12.7.1	12.8.1	12.a.1	12.b.1	12.c.1														
13.1.1	13.1.2	13.1.3	13.2.1	13.3.1	13.3.2	13.a.1	13.b.1																			
14.1.1	14.2.1	14.3.1	14.4.1	14.5.1	14.6.1	14.7.1	14.a.1	14.b.1	14.c.1																	
15.1.1	15.1.2	15.2.1	15.3.1	15.4.1	15.4.2	15.5.1	15.6.1	15.7.1	15.8.1	15.9.1	15.a.1	15.b.1	15.c.1													
16.1.1	16.1.2	16.1.3	16.1.4	16.2.1	16.2.2	16.2.3	16.3.1	16.3.2	16.4.1	16.4.2	16.5.1	16.5.2	16.6.1	16.6.2	16.7.1	16.7.2	16.8.1	16.9.1	16.10.1	16.10.2	16.a.1	16.b.1				
17.1.1	17.1.2	17.2.1	17.3.1	17.3.2	17.4.1	17.5.1	17.6.1	17.6.2	17.7.1	17.8.1	17.9.1	17.10.1	17.11.1	17.12.1	17.13.1	17.14.1	17.15.1	17.16.1	17.17.1	17.18.1	17.18.2	17.18.3	17.19.1	17.19.2		

Figure 3-10: Applicable SDGs and sub-targets for Case Study 9.

- **SDG 2 - End hunger, achieve food security and improved nutrition and promote sustainable agriculture**

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.

2.3.2 Average income of small-scale food producers, by sex and indigenous status.

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, which help maintain ecosystems, which strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

2.4.1 Proportion of agricultural area under productive and sustainable agriculture.

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

2.5.1 Number of (a) plant and (b) animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities

2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

2.c.1 Indicator of food price anomalies.

- **SDG 12 - Ensure sustainable consumption and production patterns**

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

> ***12.6.1 Number of companies publishing sustainability reports.***

- **SDG 13 - Take urgent action to combat climate change and its impacts**

13.2 Integrate climate change measures into national policies, strategies, and planning.

> ***13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change.***

Relevant to the CS9 are also:

SDG 6 - Ensure availability and sustainable management of water and sanitation for all
Specifically

6.4 - By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity. Indicators:

> ***6.4.1 Change in water-use efficiency over time***
>
> ***6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources)***

SDG 7 – Ensure access to affordable, reliable, sustainable and modern energy for all
Specifically:

7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix.

> ***Indicator: 7.2.1 Renewable energy share in the total final energy consumption).***

However, no explicit links to these two SDGs emerged during the first discussion with stakeholders. We will stimulate discussion on these aspects in future stakeholders' meetings.

3.3. Implementation of the Resilience Framework in each Case Study

The objective of ARSINOE is to explore the associations among man-based and natural systems. ARSINOE work packages implement several computer models that have been developed in distinct research domains, e.g., models of ecology, climate change, agent-based models. The framework will present a synthesis of model characteristics related to methodology (e.g., continuous or discrete-time, model resolution), application (e.g., conceptual model development, stakeholder involvement, efficacy) and technical (e.g., model reusability, APIs for input-output and control of the simulation program). The overarching objective of ARSINOE is the development of a multi-system Dynamic Modelling Framework (MSDMF) which will allow for the project partners from diverse application domains to converge at a unified view of the multi-disciplinary modelling methods.

In WP the case studies are guided by the roadmap (T6.1) and coordinated in support of their implementation of all the modelling activities required CS for the resilience modelling framework (WP3) and the Implementation of the Environmental Intelligence Services (WP4). In this chapter the activities in the case studies associated with their contributions to WP3 and WP4 are summarised.

4.0 Actions related to WP3 – Modelling and Data Collection

The objective of ARSINOE is to explore the associations among man-based and natural systems. ARSINOE work packages implement several computer simulation models that have been developed in distinct research domains, e.g., models of ecology, hydrology, climate, agent-based models. The framework will present a synthesis of model characteristics related to methodology (e.g., continuous or discrete-time, model resolution), application (e.g., conceptual model development, stakeholder involvement, efficacy) and technical (e.g., model reusability, APIs for input-output and control of the simulation program). The overarching objective of ARSINOE is the development of a multi-system Dynamic Modelling Framework (MSDMF) which will allow for the project partners from diverse application domains to converge at a unified view of the multi-disciplinary modelling methods.

Each CS will perform systematic and state-of-the-art climate risk assessments and for this purpose will apply its own suite of models to evaluate impacts and associated risks related to gradually changing climate conditions. It is interlinked in this work with various tasks managed in WP3.

All the CS started with technical preparation for Task 6.3 by preparing an **initial** "**conceptual**" **model** [3]of the types of technical/modelling activities that they envisage for their CS. These conceptual models were discussed and refined with their stakeholders at the first stakeholder meetings, which were organised with the help of WP2. The conceptual models are described in section 4.1

A second important technical issue, related horizontally to all the CSs, was the selection of climate projection models and scenarios, as well as the time frame for these selections for the risk assessment. To this end, Task 3.3, in collaboration with the partners form all CSs, defined common climate scenario baselines across the project and facilitate associated projections of multi-hazards and multi-risks within each of the nine diverse Case Studies (CS) in ARSINOE. The outcomes of this action were reported in D3.4.

The modelling needs for all the Case Studies have been collected through WP3, with the help of a specific questionnaire developed by DTU and LMU. Apart from the questionnaire there have been discussions during the weekly WP6 teleconferences and explanations. Each Case Study has further discussed the questionnaire within their own internal meetings. The whole procedure was carried out and finalized at the end of September 2022. The full list of the modelling needs for each Case Study is included in Annex A. The final list will be reported in Deliverable 6.7, where the full modelling in each Case Study will be implemented. The template for each model details the technical characteristics, but also gives the timeline for its implementation within the ARSINOE, which varies from model to model and from Case Study to Case Study, given the different context and specific demands.

Also, in ARSINOE, several modelling tools are being developed, which will be used across several Case Studies in WP3 and WP4. **Annex B** shows a list and overview and short description of those tools. This list was compiled in November and December 2022, at the request of the project REGILIENCE (the sister CSA project), with the intention to be also distributed to the sister projects (IMPETUS and TRANSFORMAR).

Subsequently, the hazard and impact models to be used in ARSINOE were mapped. This includes a variety of typologies: from climate models, GIS based tools, hydrological and hydrodynamic models, to crop and traffic modelling, and damages assessment software. An overview of all models identified for use in de CSs was reported in D3.4. This list is reproduced in Table 4-1. Additional models identified and used not

[3] A conceptual model is a representation of a system. It consists of concepts used to help people know, understand, or simulate a subject the model represents

identified in D3.4 are added and highlighted in blue. Following this overview, the modelling and data collection activities performed in each CS up to month 18 are briefly summarized.

In WP3 work will also be performed on conceptualising the application of computational models for resilience modelling of key infrastructures. This results in a model called the ‘resilience wheel’. Case Studies 1 and 8 are lighthouse cases that are developing this approach and leading its implementation. The results from this development are described in section 4.2.

Table 4-1: Overview of models used in the ARSINOE project by the different case studies, reproduced from D3.4. The first column shows the case study, followed by the model's name and a short description, scenarios currently used and planned to be implemented within the project, associated time horizon, input and output data. The last column indicates whether the described model has any dependencies, which implies that the output of a different model previously used by the case study is used as input for the described model.

CS	Name of model	Description	Scenarios (current/planned)	Time horizon	Data needed (input)	Data produced (output)	Depend. (Y/N)
CS1	Climatic indicators	climate projections	CMIP5: RCP2.6 - RCP4.5 - RCP8.5	2031-2050 2081-2100	Observations (e.g.: T), climate model data	• Daily data of minimum/maximum temperature, relative humidity • Daily humidex (compound index of temperature and rel. humidity) values • Derived indices (e.g., number of days per year with maximum temperature >35C, number of days per year with humidex >38C)	N
CS1	ArcGIS	Citizens' Accessibility to Green Urban Areas (15-minutes city concept)	CMIP5: RCP2.6 - RCP4.5 - RCP8.5	2031-2050 2081-2100	Green urban areas, Open spaces, Road network, Population, Social and urban infrastructure: residential density, mobility, inequality, refugees, jobs	• Accessibility of green urban areas • Number of citizens with and without accessibility to green urban areas, • Social characteristics in relation to the accessibility to green urban areas	N
CS1	GIS-GuidosToolbox	Connectivity of Protected Areas	CMIP5: RCP2.6 - RCP4.5 - RCP8.5	2031-2050 2081-2100	Protected areas Land use	Landscape fragmentation	N
CS1	EPISODE-CityChem (v1.5)	chemistry/transport simulations of reactive pollutants (air quality)	CMIP5: RCP2.6 - RCP4.5 - RCP8.5 CMIP6: SSP3-7.0 - SSP5-8.5	Tbd	Initial and boundary air pollution conditions (surface and atmospheric input) Anthropogenic emissions Meteorological (and land) parameters	NO_2, NO, CO, O_3, SO_2, $PM_{2.5}$, PM_{10}, VOCs, etc.	N
CS1	MINKA, MECODA	Trees- Citizen Science	-	2022-2025	Date, picture, geometry, species	Trees and tree attributes	N

CS	Name of model	Description	Scenarios (current/planned)	Time horizon	Data needed (input)	Data produced (output)	Depend. (Y/N)
CS1	Multilayer network (GIS tools)	Complex Network Analysis for the simulation of the Urban Heat Island effect	CMIP5: RCP2.6 - RCP4.5 - RCP8.5	2031-2050 2081-2100	Daily humidex (compound index of temperature and rel. humidity), Daily data of minimum/maximum temperature, relative humidity, wind speed, land uses: Landscape fragmentation including protected areas, Green & Blue infrastructure, Building heights	Average Surface Temperature Difference between Average Surface Temperature at the target location and the peri-urban, which operates as an indicator for the Urban Heat Island effect	Y
CS1	WRF	Nature based Solutions (NbS) selection and microclimate simulations (WRF)	CMIP5: RCP4.5 - RCP8.5 CMIP6: SSP1-2.6, SSP3-7.0 - SSP5-8.5	Tbd	Initial and boundary conditions (surface and atmospheric input), Static input (topography, land use, soils), Accessible green areas, Landscape fragmentation, Areas of low air quality, Trees distribution, Areas of thermal stress and UHI effect	air temperature, precipitation, relative humidity, surface temperature, soil moisture, PBL height, etc.	Y
CS2	ALADIN63	Regional Climate model (RCM): CNRM-ALADIN or ALADIN-Climat. Application in Valencia and Piraeus/Limassol	Not specified	2040-2060 2080-2100	Precipitation, Wind, Wind surface, Wave, Humidity, Sea level	Atmospheric and oceanographic climate variables	N
CS2	DMI-HIRHAM5	RCM based on HIRLAM and ECHAM models. Application in Valencia and Piraeus/Limassol	Not specified	2040-2060 2080-2100	Precipitation, Wind, Wind surface, Wave, Humidity, Sea level	Atmospheric and oceanographic climate variables	N
CS2	SMHI-RCA4	RCM. Application in Valencia and Piraeus/Limassol	Not specified	2040-2060 2080-2100	Precipitation, Wind, Wind surface, Wave, Humidity, Sea level	Atmospheric and oceanographic climate variables	N

CS	Name of model	Description	Scenarios (current/planned)	Time horizon	Data needed (input)	Data produced (output)	Depend. (Y/N)
CS3	WaSiM	Water Flow and Balance Simulation Model Hydrological model	CMIP5: RCP4.5 and RCP8.5, CMIP6: SSP1-2.6, SSP3-7.0, SSP1 SSP5-8.5	2041-2060 (2041-2071) 2081-2100 (2071-2100)	Meteorological forcing (T, P, radiation, rel. Humidity, wind) Topography, land use, soils Water management structures (reservoirs, water transfer)	Streamflow, Precipitation, Temperature, radiation, humidity, wind, Evapotranspiration, Soil moisture, groundwater recharge, snow storage, direct runoff, interflow	N
CS4	IWaMM (Integrated Water Management Model)	Hydrological and integrated water management model across sectors (climate – water – energy – food)	CMIP5: RCP2.6, RCP8.5	2021-2100	Meteorological forcing (Temperature, Precipitation); Hydrological data (inflows), Climate scenarios Static information on land use (agriculture) and water use Information on water consumption by users (households, agriculture, industry, hydro power)	Water level in the lakes Precipitation, temperature, radiation, humidity, wind Evapotranspiration, soil moisture, groundwater recharge, snow storage/melt, direct runoff, interflow, etc. Water consumption per consumer type	N
CS5	GW-EH-LP + FEFLOW	Groundwater models (insular)	CMIP5: RCP4.5 and RCP8.5	2022-2100	Maximum temperature Minimum temperature Precipitation Sea level rise	Water production cost (economic damage cost) Water quality production (saltwater intrusion)	N
CS5	Hydrodynamic Model h2d	hydrodynamic	CMIP5: RCP4.5 and RCP8.5	2015-2046 2080-2100	Wind and sea level	Free surface	N
CS5	Crop Health Index	Crop health index		2021-2022	remote sensing satellite data (Copernicus Sentinel 2): vegetation index, NDVI (Normalized Difference NIR/Red Normalized Difference Vegetation Index, Calibrated NDVI – CDVI) and NDRE (Normalized Difference NIR/Red-Edge Normalized Difference Red-Edge).	Crop Health Index La Palma and Crop Health Index Hierro	

CS	Name of model	Description	Scenarios (current/planned)	Time horizon	Data needed (input)	Data produced (output)	Depend. (Y/N)
CS6	HEC-HMS	hydrological	CMIP5: RCP4.5 and RCP6.0	2040-2060	Canopy storage, Constant rate of initial and constant loss correspond to saturated hydraulic conductivity, Meteorological data (precipitation, temperature, etc.) Surface slope - EU-DEM	Streamflow	N
CS7	DTU Damage Cost Model	GIS-based tool	CMIP5: RCP4.5 and RCP8.5	2050, 2100	Flood depth (height above ground) Land use	Cross-sectorial damage costs Localization of flooded assets including non-monetary ones	N
CS8	CAFlood	Flood model	CMIP5: RCP2.6, RCP4.5, RCP6.0, RCP8.5 CMIP6: SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5	2021-2040, 2061-2080	LiDAR DEM Precipitation Design rainfall Land cover UK Climate change allowance Downscaled UK climate projection	Water depth, flood extent, flood duration for the modelled domain Water depth hydrograph at selected locations	N
CS8	SUMO (Simulation of Urban Mobility)	traffic modelling software	CMIP5: RCP2.6, RCP4.5, RCP6.0, RCP8.5 CMIP6: SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5	2021-2040, 2061-2080	Road Network Data Traffic Count Data Flood Data	Time-Series Graphs showing Traffic Loading in Network/Cross comparison of Traffic Flows under Dry and Flooded Conditions, Traffic Congestion Maps Emergency Response Service Zone Maps	Y
CS9	CERES-Wheat model (implemented in DSSAT software)	Crop modelling	RCP4.5 and RCP8.5 CMIP6: SSP1-2.6, SSP2-4.5, SSP4-6.0, SSP5-8.5	2050 (2026-2075), 2080 (2076-2099)	Daily data of maximum and minimum temperature, total precipitation, and global solar radiation Soil data (texture, pH, soil organic carbon, etc..) Crop and management data	Crop phenology and crop yield Water and nutrient balances	Y

CS	Name of model	Description	Scenarios (current/planned)	Time horizon	Data needed (input)	Data produced (output)	Depend. (Y/N)
CS9	AquaCrop (developed by Food and Agricultural Organisation of United Nations)	Crop growth model			Climate data (temp, precipitation, evapotranspiration), CO2 concentration, soil data crop data	Crop yield response to water availability and irrigation strategies	

4.1 Defining Conceptual models

In the ARSINOE case studies, stakeholders from diverse backgrounds and disciplines are brought together to co-design an accepted vision of the future. The objective of this task is to enable project partners from diverse disciplines to converge on a unified view, before implementing resilience modelling and assessment frameworks using multi-disciplinary modelling methods. To define the context and map out all relevant aspects, each case study developed a conceptual model. This forms the basis for all modelling activities concerning the Case Studies. The conceptual structure places 'in context' the research that is carried out across different disciplines.

4.1.1 CS1 – Conceptual model

The Athens case study conceptual model has been developed through an iterative process between ARSINOE experts and the living lab, which is an ongoing process until the end of the project and is thoroughly linked to the participatory modelling thread in the sense that the stakeholders also determine the structural components of the model and its thematic subroutines. The main and horizontal subroutine remains the climate change which is considered as the main driver and stress to our complex systems. For the case study of Athens, where the extreme heats are identified as the central hazard, temperature, humidity and other derived climatic indicators will provide insight into the spatiotemporal distribution of the hazard. This will be done through the urban heat island subroutine which also considers other attributes, such as grey/green/blue infrastructure land cover, materials, building heights, colours, etc. During the iterative process, air pollution and noise have also been identified as quite relevant hazards that indicate synergetic threat to the health and well-being of the citizens, but also the local economy, especially the touristic thread.

The three hazards have some common drivers such as transportation and some non-common, and each one of them will be modelled through combinations of deterministic and stochastic approaches, also involving machine learning. Regarding the vulnerable systems to the identified hazards, except for the health, well-being and economy, the cultural and biodiversity urban fabric fragmentation is also identified. Stakeholders suggested that Athens needs synergetic integrating routes that combine culture, such as the AMA antiquities, and urban terrestrial ecosystems, providing cool walks of high aesthetics. For addressing the biodiversity aspect, citizen science tools are developed and will be used to collect the relevant attributes that will inform on the urban biodiversity habitant fragmentation. All the above will feed the intervention submodules. One of the main interventions to be modelled and tested is the urban landscape choices, including green and blue infrastructure, quantifying their effect to the multiple cascading hazards. Other solutions to be feeding our conceptual framework in a more high-level interaction with the models refer to the citizen engagement and the training modules, which have a multiplying effect on our systems by increasing participation, willingness to pay, and reinforcing the green policy agenda.

The conceptual model as developed in collaboration with the CS1 living lab is shown in Figure 4-1.

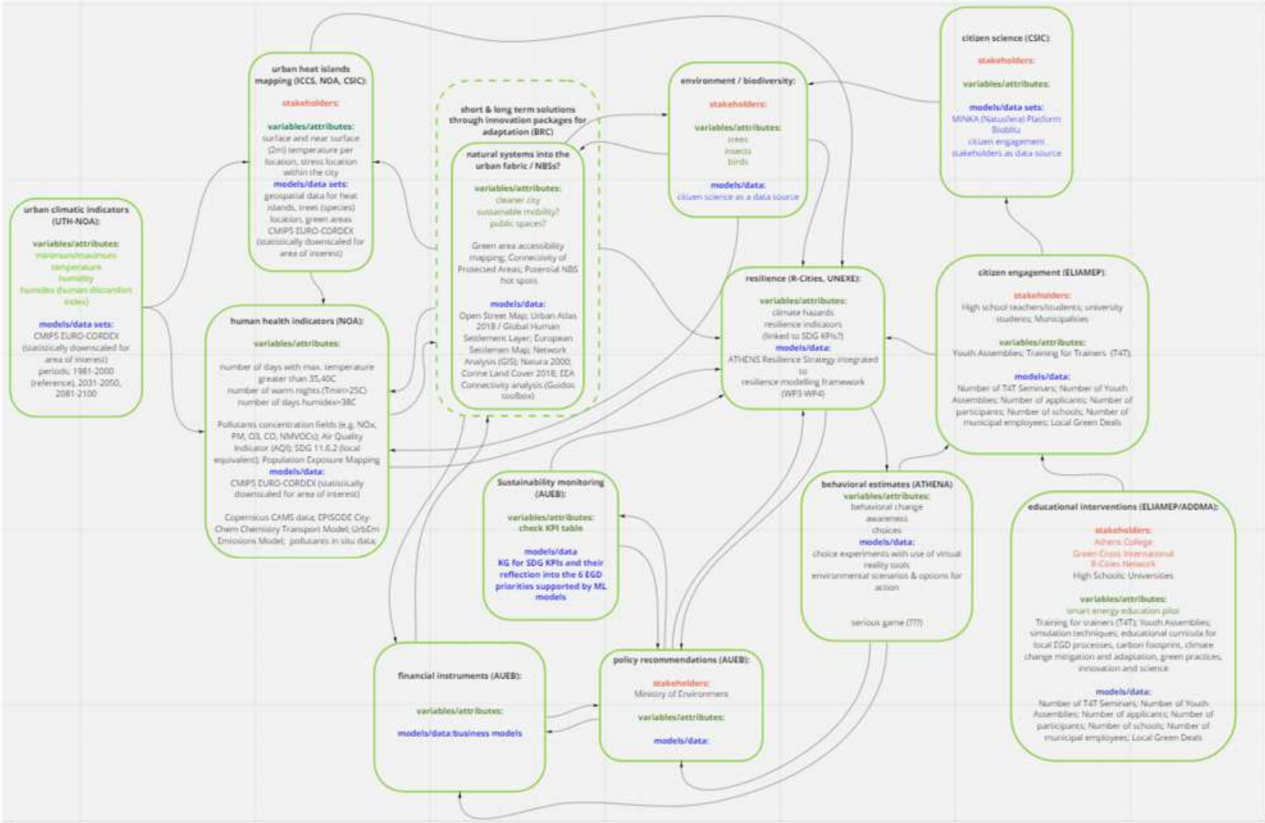

Figure 4-1: CS1 conceptual model.

4.1.2 CS2 – Conceptual model

The Conceptual Model for Mediterranean Ports was drafted and delivered on the 10th of March 2022 (Figure 4-2).

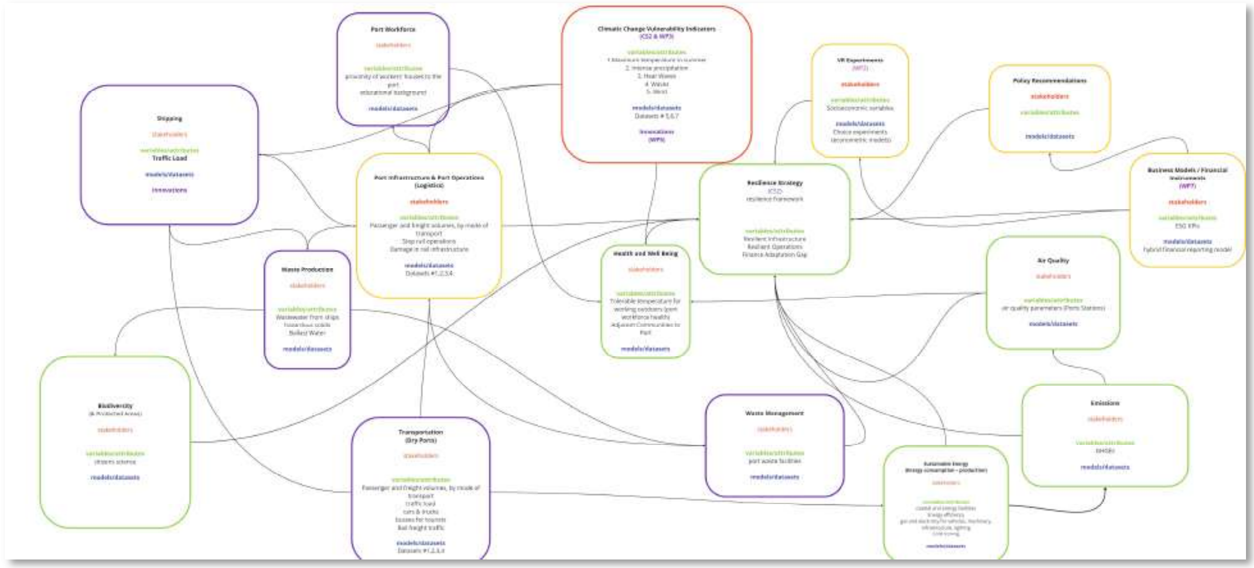

Figure 4-2: CS2 conceptual model.

The conceptual model, which is relevant for all 3 ports of the case study, describes the CS's resiliency strategy by incorporating many seaport dimensions, namely the environment, operations, energy, core infrastructure, socioeconomic and safety. It also describes how the several analyses conducted in the WPs of ARSINOE will increase the resilience strategy for the Mediterranean Ports, as for example the VR experiments in WP2. In each Node, the relevant datasets provided to WP4 are also reported. The red box indicates the relevant climatic variables and how this impact directly or indirectly the port operations and infrastructure by considering several other factors (e.g. other sectors as shipping or Energy Demand).

4.1.3 CS3 Conceptual Model

As part of CS3 the following activities were performed to develop the conceptual model. The resulting conceptual model is shown in Figure 4-3.

- The main model to analyse the water availability under current and future climate conditions is the physically based and spatially distributed hydrological model WaSiM. This model not only delivers simulated river discharge at specified gauges, but also delivers gridded spatial outputs that can be used to assess changes in the different storage components of the water balance as well as the physical states during extreme dry or wet conditions. Examples of outputs are:
    a. Evapotranspiration
    b. Soil moisture in the root zone and the full soil column
    c. Snow storage
    d. Groundwater depth
    e. Groundwater recharge

- Low Flow conditions under current and future conditions for selected catchments in the Main River Basin have been conducted in a Master Thesis.

- The conceptual modelling of irrigation demand in future and the associated impacts of using irrigation water from the river and the groundwater on the local hydrology has been conducted in a Master Thesis for one catchment in the Living Lab region.
- In order to extend the capabilities of the hydrological model WaSiM to other possible hydro-climatic and environmental impacts, we seek possibilities in new machine learning approaches to extend the existing framework. In a first step, a LMU student analysed and tested for his Master thesis various machine learning and statistical approaches for the estimation of river temperatures. In this context a regional machine learning framework (based on LSTM) for the projection of river temperature projections has been developed for several gauges of the Main River which are located in the Living Lab borders.

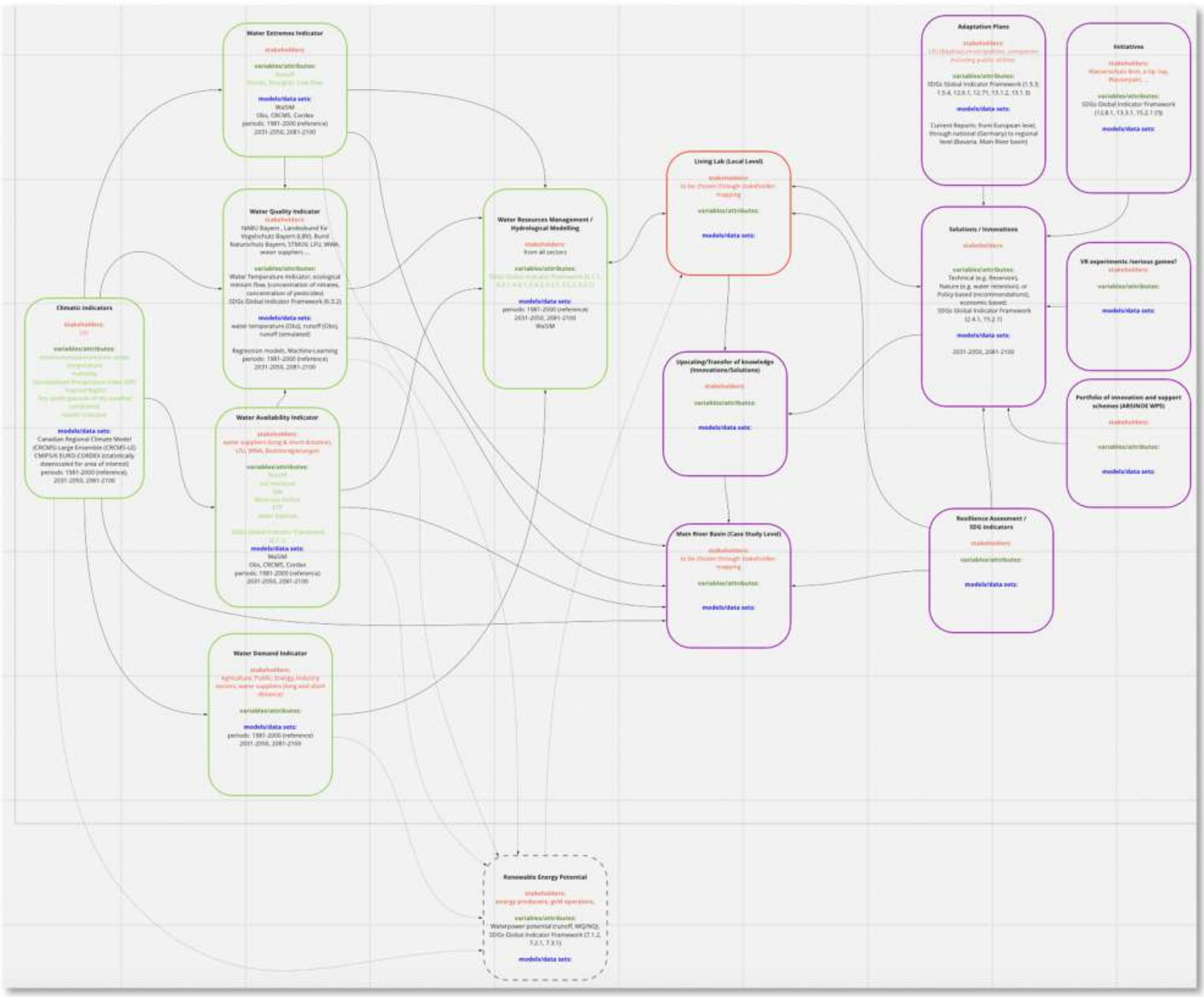

Figure 4-3: CS3 conceptual model.

4.1.4 CS4 Conceptual model

The conceptual model was developed by integrated activities of all the three partners (IECE, NECCA, AKPT). The conceptual model is presented on the figure below:

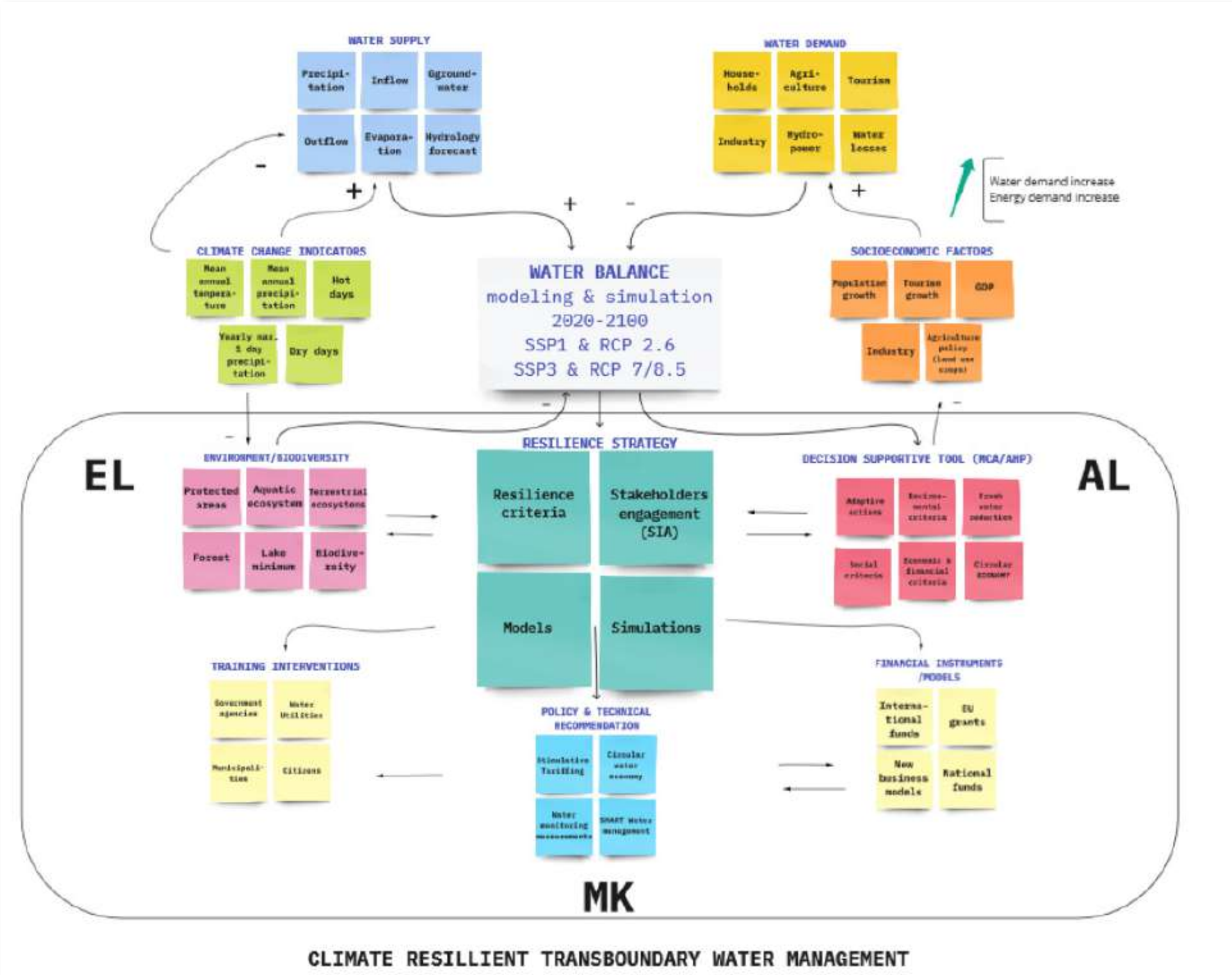

Figure 4-4: Conceptual model of CS4: Ohrid and Prespa Lakes.

The conceptual model was developed on the basis of the following subjects and aspects:

1. Key sectors addressed

- Water supply (households)
- Agriculture
- Forestry
- Industry
- Tourism
- Fishery
- Energy
- Environment, Biodiversity
- Cultural heritage
- Society

2. Main questions to be addressed:

- Sectors that are subject to the case study observation:
- How the sectors are **connected**– interlinkages (conceptual diagram)
- Present base-line trends (2020).
- National specifics, similarities and differences
- What are the **main trends** in the case study area for each of the connected sectors
- Current policies in every sector, in each of the countries (laws, regulations, tariffs, agencies in charge)

3. Objectives and aims

- Identification of vulnerability of all affected environmental, social and economic sectors, induced by **water availability in climate risks forecasts**,
- Specification **of long-term water needs** at conditions of integrated sustainable growth,
- **Simulation of multi sector coupled systems' operation** in climate risks (IPCC) & SSP scenarios,
- Defining **impacts, indicators, monitoring and adaptiveness strategy**,
- Design of **actions and sequence of necessary adaptations**,
- **Integration of the identified multi sectoral consumption** patterns providing resilience,
- Optimization of **multi–sector climate adaptiveness** (in the aspect of feasibility, reliability, effectiveness, health protection, environmental systems preservation, economy recovery and sustainable growth and social patterns),
- **Improving the water management** with the aim to guarantee a sustainable use of the resource, ensuring a balance among environment, society and economy,
- Deployment of **technological innovations**, selection through open calls and BRIGAID CIW
- **Resulting in a new regional water governance model and policy recommendations.**

4.1.5 CS5 Conceptual model

Case Study 5 has defined their conceptual model, including the geological boundaries and its main features, flows and functions, and to establishing the scale of the work. The conceptual model is shown in Figure 4-5.

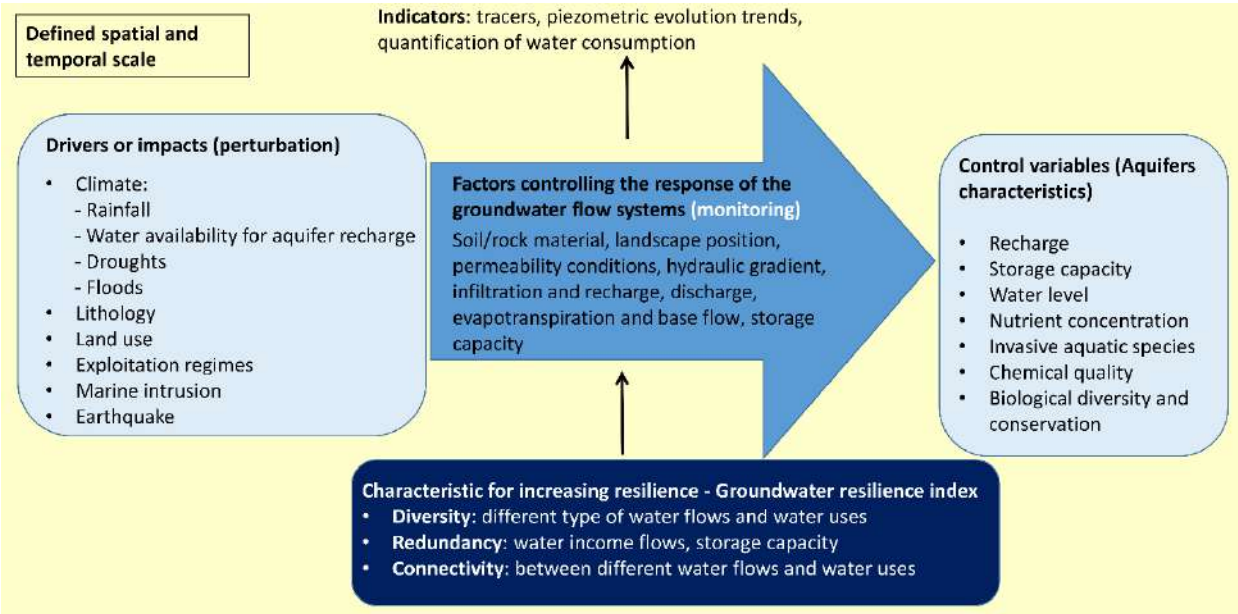

Figure 4-5: Conceptual model of CS5.

The key element identified is resilience in aquifer management. To this end the aquifer model to understand the resilience of the hydrogeological system, cause-effect relationships and impacts, is being developed. This includes completing the hydrogeological model and combining it with a sea level rise model and to study possible future scenarios with the projections we are working with. In this way reliable resilience measures and their respective mapping will be obtained. A conceptual model for the sea level rise modelling is shown in Figure 4-6.

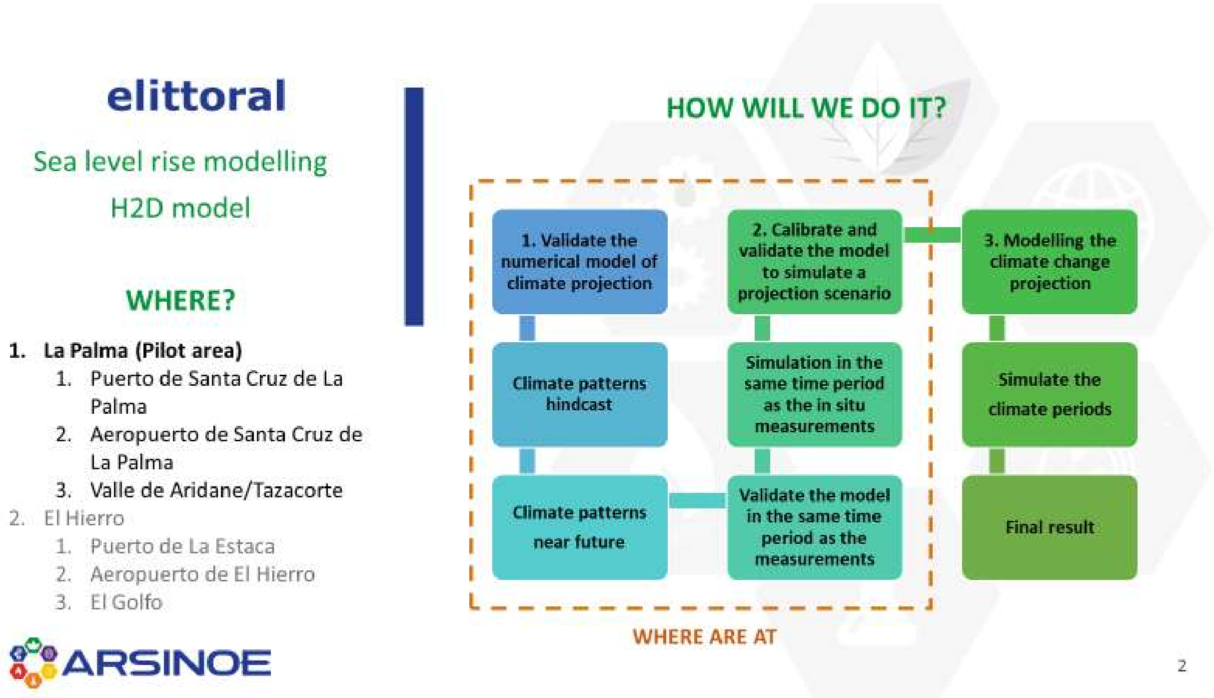

Figure 4-6: Sea level rise modelling.

4.1.6 CS6 Conceptual model

The Black Sea Case Study consists of four sub-Case Studies (Aliakmon River, Ropotamo River, Danube Delta, Western Coast of the Black Sea and Sea of Marmara) that are spatially different and that have different focus areas. The main focus of the Case Study, though, is the formation of a virtual watershed that depicts the connection between land-sea and climate change. Thus, the models used in each sub-Case study may vary. For the purposes of the project and to provide a better understanding of the formation of the virtual watershed referred above, an initial conceptual model was created in February 2022 (Figure 4-7).

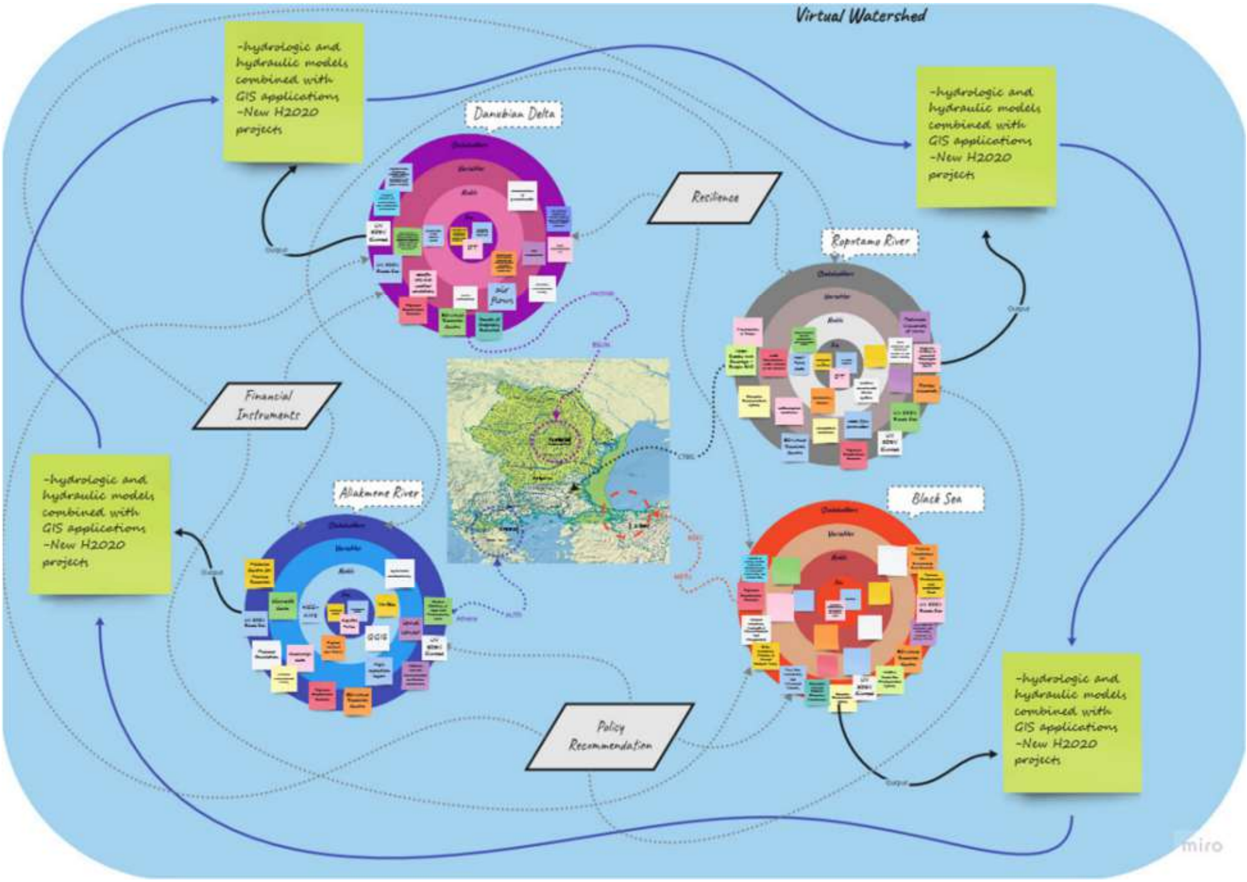

Figure 4-7: Conceptual model of CS6.

Each sub-Case Study of CS6 includes the main stakeholders, the main variables of the models that will be developed, the models and means that will be used to reach the goal of each sub-Case Study, and finally the aim of each sub-Case Study. Then, sub-Case Studies were then linked with each other within the Resilience-Policy Recommendations-Financial Instruments framework, aiming at the creation of the virtual watershed. Due to the complexity of CS6, the conceptual model is considered dynamic and will be altered in May 2023.

4.1.7 CS7 Conceptual model

The conceptual model for CS7 (Figure 4-8) was developed and discussed over the course of several meetings between the partners of CS7. The main contributors were the four municipalities in the Wadden Sea region (Esbjerg, Fanø, Varde and Tønder) led by Esbjerg municipality and DTU. Other contributors were LNH Water and the Danish Coastal Authority.

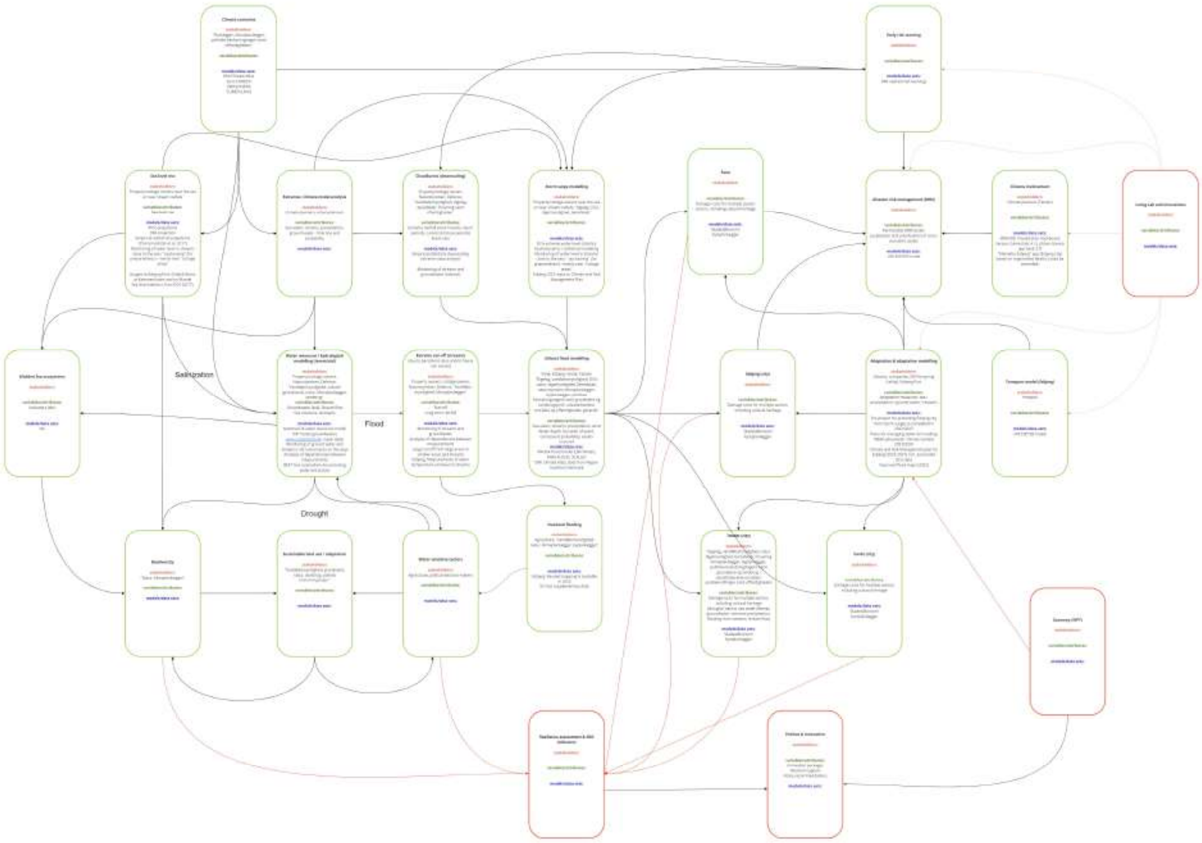

Figure 4-8: Conceptual model / modelling activities in the Wadden Sea region.

Our conceptual model principally covers the interrelated climate challenges discussed above related to water (coastal flooding, pluvial flooding, fluvial flooding, rising groundwater, drought, compound events) across the four municipalities and the Wadden Sea region in the southern part of Jutland. The LL, which covers the coastal region of Esbjerg municipality including the Port of Esbjerg, constitutes a subset of the conceptual model.

The rightmost part of the conceptual model and the LL covers mainly urban challenges, including urban development & climate change adaptation, disaster risk management (coastal urban areas), vulnerable urban infrastructure, and economics. As indicated, the focus here is the city of Esbjerg and, when relevant, the part of Fanø within the domain that has been designated as flood-prone and high-risk after the EU Floods Directive. Fanø and Esbjerg are connected by a ferry, and local emergency management services are shared between the two.

Contextually, the urban and rural terrestrial environments (left part of the conceptual model) are connected physically by water courses, which at high water levels may compound the risk of urban floods (i.e., coastal and pluvial flood events). They are also connected by the Wadden Sea.

The left part of the conceptual model involves sectoral and ecosystem challenges - with a focus on agriculture - and ecosystems/biodiversity related to water resources (drought, salinization caused by intruding sea water) and floods in the open land.

As indicated, the resilience assessment, SDG indicators, economics, and (potential) policy recommendations and decision-support connect the different parts of the conceptual model.

4.1.8 CS8 Conceptual model

As detailed in deliverable 3.1, work is being undertaken to develop two models. The first one is a light-weight real-time cascading engine model simulating the effects of cascading failure on interdependent infrastructures, while considering the impact on the population and workforce, as well as the ability to use permutable resources and services to minimise disturbances. Its purpose is to run fast enough to be used with an interactive visualisation system. The second one is a detailed model simulating the effects of permutable service on cascading failure using concepts of operational research and hybrid modelling techniques. The general roadmap of the envisaged modelling activities of CS8 is illustrated in Figure 4-9.

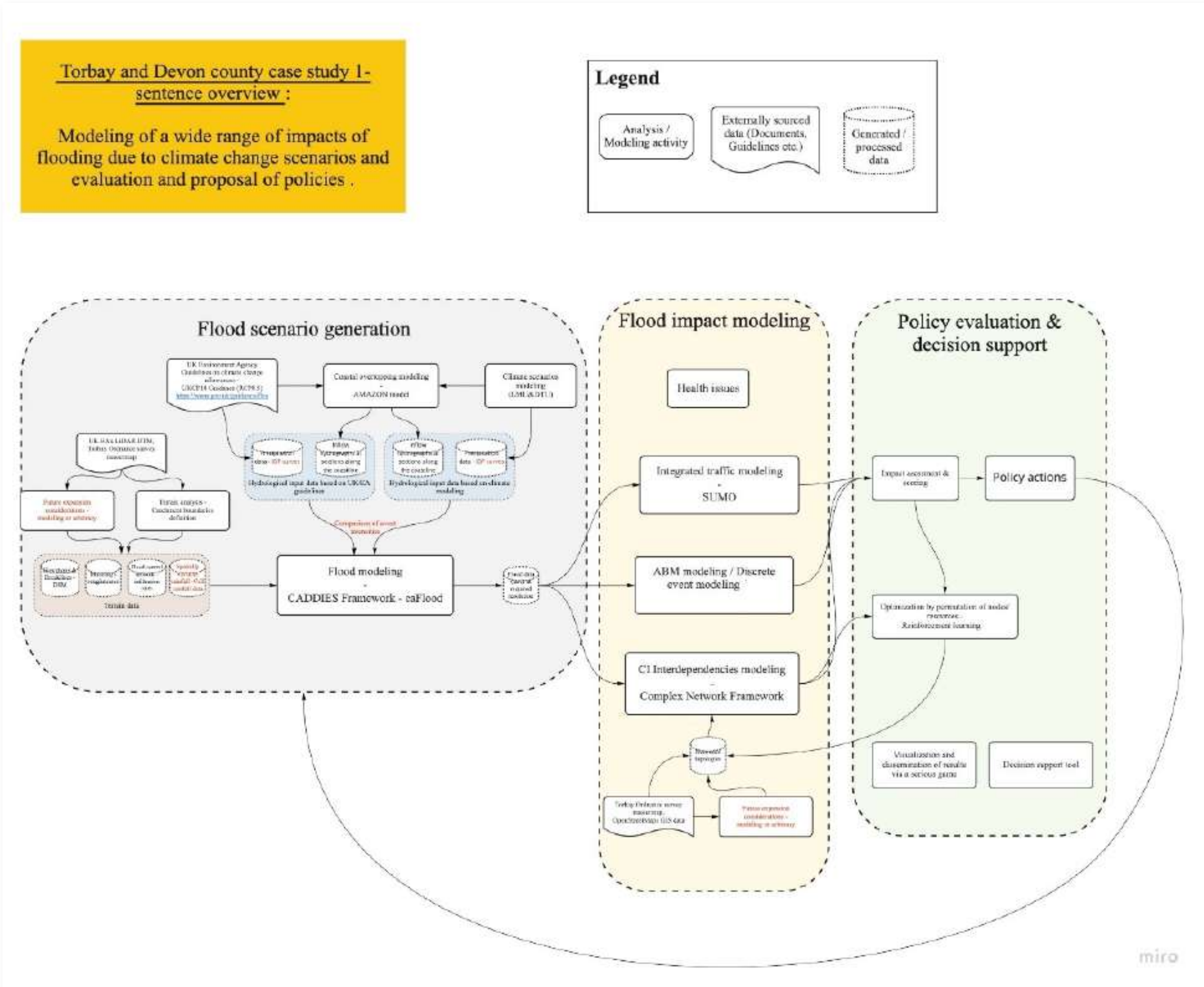

Figure 4-9: Conceptual model / modelling activities in the Torbay and Devon county case study.

The development of the two models simulating the cascading effects caused by flooding situations in CS8 has been reported in D3.1 Below the two conceptual models for both the models are reproduced.

Light-weight real-time cascading engine model

The simulation engine captures a co-dependence relationship between physical infrastructure assets and business and communities. Figure 4-10 shows how it was initially intended to make physical assets failures impact residents, and in turn, how the disturbance to the workforce would in turn affect in some sort of feedback loop the Critical Infrastructure (CI) services and related assets. In Figure 4-11, as explained in D3.1, damages to Critical Infrastructure nodes can impact the availability of services delivered by these nodes to different Output Areas. The population in these areas as well as the businesses are then affected. If the employed fraction of the population is not able to go to work, then the disruption of the workforce availability will impact the ability of business and CIs to function and deliver all the required services.

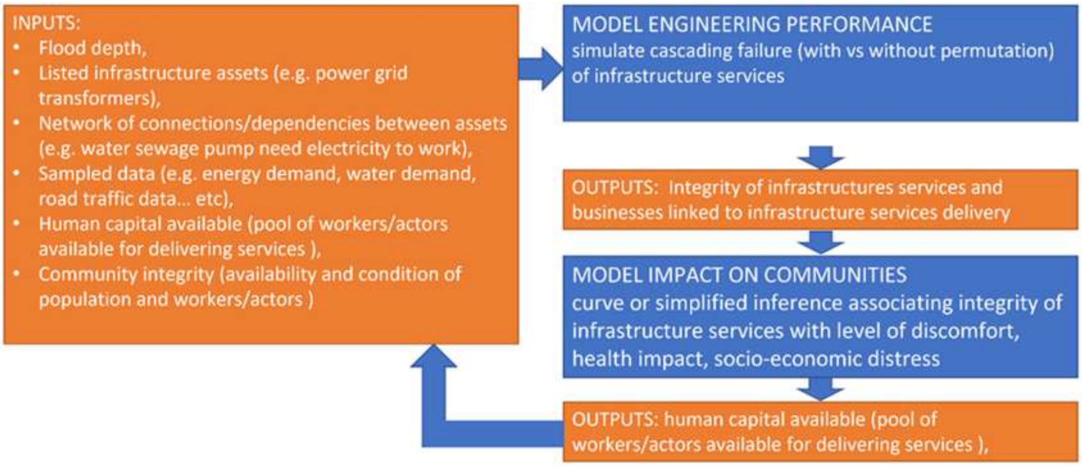

Figure 4-10: Intended feedback loop in the modelling in order to capture the co-dependence between physical CI assets and residents and the workforce (source: D3.1).

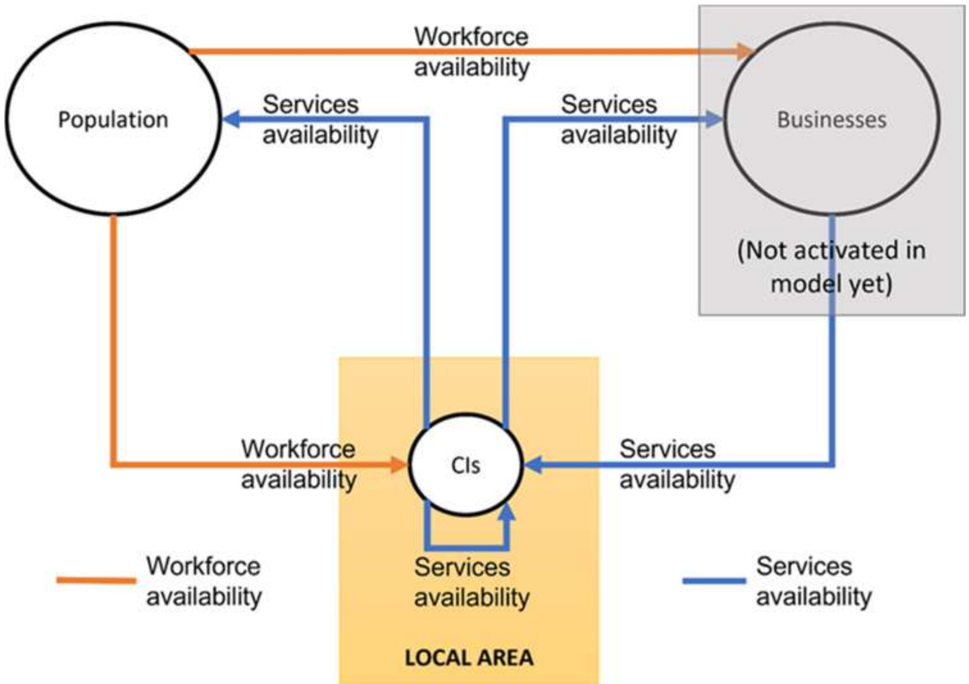

Figure 4-11: Overview of the improved way the cascading failure engine links physical CI failures and community impact together in a feedback loop (source: D3.1).

Conceptual model of the second model

As flooding situation normally causes different kinds of operational impacts on different types of infrastructure, which means different types of infrastructure usually request mitigation services from different emergency responders, e.g., city council, Environment Agent (EA), fire brigade, the responders tend to work individually due to different services they can provide, which leads to few opportunities for the management dimension to see the whole picture and gain insight from a holistic view towards emergency response of a region (regarding resource utilisation and allocation). However, the climate impact and mitigation measures involve systems behaviour, e.g., cascading effects, which are increasingly complex and interrelated systems. Systems approach helps organisations, including government and emergency responders, examine complexity and simplify it; recognise patterns, and provide effective solutions to climate challenges. To this end, we developed a hybrid modelling based on three simulation approaches, namely discrete event simulation (DES), system dynamics (SD) and agent-based simulation (ABS) in operational research, to better represent the cascading effect with systems thinking.

The modelling explores how the cascading failures amongst different types of CI could be mitigated if resource of emergency responders can be shared between responders, and if external resource, i.e., from non-responders, can be supplied to the responders as permutable resource, and how can the responders switch between permutations effectively.

The upper part of Figure 4-12 shows how cascading effects are interrelated amongst different CI types, established by a SD module. For instance, an electricity substation can be considered as a CI type (Type A), which provides electricity to other types of CIs, such as a hospital (Type C). Once the CI is flooded (i.e., target CI), the service capacity of the affected/flooded electricity substation will decrease, i.e., as the direct impact, whilst the service capacity of its linked hospital may also decrease to some level as the indirect impact (when it operates with emergency power generators).

On the other hand, the lower part of the figure describes how emergency responders work, with the application of permutation in resource. Through the interviews and meetings with stakeholders in CS8, the modelling simulates the real practice that different emergency responders basically provide different kinds of mitigation service, which helps distinguish responsibilities and work scopes. It leads to the parallel pattern that each responder deals with its own task, without overlapping tasks or demands. However, it also leads to few interactions and interdependencies. Sharing resource between responders is an example, as the yellow arrows in the figure, which is particular challenging under the parallel working pattern such that it barely exists in the current practice. Another type of resource permutation the modelling tries to introduce into current practice is from non-responders, i.e., the orange arrows. The modelling can analyse how much benefit, i.e., service capacity to be saved, when these two permutations are introduced in the existing emergency response system.

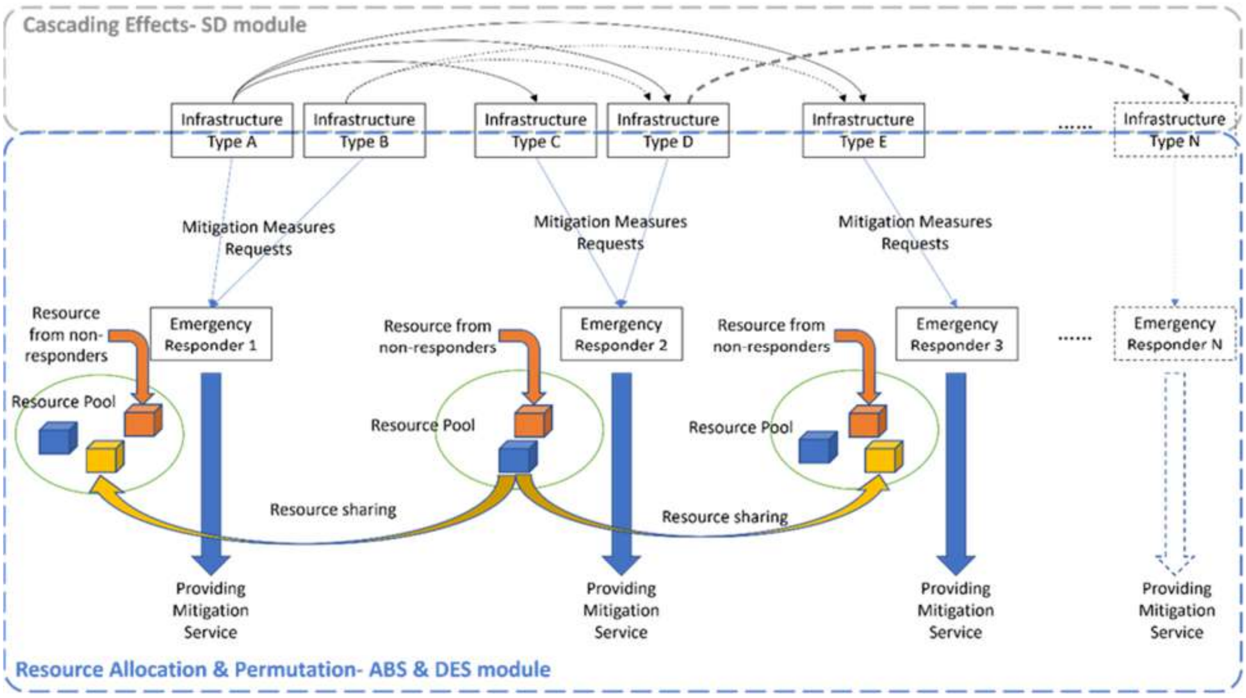

Figure 4-12: The conceptual framework of the hybrid modelling for permutable service.

4.1.9 CS9 Conceptual model

CERES-Wheat and AQUACROP models will be used in parallel to simulate durum wheat performance under rainfed and irrigation both in current and future climate conditions in the experimental sites of Ussana and Benatzu to provide expected anomalies in terms of crop growth and crop production, as well as crop water requirement and nutrient balances. In addition, a selection of alternative options (changes in crop calendars, cultivars, crop management, etc.) will be modelled under climate change projections in order to explore the effects of potential adaptation strategies to reduce climate change impacts on durum wheat in Mediterranean areas, with a specific focus on irrigation and crop water requirements. The option of extending the analysis to a larger area - or the whole Sardinia - will be evaluated according to the CS9 needs.

The resilience assessment will follow the conceptual model of the case study, as summarized in Figure 4-13.

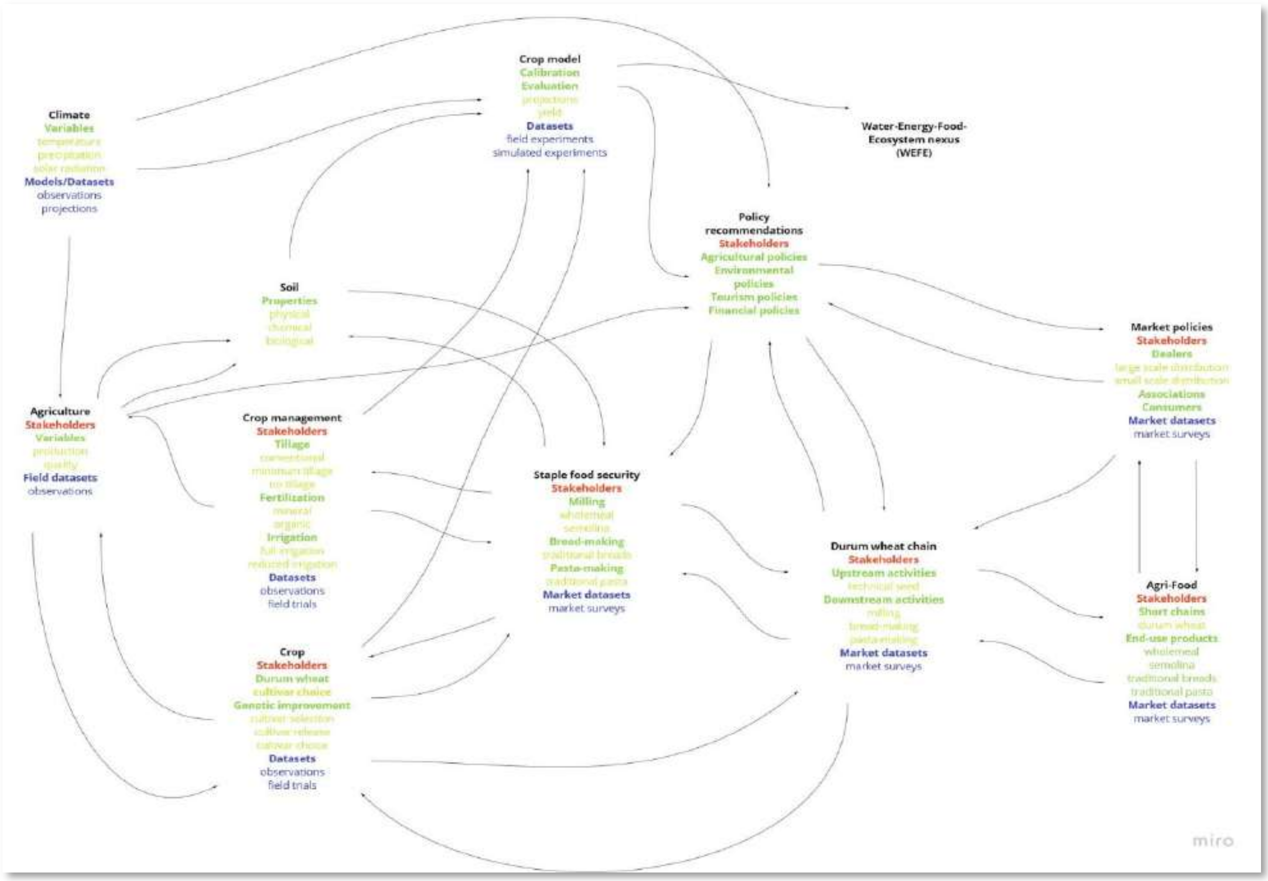

Figure 4-13: conceptual model of the case study 9.

4.2 Progress towards resilience assessment - the resilience wheel

The Modelling Work Package (WP 3) of ARSINOE aims to further cross-disciplinary research in hybrid simulation and hybrid modelling by developing the Dynamic Multi-Sectoral Resilience Modelling and Assessment Framework (DMRM&AF). The framework supports the modelling of both human and nature-based elements and the interaction between these systems. Towards this, the objective of the ARSINOE DMRM&AF is to conceptualize the application of computational models for resilience modelling of key infrastructures.

The ARSINOE DMRM&AF has four concentric circles, as such, it is also referred to as the *wheel.* At the very centre, we have the climate projection models. These models are generally 3-D grid-based models of Earth's surface. The second circle in the wheel models the effect of climate change on Earth's physical geography. For example, the climate projection models may output the expected variance in temperature over time, and which could be used as in input to flood modelling. Like the climate projection model, the flood model will also have a time element. However, the granularity of time advance may be different. The third concentric circle represents a more detailed level modelling approach. Four examples that have been included in here are, Data Science/Machine Learning models, Discrete-event simulation model, Geo-spatial model and Agent-based models. The blue nuclear symbol represents hybrid modelling approaches, wherein multiple modelling methods are applied for the realisation of the objectives of a single simulation study (Brailsford et al., 2019).

The area of Operations Research and Management Science (OR/MS) is arguably one of the key subject disciplines that are often seen as the custodians of such detailed modelling approaches, especially if they include an element of decision support at an operational level. The fourth and final concentric circle represents modelling methods that are generally used for strategic decision making.

The final element of the ARSINOE DMRM&AF is the four pillars on which the four concentric circles (the wheel) rests. As these four elements of the wheel represent different resolutions of modelling, and within each resolution, there are one or more disciplinary modelling methods, it follows that most of the modelling methods are in-turn dependent on the four pillars of the framework. The pillars are:

- Stakeholder engagement
- Data and logic requirements for modelling
- Risk assessment
- Stakeholder decision making

The resilience wheel concept is described in more detail in D3.1.

The four concentric circles of the framework represent the conceptualisation of the modelling methods. As mentioned in D3.1, the framework is extensible, and the methods are based on the requirements of specific case studies. Similarly, the methods specific to the four pillars are also extensible, and not all case studies will use all the methods. The framework could thus be used to represent the different elements that are operationalised in a particular case study.

In ARSINOE CS8 and CS1 acts as frontrunners in the implementation of the resilience wheel as a resilience assessment tool. Their progress is reported below.

4.2.1 CS8 – resilience wheel progress

The wheel for Torbay case study is shown in Figure 4-14. The green arrows (<<) between the concentric circles represent the dependency of the models. Thus, we see that the results from the climate projection models will be used as input for the modelling of the Earth's physical geography using approaches flood modelling. The output of flood modelling will be used as input for detailed-level modelling using approaches such as DES, ABS, ML, or hybrid simulation. What we learn from the detailed analysis will feed into strategic-level decision-making. In this phase, System Dynamics will be used. Finally, the nuclear symbol in blue signifies that the Torbay case study includes an application of hybrid methods, e.g., through combined detailed and strategic level modelling.

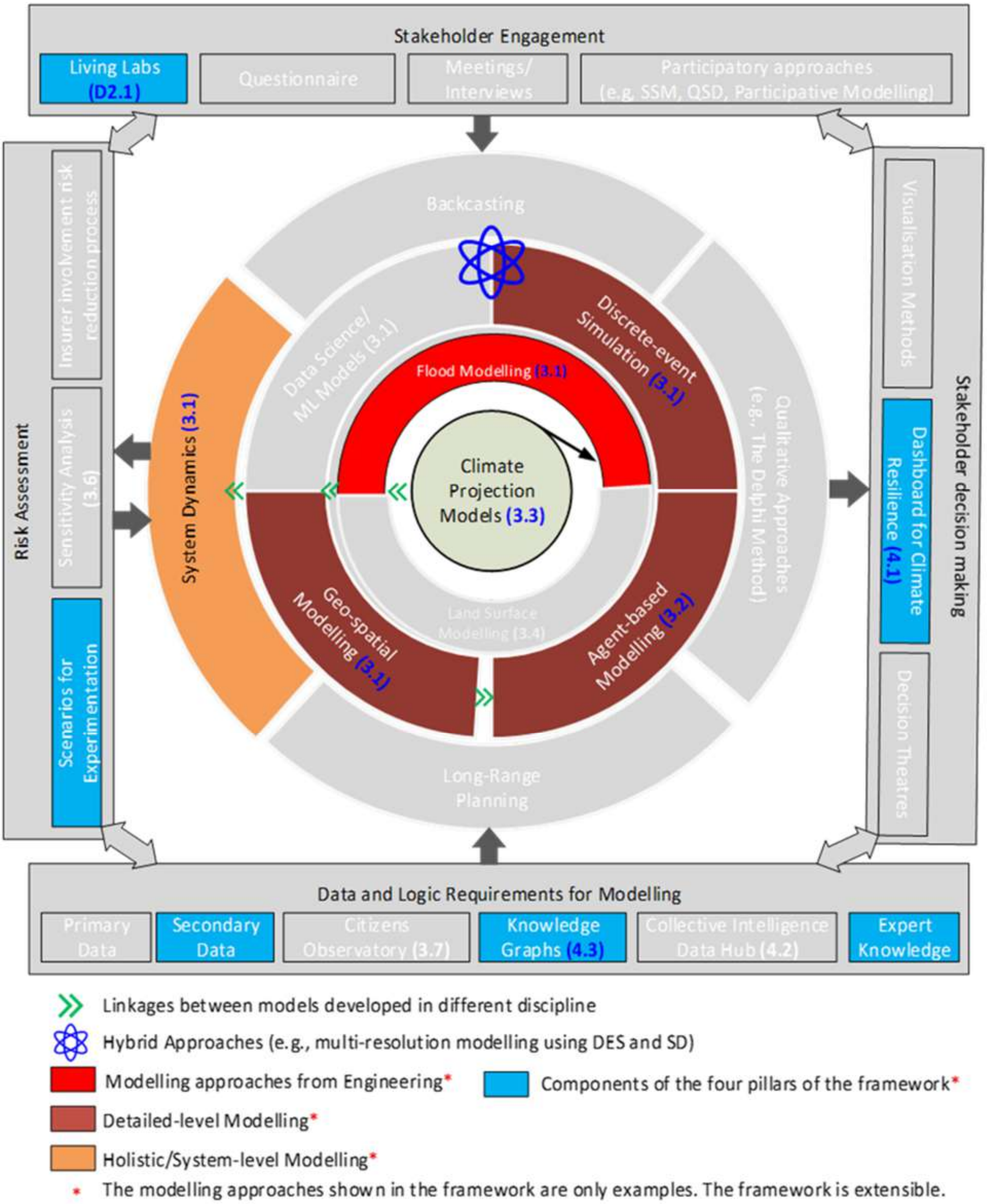

Figure 4-14: The ARSINOE Dynamic Multi-Sectoral Resilience Modelling and Assessment Framework (DMRM&AF) applied to the Torbay case study. Some components of the ARSINOE wheel and the four pillars are highlighted; this shows the elements that are used in the Torbay case study (the remaining are illustrated in grey).

4.2.2 CS1 – resilience wheel progress

The Athens case study, alongside with the Torbay-Devon case study, operate as testing frontrunners for the resilience framework of ARSINOE, coded as the resilience wheel. The resilience wheel integrates 4 pillars that are relevant to data, risk, stakeholders, and planning. The Athens case study is exploring the formats that each one of them are integrated with use of the multiple enabling ARSINOE tools, such as the data hub that hosts all relevant data, the Knowledge Graph, that systematizes through ontological and semantics assessment the four pillars and allows for their fluent communication, the citizen science, that enables the data feeding by the citizen stakeholders, the Virtual Reality that will catalyse the communication between stakeholders and planning, the Agent Based Modelling that will enable the communication between stakeholders and risk analysis, and the Climate Innovation Window marketplace that will constitute the bridge between the stake holders and actual commercial planning options.

Several working threads are ongoing that are building up the case for Athens upon the resilience wheel. The stakeholders and the SDGs integration to the knowledge graph are already developed, so is the data hub. For the risk assessment pillar, a thorough taxonomy of hazards, vulnerabilities and exposures is built and the modelling options for each one of them is investigated. A sequence for the models is established regarding the input requirements and outputs of each model, all leading to the integration of the models in an SDM. Regarding the planning pillar, which would imply an inventory of recommended and tested soft and hard solutions, parallel works are ongoing, such as the training activities and the citizen engagement (soft) and the investigation and modelling of technical interventions such as the integration of green and blue infrastructure.

The ambition is that the resilience wheel will operate sustainably for Athens through an integration of all the enablers that will provide for its dynamicity and will constitute an asset for Athenians for addressing adaptation to the current, but also future state of the investigate hazards. Additionally, an ambition for this case study is to offer a set of replicability enablers, through specific KPIs, so that Athens can constitute a paradigm for other similar urban settings to follow.

4.2.3 CS2 – resilience wheel progress

The AUEB team, based on the PIANC methodology (2020) is seeking to conduct the vulnerability assessment of the three ports (i.e. Valencia, Piraeus, Limassol) of the case study. As far as it concerns the port of Valencia, this work was previously conducted in the context of the ECLIPSE and the CRISI-adapt projects, therefore the representative of Valencia port provides guidance to the other two ports, while in parallel validates its results, compares with the other two ports, identifies gaps and expands its assessment to incorporate previously dismissed relevant climate variables (e.g. sea surface temperature). Valencia has identified the linkage of climate drivers to the most eminent hazards as: shown in Table 4-2 (columns and rows respectively). The latter was the result of several cycles of interviews with multiple stakeholders involves in the function of the port. To evaluate the sensed risk of each hazard, a common classification of risk severity has been used (Table 4-2).

Table 4-2: Relationship between climate-related hazards with parameters and processes.

Hazard	Sea level rise	Storm surge	Currents	Waves	Wind	Precipitation	Fog	Air temp
Flooding	X	X				X		
Wave overtopping	X	X		X	X			
Changes in bathymetry	X		X	X				
Reduced visibility		X					X	X
Port agitation		X		X	X			
Changes in wind speed/direction					X			
Heat/Cold waves								X

Table 4-3: Impact classification for port operations.

Impact level	Operations
Severe/Critical	Affection to the activity due to the number of times the operations has to be stopped due to this environmental variable risk long-term viability of business and supply chain
High	Serious affection to the supply chain and economic impact due to the number of times the operation must be stopped due to this environmental variable. Intervention require significant remedial actions to protect business continuity
Moderate	The number of times the operation has to be stopped due to this environmental variable affects the supply chain and has an economic impact. This affection requires some minor actions to protect business continuity
Low or Insignificant	The number of times the operation has to be stopped due to this environmental variable does not affect the supply chain or has been considered as a normal situation in the annual activity planning.

Regarding the ports of Piraeus and Limassol, no work related to assessing the ports' vulnerability has been conducted so far. The two ports significantly vary regarding their size, traffic metrics and layout. However, they are both located in the Eastern side of the Mediterranean and both host multiple operations and terminals-although very different in magnitude-, i.e. container, passenger, cruise and Ro-Ro terminals.

To commence with their vulnerability assessment, during the first year of the project and multiple iterations among the case study participants, the steps of the methodology have been decided and shown in Figure 4-15.

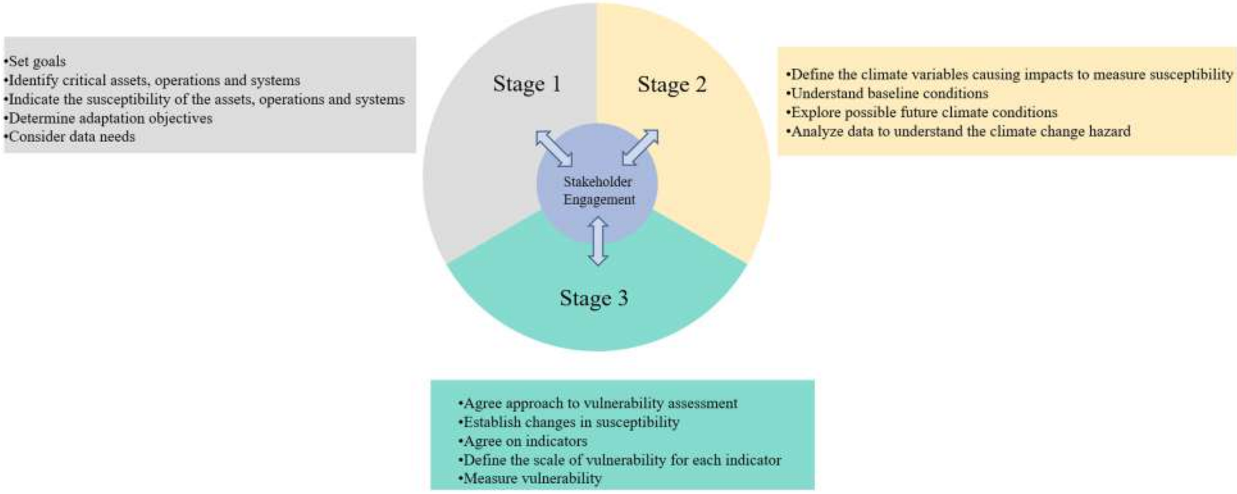

Figure 4-15: Vulnerability Assessment Methodology.

The main steps of stage 1 (Figure 4-15: Vulnerability Assessment Methodology.) that have been undertaken during M1-M18 are the following:

- List the ports' assets (i.e. infrastructure, operations and systems) to understand what is to be assessed as vulnerable. Data availability was the main barrier to complete this step for the first months of the project, along with the establishment of a common basis for the vulnerability assessment.
- Request data from the ports, which are necessary throughout the assessment of their vulnerability. Such data include a bathymetric map of the port, the layout of the port in an Autocad or GIS format where the port's infrastructure, depths and uses are indicated, metrics of traffic and types of cargo, as well as historical data of climate variables including wind velocity, significant wave height, air temperature etc. For the port of Piraeus all the above data (except for the data regarding climatic variables) have been collected with more to be collected in the future.
- Identify susceptibility patterns based on stakeholders' perspective. Susceptibility "indicates whether an asset, operation or system is prone to harm, disruption or other adverse effects as a result of changes in meteorological, oceanographic or hydrological characteristics". The Living Labs outputs, the cooperation with key people from the ports of Piraeus and Limassol to list their assets, as well as the continuous exchange of experience with the port of Valencia has provided the first indications of susceptibility, thus the degree of climate drivers-hazards/impacts linkages. Among others, air temperature, wind velocity and precipitation variability cause impacts to port infrastructure and operations. Additional climate drivers-impacts relationships, the level of susceptibility of assets and the projection of increased or decreased susceptibility in the future remains to be thoroughly examined during stage 2, with the involvement of more key-persons of the port (e.g. representatives of several departments of the port authority, tenants, other users).

4.3 Modelling and Data Collection

4.3.1 CS1 – Modelling and Data Collection progress

The following Table shows the partners involved in activities related to WP3/modelling and their role.

Table 4-4: List of CS1 partners involved in activities related to WP3/modelling and their role.

Partner	Abbreviation	Role
University of Thessaly	UTH	Development of conceptual model, work on Relevant SDGs as possible indicators.
Hellenic Foundation for European and Foreign Policy	ELIAMEP	Organization of a Training for Trainers (T4T) Seminar for high school teachers and two Youth Assemblies for high school and university students.
National Observatory of Athens (under University of Thessaly)	NOA/UTH	Modelling activities – provision of climate parameters – development of UHI methodology, citizens' accessibility to green urban areas, connectivity of protected areas – landscape fragmentation, climate parameters, air quality, NbS selection and microclimate simulations.
Natural Environment and Climate Change Agency	NECCA	Actions related to the Greek version of the Citizen Observatory – MINKA (translation of website in Greek, alignment of the Greek translation of the User Guide to the content of the website).

4.3.1.1 Climate change base layer and UHI

Climatic parameters

In the framework of the project daily data from a five-member sub-ensemble of Global Climate Models (GCM) and Regional Climate Models (RCM) couples developed within the EURO-CORDEX initiative will be utilized. The climatic data are available in the Copernicus Climate Change Service (C3S) Climate Data Store (CDS) for a continuous period ranging from 1950 to 2100. The horizontal resolution of the models is 0.11°, while the simulated data will cover three 20-yr periods: the period 1981–2000 which will be used as the reference period and the future periods 2031– 2050 and 2081-2100. To cover a range of possible futures, three Representative Concentration Pathways (RCPs) will be examined, i.e., RCP2.6, RCP4.5 and RCP8.5. Further processing of the climatic data will be performed, and statistical downscaling techniques will be implemented to obtain the appropriate climatic data for Attica with a higher horizontal resolution. To this aim, a daily high resolution (1kmx1km) gridded dataset (for the period 1981-2000) based on observations for temperatures (Tmax, Tmin) and relative humidity for Attica has been developed. The statistical downscaling of climate change projections using the bias-correction and disaggregation framework (according to Varotsos et al., 2022) is ongoing and is expected to be delivered in M20.

Data collection

Table 4-5: Climatic data derived from model output parameters.

Model input (or output) parameter(s)	Source	Resolution
Daily data of minimum/maximum temperature, relative humidity	Euro Cordex	0.11° resolution (i.e. ~12km)
Daily humidex (compound index of temperature and rel. humidity) values	Euro Cordex	1 km
Derived indices (e.g. number of days per year with maximum temperature >35C, number of days per year with humidex >38C)	Euro Cordex	1 km

Urban Heat Island (UHI) - Distribution of temperatures and associated factors

The specific work aims to provide information about the distribution of air and land surface temperatures and associated parameters like building heights land use and tree cover. The model calculates the mean distribution of summer temperatures for the months June, July and August from five years. It covers the area of Hadrian aqueduct with a buffer zone around it. The data used for the land surface temperature distribution comes from a Landsat satellite (several missions) with a spatial resolution of 100m.

The air temperature comes from Copernicus Climate Change Service (C3S) and a climate urban model again using temperatures from 5 summers like before. The difference is that the data comes hourly allowing to study that the diurnal variability of air temperatures within the area of interest. In addition, we have used the Urban Atlas data set from Copernicus Land Monitoring Service (CLMS) and, in particular, the land use, the street trees and the building height. We have showcased the hotspots along the Hadrian aqueduct at different times of the day to support mitigation activities Figure 4-16. All the codes used for this analysis are developed in house by the National Observatory of Athens/IAASARS.

A presentation of the outcomes was held during the 1st Living Lab in Athens (M7) to trigger discussion among participants on the solutions/ interventions. As it was decided, calculation of Land Surface Temperature will be repeated for the entire study area to feed the climate models and the microclimate simulations (WRF).

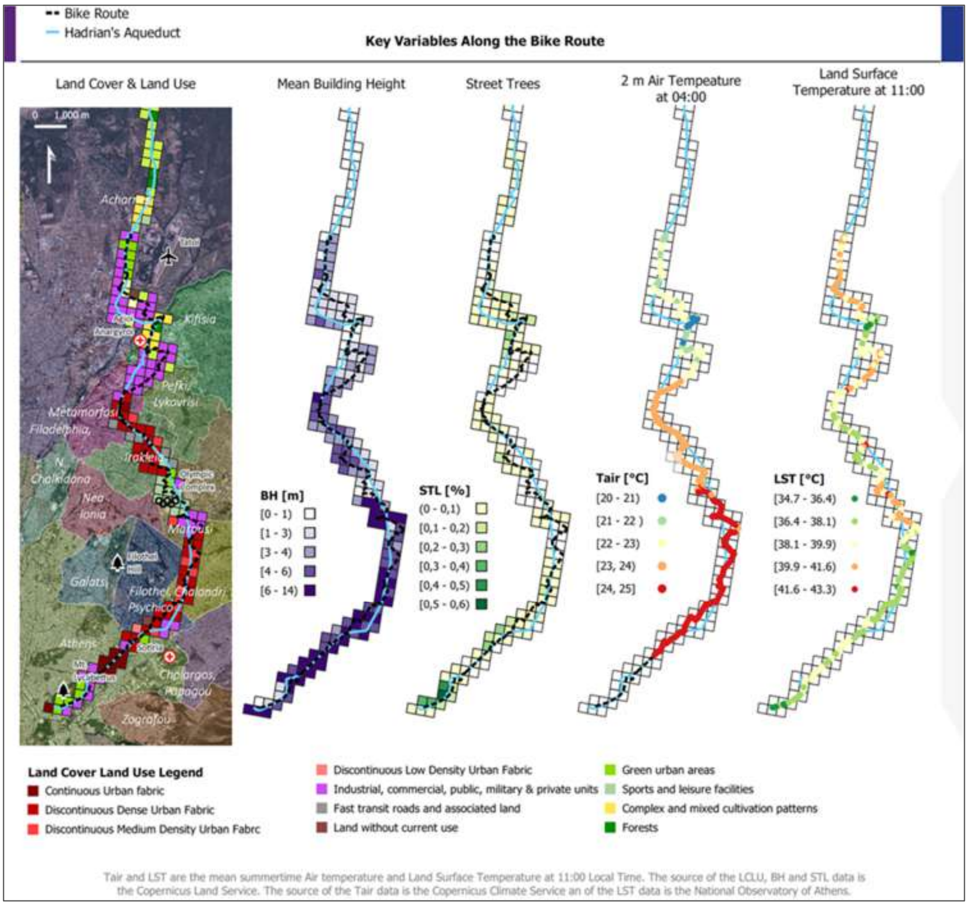

Figure 4-16: Key variables along the Hadrian aqueduct (bike route) such as distribution of air (Tair) and land surface temperatures (LST) at different times and associated parameters that describe land cover and land use, building height (BH) and tree cover (STL).

Data collection

Table 4-6: Model input used to study the urban heat island (UHI).

Model input parameter(s)	Source	Resolution
Landsat images	https://www.usgs.gov/landsat-missions/landsat-collection-2-level-2-science-products	30-160 m, depending on spectral band and satellite mission
Urban climate model	Copernicus C3S	100 m
Urban Atlas	Copernicus CLMS	Vector – building block level

4.3.1.2 Green Infrastructures

Citizens' Accessibility to Green Urban Areas (15-minutes city concept)

The model aims at measuring how conveniently located green urban areas are for the citizens of AMA. The model calculates the surface area of green urban areas within a walking distance of 5 to15 minutes and the number of citizens with no access to green urban areas. In this way, the proximity of green urban areas for AMA will be assessed along with the percentage of people living in AMA with no accessibility to green urban areas.

The spatial analysis is performed using ESRI ArcGIS tool, including the toolbox Network Analyst, and scripted using Python language and the ArcPy library for ArcGIS (a snapshot is given in Table 4-7).

Table 4-7: Model input used for the spatial analysis over the AMA study area.

Model input parameter(s)	Source	Resolution
Land cover	Urban Atlas 2018	50 m
Road network	Open Street Map (*OSM*)	Polyline (vector dataset)
Population	Urban Atlas 2018	50 m
Socio-economic characteristics	London School of Economics, LSE Cities and EKKE-ELSTAT provided by the Athens municipality (tbc)	TBC

The definition of green urban areas, as far as the data preparation and study area boundaries has already been completed. The next step consists in performing the network analysis to assess the accessibility of citizens to green urban areas. Tests to verify the applicability of the model have already begun. The calculation of the population and other socio-economic characteristics will follow. The final report and the ArcGIS ArcMap document of the accessibility model will be delivered in M24 of the project.

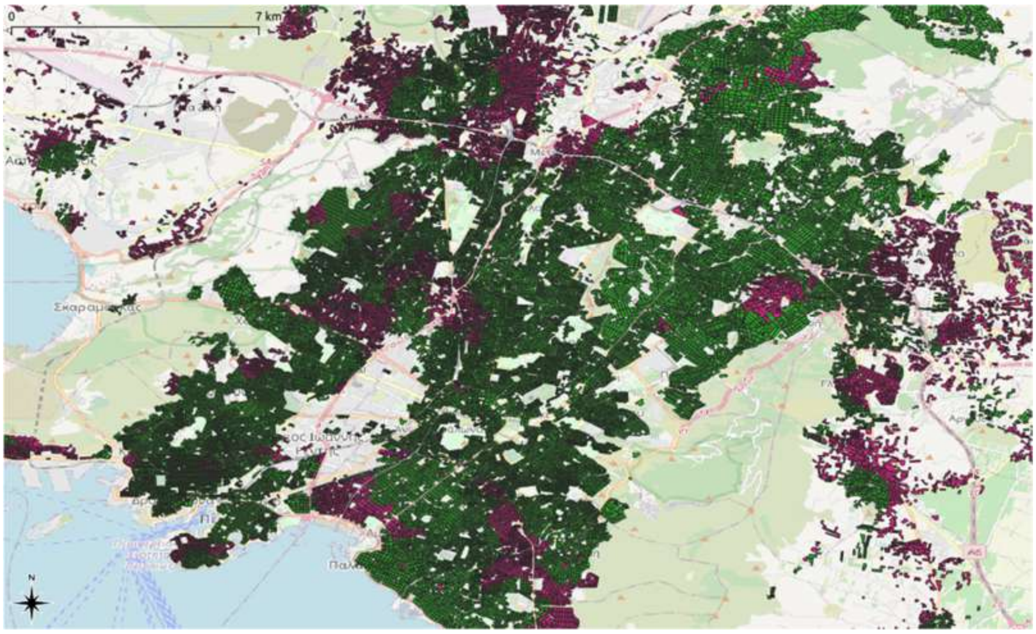

Figure 4-17: Snapshot of the spatial analysis performed with the ESRI ArcGIS tool.

Connectivity of protected areas – Landscape fragmentation

The model aims at evaluating the landscape fragmentation of the study area by measuring the connectivity of protected areas in AMA. The model is a GIS-based toolbox, named GuidosToolbox

(Graphical User Interface for the Description of image Objects and their Shapes - GTB) with a wide variety of generic raster image processing routines, including related free software such as GDAL (to process geospatial data and to export them as raster image overlays in Google Earth), and FWTools (pre/post-process and visualize any raster or vector data). The GuidosToolbox Workbench (GWB) contains the most popular image analysis modules set up as command-line-only scripts for automated mass-processing on Linux 64bit servers. The model is performed using ESRI ArcGIS tool.

Data collection

Table 4-8: Model input used for evaluating landscape fragmentation and the connectivity of protected areas in AMA.

Model input parameter(s)	Source	Resolution
Protected areas	Natura 2000 network	Minimum mapping unit (MMU): 0.5 ha
Normalized Difference Vegetation Index (NDVI)	Copernicus Open Access Hub (TBC)	10 m

The identification of protected areas, species and habitats in AMA has already begun. The next step comprises the Morphological Pattern Analysis (MSPA) to assess the connectivity of protected areas and the landscape fragmentation in the study area. The final report and the ArcGIS ArcMap document of the connectivity model will be delivered in M24 of the project.

Air Quality

EPISODE-CityChem (v1.5) is a Chemistry Transport Model that enables chemistry/transport simulations of reactive pollutants on the city scale. EPISODE is a Eulerian dispersion model developed at the Norwegian Institute for Air Research (NILU) appropriate for air quality studies at high-resolution (up to 100m x 100m). The CityChem extension, developed at Helmholtz-Zentrum Geesthacht (HZG) is designed for treating complex atmospheric chemistry in urban areas and improved representation of the near-field dispersion (Table 4-9).

Data collection

Table 4-9: Model input used to drive air quality simulations at a city scale.

Model input parameter(s)	Source	Resolution
Initial and boundary air pollution conditions (surface and atmospheric input)	Copernicus/CAMS	10km x 10km, Surface, 50m, 250m, 500m, 1000m, 2000m, 3000m, 5000m, hourly
Anthropogenic emissions	Copernicus/CAMS after spatial disaggregation	6km x 6km spatially disaggregated to 1 by $1km^2$, surface, yearly which is temporally distributed on an hourly basis
Meteorological (and land) parameters	WRF simulations	1 by $1km^2$

The model setup details for the particularities of the study area are being prepared and have been delivered in M18. In particular, the air pollution emission fields for 2019 are produced and already delivered. In addition, the in-situ data to be used for the model evaluation are gathered and already delivered. The first identification of hotspots, for a winter and summer month of 2019 will be ready in M20. The final impact assessment of simulated mitigation/adaptation scenarios on urban air pollution will be delivered in M24. Examples of air quality model output are shown in Figure 4-18.

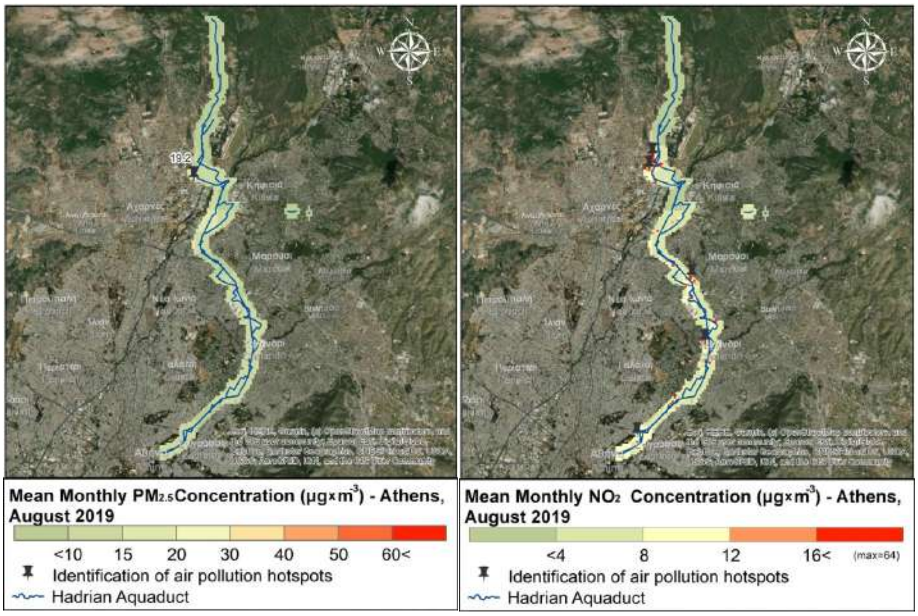

Figure 4-18: An example of air quality model output (mean monthly PM2.5 & NO2) along the Hadrian aqueduct during a summer and winter period (August 2019).

Nature based Solutions (NbS) selection and microclimate simulations (WRF)

The Weather Research and Forecasting (WRF) regional model (Version 4.4), is a numerical weather prediction and atmospheric simulation system, which integrates the Advanced Research WRF (ARW) dynamics solver. The WRF model is applied to simulate present climatic conditions by performing, short term and long term, high spatial resolution (< 1km) runs. The aim is to validate the outcomes of all the prerequisite, above-mentioned models -determining sites with no accessibility to green urban areas, low urban biodiversity value and air quality, and significant levels of urban thermal stress- with the ultimate goal to identify hotspots of the study area that require mitigation/adaptation measures to implement NbS. Specific NbS per site of the study area are selected based on existing repositories and relevant platforms (e.g., BISE, ClimateScan, ClimateADAPT, DRMKC, Natural Hazards — Nature-based Solutions, Nature-based Solutions Initiative platform, Naturvation Urban Nature Atlas, NWRM, OPPLA, ThinkNature, weADAPT, Connecting Nature, Global Program on Nature-based Solutions for Climate Resilience) and/or proposal of new interventions, if needed, according to local characteristics, environmental status and current climatic conditions. Next, the potential impact of selected NbS on the city's microclimate, such as the enhancement of green and blue infrastructures, is investigated by simulating different land use scenarios. Model runs need accurate and updated land use, vegetation and soil type input data. Predefined datasets of Moderate Resolution Imaging Spectroradiometer (MODIS) with 21 land use classes and 16 soil categories are generally used by the WRF pre-processor (WPS). At the same time, numerical simulations can also be supplemented by high-resolution soil, vegetation and urban land use data, derived from satellite image analysis, national urban databases and land cover databases. The future microclimate simulations will contribute towards testing the effectiveness of NbS, thus concluding on the most suitable NbS to be implemented in each site to improve climate resilience in AMA. Model input used for the Nature based Solutions (NbS) analysis and the microclimate simulations are represented in Table 4-10. The model will start during M24 of the project, whereas the final report with the selected NbS will be delivered at M30. However, preliminary trials and tests to configure the model have already begun.

Data collection

Table 4-10: Model input used for the Nature based Solutions (NbS) analysis and the microclimate simulations (WRF) of AMA.

Model input parameter(s)	Source	Resolution
Initial and boundary conditions (surface and atmospheric input)	ERA5	31 x 31 km, 137 vert.lvls (up to 80km), hourly
	GCM/RCM data (CMIP6, CORDEX)	Defined by the downscaling methodology that will be applied
Static input (topography, land use, soils)	MODIS, USGS	≤ 1 km
Accessible green areas	Outputs of accessibility model	TBC
Landscape fragmentation	Outputs of connectivity model	TBC
Areas of low air quality	Outputs of air quality model	TBC
Street Tree Layer (STL)	Street Tree Layer (STL) 2018	Minimum Mapping Width: 10 m
Areas of thermal stress and UHI effect	Outputs of UHI model	TBC

4.3.1.3 Citizen Observatory

MINKA citizen observatory

CSIC has developed a new citizen observatory, called MINKA, which is an evolution of the previous citizen observatory Natusfera. MINKA has an improved back-end and front-end interface that facilitates on one hand the management of the data, and on the other hand improves the user experience and facilitation the interaction between users.

MINKA is a citizen science platform for collecting biodiversity and environmental data focused on the sustainable development goals (SDGs). The platform supports the collection, store and publication of the data. The observations are validated through a collaborative process that includes experts by training and by experience. The platform is under development (Beta phase) and is available at the following link: https://minka-sdg.org/

Official release is schedule to be in March-April 2023. MINKA will be used in CS-1 Athens to monitor urban habitats. The content of the website was to Greek by Case Study partners (Figure 4-19). Therefore, it can now be used by citizens and students for collecting biodiversity data in the framework of Case Study 1.

MINKA enables the registered users to create their own projects (both principal projects and collection projects, which can be useful for BioBlitz events), to upload geolocated observations with pictures, sounds and other information, and to view the observations of other users. It also allows users to hide the coordinates of their observations, which can be useful in case of endangered species. In Figure 4-20 the main architecture of MINKA is shown, divided in four components: project, observations, taxa and users.

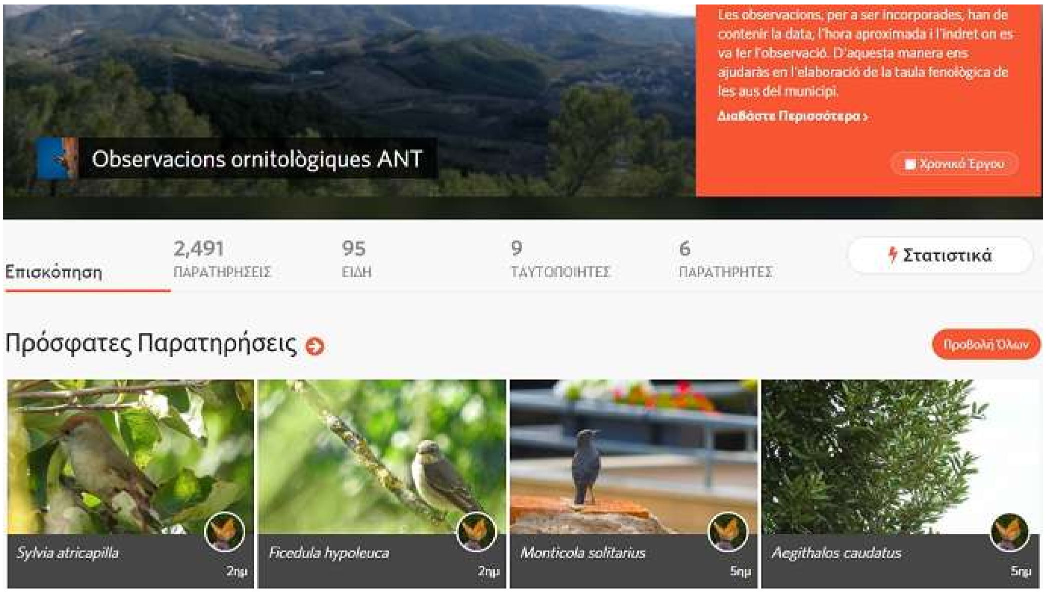

Figure 4-19: Screenshot of the user MINKA interface in Greek.

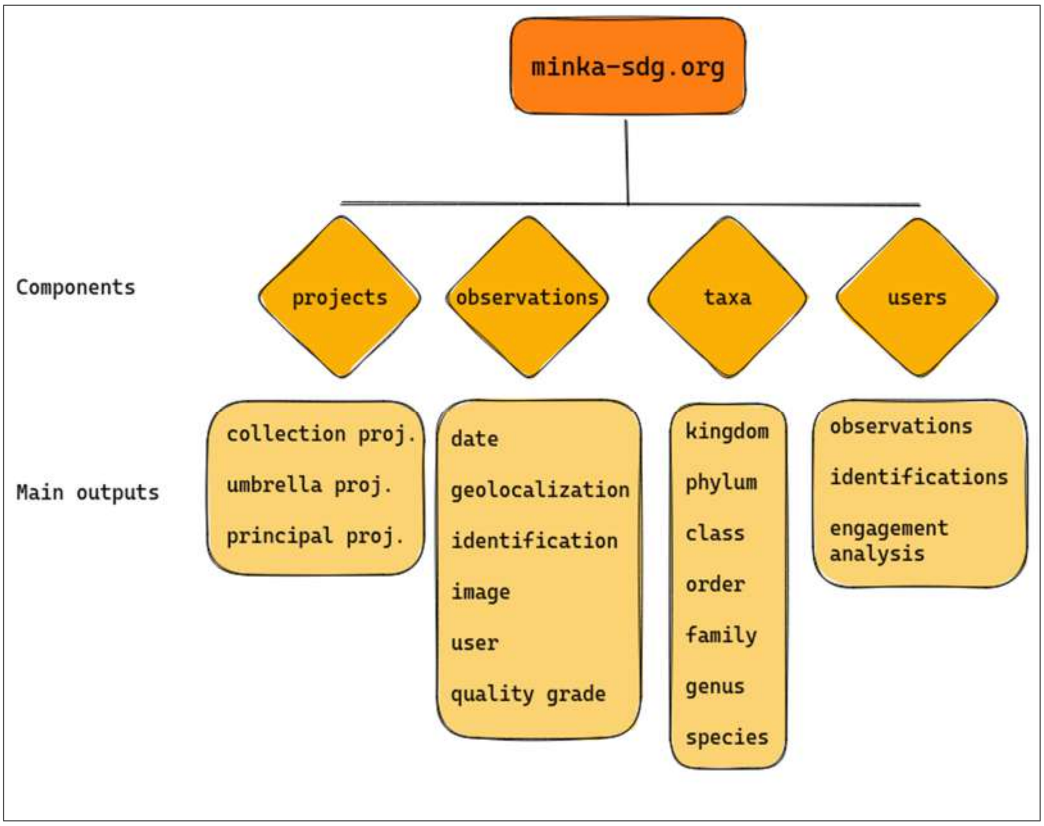

Figure 4-20: MINKA main structure.

Citizen engagement in Athens

Engagement is a key element in a citizen science project, and with this purpose CSIC developed a new theoretical engagement framework for biodiversity monitoring programs such the one that will be implemented in Athens. The Janus engagement framework (Figure 4-21) is a multi-temporal approach to address long-term public engagement challenges that uses a novel approach that combines strategies and theoretical models that have proven efficient in other disciplines, such as human behaviour change and persuasion. The Janus engagement framework is based on four interconnected pillars that feed each other: theoretical engagement models for behavioural change; social design for citizen science platforms; strategies for maintaining volunteer motivation; and strategies to increment the volunteers' ability. The combination of these four pillars results in a framework that integrates both short-term and long-term interaction mechanisms. This multi-temporal approach ensures keeping volunteers motivated and engaged for long periods, a requirement for many citizen science-monitoring programs. The framework and a guide to implement it is available as a research paper in the Journal Environmental Research Letters and can be downloaded here: https://iopscience.iop.org/article/10.1088/1748-9326/ac939d. This engagement framework will be used in Case Study 1 for monitoring urban habitats in Athens.

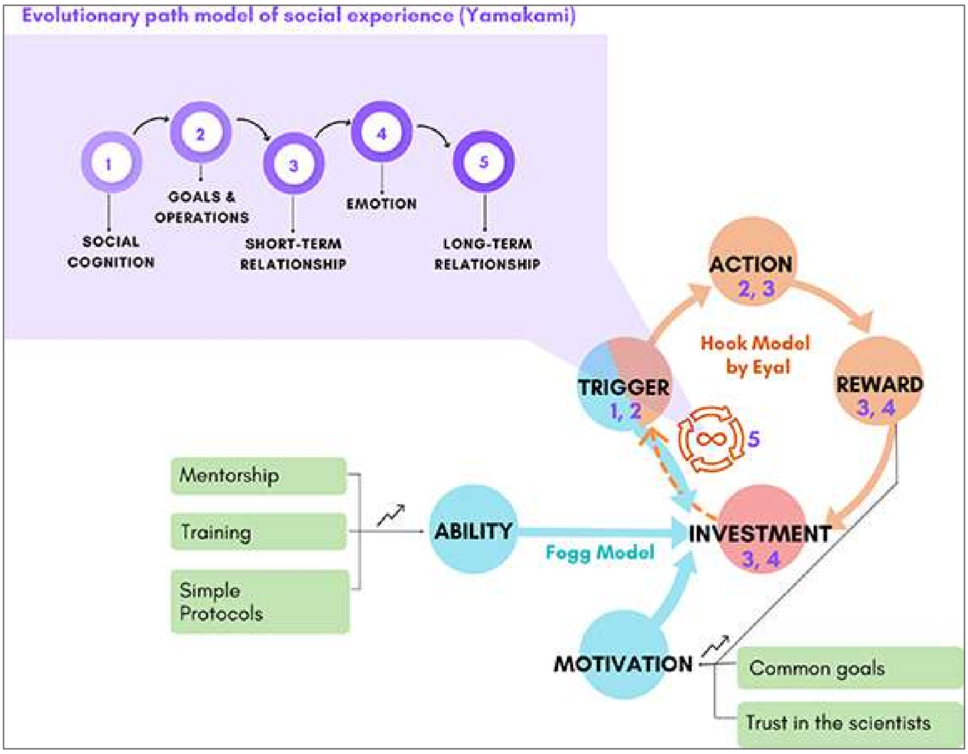

Figure 4-21: Janus Engagement Framework for Environmental Citizen Science Projects.

The Janus Framework identifies four main engagement roles that must be fulfilled:

- Triggers
- Reward and Acknowledgement
- Strategies for incrementing volunteers' motivation: common goals, trust in the scientists behind the project, reward
- Strategies for incrementing volunteers' ability: mentorship, training and stablishing simple protocols

Regarding the strategies for incrementing volunteers' ability, CSIC has developed different types of materials to train volunteers in the use of MINKA. These materials have already been translated to Greek or are in process of being translated. They consist of:

- **User guides:** a MINKA user guide in PDF was prepared by CSIC and translated to Greek by a professional translation agency. The translated user guide was revised by case study partners, and necessary adjustments were made on the text, in order for it to be aligned with the Greek terms used on the website. The guide is now ready to be used by citizens and students for collecting biodiversity data.
- **Video-tutorial:** a step-by-step video-tutorial was created in English. Greek subtitles will be added by March 2023.
- **Infographics:** a step-by-step set of infographics were created in English and will be translated by March 2023 (example in Figure 4-22).

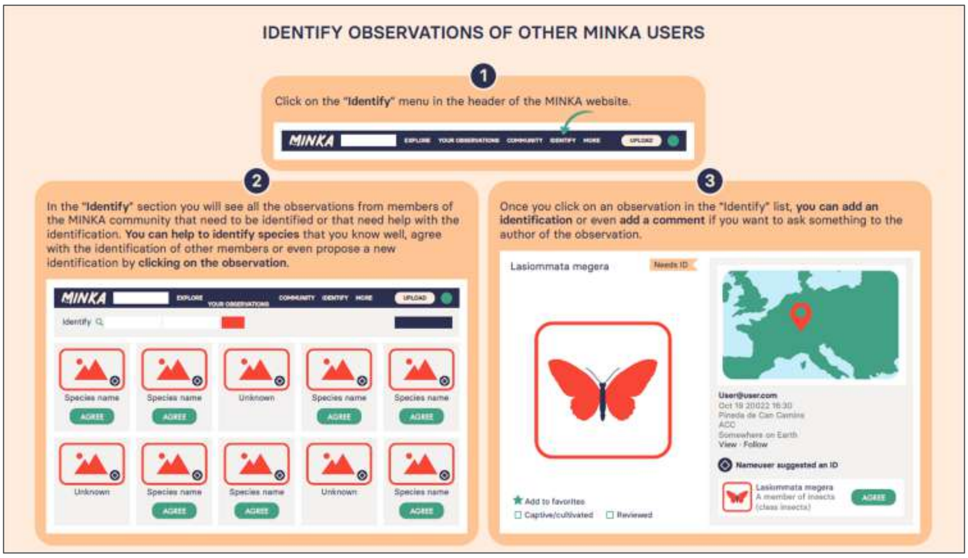

Figure 4-22: Example of tutorial infographics created for MINKA.

Engagement actions

It was decided by case study partners that one key target audience for monitoring urban trees in Athens using MINKA are educators and students. To do this, ARSINOE collaborated with the EU funded project Cos4Cloud. Cos4Cloud partner NKUA developed an online course and a set of education scenarios with the aim of introducing citizen science in Athens classrooms. The methodology and training material developed by NKUA was tested in ARSINOE in two pilot events. The pilot events were useful to test the acceptance of MINKA within the teachers and educators' community in Athens. Besides, MINKA and related future actions as part of Case Study 1 were presented in the T4T seminar for school teachers on 08/02/2023.

The two pilots with educators conducted in Athens were:

- **Training event 'Introduce innovative citizen science tools into Greek schools.**

Date and venue: October 22, 2022 - Ktima Syngrou park (Athens)

Participants: 20 teachers form primary and secondary schools in Athens CSIC, in the framework of ARSINOE and Cos4Cloud, organised a face-to-face training in the use of two different citizen observatories: Odour collect and MINKA. During the workshop, participants did an outdoor exercise for taking plant pictures and uploaded them in MINKA.

Link to project in MINKA: https://minka-sdg.org/projects/testing_greece_2022

Participants were asked to fill evaluation questionnaires of the tools used during the training event. Quantitative results are shown in graphics (one example is given in Figure 4-23), qualitative results (written comments) are still ben processed.

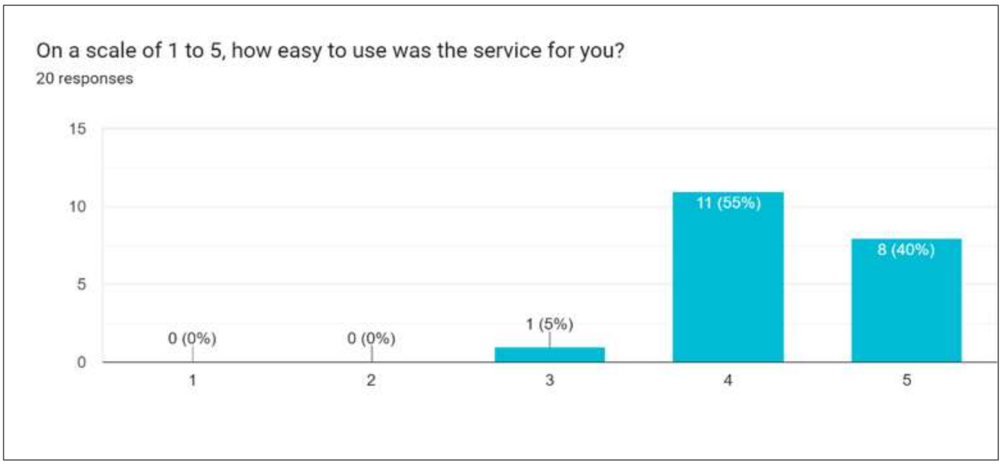

Figure 4-23: Responses on the easiness to use the service.

- **Bio-Datathon "Trees for life, trees for learning"**

Date and venue: December 2022 to January 2023, online

Participants: 27 Greek postgraduate students in education and educational technology

CSIC, in the framework of ARSINOE and Cos4Cloud, organised a Bio-datathon aimed to evaluate the use of MINKA by teachers and students, as well as to create new ways for students to visualise data using MECODA. To do so, Greek postgraduate students in education and educational technology participated in two training workshops, one about MINKA and another one about MECODA. Students were asked to fill evaluation questionnaires of the tools and services used during the Bio-Datathon. Students were asked to fill evaluation questionnaires of the tools used during the Bio-Datathon. Results (written comments) are still ben processed.

Link to project in MINKA: https://minka-sdg.org/projects/bio-datathon-athens-trees-for-life-trees-for-learning

4.3.1.4 Educational activities and citizen engagement

ELIAMEP annually organizes two Youth Assembly simulations on climate change, engaging high school and university students, as well as a Training for Trainers (T4T) seminar with the participation of high school teachers of the Attica region. The aim of these activities is twofold: first, to promote understanding of the challenges created by climate change and related policies for mitigation and adaptation with a special focus on megacities such as Athens.

The second aim is to promote experiential-based climate change education in schools, foster dialogue and social consensus, as well as offer participants the chance to gain first-hand experience on participatory decision-making processes and integrate simulation techniques and experiential learning activities into education curricula.

The organization of the first and second "Training for Trainers" seminars and the two Youth Assemblies on Climate Change has been enthusiastically welcomed by the educational community, receiving more than 600 applications.

Training for Trainers (T4T) seminar

The first and second T4T seminars for high school teachers of the Athens metropolitan area were held online on 16, 17 and 23 February 2022 and 6, 7 and 8 February 2023 respectively. Both received more than 400 applications. 94 and 50 teachers and municipality employees, who participated in the first and in the second T4T seminar, acquired science-based knowledge on how to tackle climate change and adapt to its impacts, especially in urban environments, as well as the necessary theoretical and practical tools for integrating simulation techniques and related methods of experiential learning into learning process.

The seminar is interdisciplinary and focuses on the following topics: a) Understanding the concepts of "climate change", "climate change mitigation", "climate change adaptation", "vulnerability", "sustainability" and "resilience", b) Causes of climate change, including greenhouse gas emissions by various activity sectors, c) Social, economic and environmental impacts of climate change, d) legal frameworks at international, European and national level, as well as specific policies and measures for climate change mitigation and adaptation, e) Experiential learning and the simulation technique: benefits and range of applications and f) Organizing a simulation at school.

For the purposes of the T4T seminar, the educational material "**T4T Toolkit**" was prepared, and it is updated each year. It is provided to the participants electronically and it is available online.

Youth Assemblies on Climate Change with the participation of high school and university students: "Shaping Green Deals for Athens city and Athens Metropolitan Area"

Youth Assemblies on Climate Change are experiential learning activities, organized annually by ELIAMEP. These activities aim, inter alia, to bring climate scientific knowledge and policy action closer to the youth and encourage the involvement of young people and citizens in enhancing social resilience and adaptation of local communities to climate change impacts. With the organization of Assemblies for high school and university students, ELIAMEP seeks to open new channels of communication with the young generation on climate change mitigation and adaptation policies as well as the strengthening of their neighbourhoods' resilience to different impacts of climate change.

The first Assemblies were organized online on 5 & 6 May 2022 (University Students Assembly) and 12 & 13 May 2022 (High School Students Assembly), respectively. More than 80 students from the wider Athens metropolitan area were invited to map and understand the challenges pertaining to their neighbourhoods, discuss with their peers from other neighbourhoods, co-design and propose realistic solutions. For instance, they measured their carbon footprint and recorded the vulnerability of their area, as well as existing measures to tackle climate change and adapt to its inevitable effects. They also proposed specific actions, negotiated and concluded through a structured dialogue on policy proposals for a Green Deal for the Municipality of Athens and for the Metropolitan Area of Athens (Local & Regional Green Deal).

Youth Assemblies' Handbook

For the purposes of the Youth Assemblies, the educational material "**Youth Assemblies' Handbook**" was prepared, and it is updated each year. It is provided to the participants electronically and it is available online.

4.3.2 CS2 – Modelling and Data Collection progress

The following Table shows the partners involved in activities related to WP3/modelling and their role.

Table 4-11: List of CS2 partners involved in activities related to WP3/modelling and their role.

Partner	Abbreviation	Role
Athens University of Economics and Business	AUEB	Vulnerability Assessment, Modelling, SDG Mapping
Fundación Valencia port	FV	Vulnerability Assessment, Modelling, SDG Mapping
Piraeus Port Authority	PPA	SDG Mapping
Cyprus University of Technology	CUT	SDG Mapping

Today, the most powerful tool for climate simulation are the Climate Models (CMs) that are often divided into Global Climate Models (GCMs) that are spatially coarser models covering the entire globe; and Regional Climate Models (RCMs) that are spatially refined models usually applied to an continent scale. These numerical models represent the climate system based on the physical, chemical and biological properties of its components, their interactions and feedback processes, and which includes all or some of their known properties.

CS2 will built on previous work conducted in the Mediterranean Ports, as the ECLIPSE, the CRISI ADAPT and Loop Ports projects. Whereas in the ECCLIPSE project as many RCMs as possible were used, for ARSINOE, three of the provided RCMs were selected (Table 4-12).

Table 4-12: List of RCMs used in the ECCLIPSE project.

CNRM-CERFACS-CNRM-CM5	ALADIN63	CNRM (Centre national de Recherches Météorologique), France
IPSL-IPSL-CM5A-MR	SMHI-RCA4	Rossby Centre regional atmospheric model, SMHI (Sveriges Meteorologiska och Hydrologiska Institut), Sweden
MOHC-HadGEM2-ES	DMI-HIRHAM5	DMI (Danish Meteorological Institute), Denmark

As discussed previously, since the main goal is to compare predictions with present conditions it is important that the selection of the climate projections datasets takes in consideration the types on datasets (spatial and temporal scales) used to determine the baseline values. AUEB, replicates the PIANC (2020) methodology to identify the vulnerable elements in terms of Infrastructure and operations to the ports of Piraeus and Limassol. For Valencia the work will built on the relevant analysis conducted for ECLIPSE project, by validating the results and focusing more on the Infrastructure, while expanding on the climatic variables assessed (water temperature). Through a series of Interviews with ARSINOE stakeholders, FV validated the identification of several hazards to critical assets of the port, as shown in Figure 4-24.

Hazard	Sea level rise	Storm surge	Currents	Waves	Wind	Precipitation	Fog	Air temp
Overwhelmed drainage systems	X	X				X		
Flooding	X	X				X		
Wave overtopping	X	X		X	X			
High current velocities	X			X	X			
Changes in bathymetry	X		X	X				
Reduced visibility							X	X
Port agitation				X				
Ship manoeuvres				X	X			
Changes in wind speed/direction					X			
Heat/Cold waves								X
Damages in infrastructures	X	X	X	X	X	X		

Figure 4-24: Identified hazards to critical assets of the port

4.3.3 CS3 – Modelling and Data Collection progress

The following Table shows the partners involved in activities related to WP3/modelling and their role.

Table 4-13: List of CS3 partners involved in activities related to WP3/modelling and their role

Partner	Abbreviation	Role
Ludwig-Maximilians-Universität München	LMU	CS-Lead
Verband kommunaler Unternehmen e.V.	VKU	CS-Partner
Danish Technical University	DTU	WP3-Leader

The main model to analyse the water availability under current and future climate conditions is the physically based and spatially distributed hydrological model WaSiM. This model not only delivers simulated river discharge at specified gauges, but also delivers gridded spatial outputs that can be used to assess changes in the different storage components of the water balance as well as the physical states during extreme dry or wet conditions. Examples of outputs are:

- Evapotranspiration
- Soil moisture in the root zone and the full soil column
- Snow storage
- Groundwater depth
- Groundwater recharge

Low Flow conditions under current and future conditions for selected catchments in the Main River Basin have been conducted in a Master Thesis.

The conceptual modelling of irrigation demand in future and the associated impacts of using irrigation water from the river and the groundwater on the local hydrology has been conducted in a Mater Thesis for one catchment in the Living Lab region.

Models with regard to land surface response tools in WP3:

- In order to extend the capabilities of the hydrological model WaSiM to other possible hydro-climatic and environmental impacts, we seek possibilities in new machine learning approaches to extend the existing framework. In a first step, a LMU student analysed and tested for his Master thesis various machine learning and statistical approaches for the estimation of river temperatures. In this context a regional machine learning framework (based on LSTM) for the projection of river temperature projections has been developed for several gauges of the Main River which are located in the Living Lab borders.

A CS3 model description for WP3 was included in Deliverable D3.4

4.3.4 CS4 – Modelling and Data Collection progress

A series of actions in preparation of the modelling and data collection for CS4 were performed. These include:

- Data were collected by coordinated actions of all the CS4 partners, on their national level, and included:
    - Collection, review and analysis of the existing national and transboundary studies, strategies and plans, along with regional project outputs
    - Collection of hydrological, meteorological and water consumption data needed for modelling (hydrological and meteorological data were purchased using financial sources declared for that purpose in the Grant Agreement)
- Other data collected includes:
    - Climate indicators (temperature, precipitation) forecast simulation developed of mean monthly values until 2100, for RCP 2.6 and RCP 8.5
    - Hydrological arrays continued on a mean monthly basis, until 2100
    - Water consumption and allocation models by sectors, taking in consideration social and economic growth, simulated
- Some of the data (e.g. on HPPs and hydro energy use, water use in municipalities, etc.) were obtained by direct contribution of the involved stakeholders, which can be deemed as a success from the workshops and LLs, i.e. one of the impacts of the SIA applied in the CS4.
- Specific model adjustments for the Ohrid and Prespa application were made.
- The data provided (collected and purchased) have been uploaded to the Google drive (path: General / WP6/ CS4/ Input data) and made available for use of all Arsinoe partners.
- The data provided so far will be sufficient for the first stage of modelling activities in CS4 (until M20). Further demands for data will be timely identified and processed by the partners.

The following Table shows the partners involved in activities related to WP3/modelling and their role. A detailed description of the actions is provided in the following section.

Table 4-14: List of CS4 partners involved in activities related to WP3/modelling and their role

Partner	Abbreviation	Role
Institute for Research in Environment, Civil Engineering and Energy, North Macedonia	IECE	Leader (data collection, model development)
Natural Environment and Climate Change Agency, Greece	NECCA	Partner (data collection)
National Territorial Planning Agency	AKPT	Partner (data collection)

The following sections detail specific information collected, and decisions made, to facilitate the modelling work that is to be performed as part of Case Study 4.

Models to be used

The case study will use an integrated multi criteria numerical model for environmental – economy assessment of complex hydro systems, developed by IECE, Funded by Ministry of Environment and Physical Planning of North Macedonia, 2015 – 2016, (contract number08-4941/1-01.06.2015).

Data Collection

Climate data

In addition to the climate models and data sources listed in D3.4, Case Study 4 will make use of the following local data sources:

- Report on climate change projections and changes in climate extremes for the Republic of North MACEDONIA Ref. number IC 44/2019 https://api.klimatskipromeni.mk/data/rest/file/download/5e8046fa4761fb1b91d41c7fa0a0f34b621b19acc537ff9f45b79af5b623255e.pdf

Hydrological and meteorological data

Spatial scope of the CS4 includes watershed area of Ohrid and Prespa lakes, in the three countries that share these water resources (North Macedonia, Greece and Albania). Data collection will take place at the national level from hydrological stations.

In North Macedonia, data (mean monthly flows) is collected from the following hydrological monitoring stations (HS) en meteorological measuring stations (MS):

- HS Ohrid (Ohrid Lake)
- HS Nakolec (Ez Prespa)
- HS Stenje (Ez Prespa)
- HS Brajcino (Brajcarska river)
- HS Kosel (Koselska river)
- HS Resen (Golema reka)

- HS Leva Reka (Leva Reka river)
- HS Botun (Sateska river)
- HS Lozhani (Crn Drim river)
- MS Ohrid (temperature, precipitation, wind)
- MS Pretor (temperature, precipitation, wind)

In Greece, data (mean monthly flows) is collected from the following hydrological monitoring stations (HS) and meteorological data (MS):

- HS Agios Germanos (flow rate river, monthly)
- HS Small prespa (lake water level)
- HS Big Prespa (lake water level)
- HS Slatine (groundwater level)
- HS Pigi Pylis (groundwater level)
- HS KPR03 (groundwater level)
- HS Kallithea (groundwater level)
- MS Florina (nearby, not within, Prespa watershed)

In Albania meteorological data were provided from two monitoring stations:

- HS Pustec (Prespa watershed)
- HS Pogradec (Ohrid watershed)

Consumer Water Use data

Data of water use per consumers (households, industry and irrigation) were provided by partners, in North Macedonia and Greece. The collected data for water use are presented in Table 4-15.

Table 4-15: Collected data for water consumption per users.

WATER SUPPLY CONSUMPTION DATA - ARSINOE						
NORTH MACEDONIA						
Municipalities	Period	Water consumption (m^3)				
	(year)	Households	Industry	Irrigation	Livestock farms	Total
Municipallity of Ohrid	2015	2.529.886,00	531.924,00	/	/	3.061.810,00
	2016	2.377.329,00	542.538,00	/	/	2.919.867,00
	2017	3.007.161,00	614.888,00	/	/	3.622.049,00
	2018	2.333.069,00	731.469,00	/	/	3.064.538,00
	2019	2.284.260,00	771.118,00		/	3.055.378,00
	2020	2.303.532,00	527.359,00	/	/	2.830.891,00
	2021	2.280.635,00	562.932,00	3.340.000	/	6.183.567,00
Municipality of Struga	2017	1.676.654,00	/	/	/	1.676.654,00
	2018	1.603.944,00	/	/	/	1.603.944,00
	2019	1.533.976,00	/	/	/	1.533.976,00
	2020	1.427.935,00	/	/	/	1.427.935,00
	2021	1.524.129,00	/	10.980.000	/	12.504.129,00
Municipality of Resen	2020	509.507,00	94.504,00	/	/	604.011,00
	2021	519.586,00	96.678,00	/	/	616.264,00
GREECE						
Municipalities	Period	Water consumption (m^3)				
	(year)	Households	Industry	Irrigation	Livestock farms	Total
Prespa	2012	370.000,00	/	5.340.000,00	200.000,00	5.910.000,00
	2015	372.225,00	/	5.397.295,00	200.000,00	5.969.520,00
ALBANIA						
Municipalities	Period	Water consumption (m^3)				
	(year)	Households	Livestock farms	Irrigation	Livestock farms	Total
no data						

<u>Data for dams, reservoirs and hydro power plants in Drin River watershed (North Macedonia and Albania)</u>

Data for water use for generation of clean energy in existing hydro power plants (HPPs) were collected. For North Macedonia data were provided on HPP Shpilje and HPP Globocica were provided from the national power utility Power plant of North Macedonia. The specification of data is given in Table 4-16.

Table 4-16: HPP water management data – Ohrid Lake, HPP Shpilje and HPP Globocica (North Macedonia).

Lake / Dam	Period (year)	Type of data
Ohrid Lake	1970 - 2022	mean month water level
	1970 - 2022	mean month water inflow
	1970 - 2022	mean month water outflow
HPP Globocica	1970 - 2022	mean month water inflow
	1951 - 2010	mean month water outflow
HPP Spilje	1970 - 2022	mean month water inflow
	1951 - 2010	mean month water outflow

For HPPs in Albania data was collection for HPP Fierza, HPP Koman, HPP Vau i Dejes and HPP Okshtun in the Drin River watershed.

4.3.5 CS5 – Modelling and Data Collection progress

Table 4-17: List of partners involved in activities related to WP3/modelling and their role

Partner	Abbreviation	Role
Universidad de La Laguna	ULL	Leader
Instituto Geológico y Minero de España	IGME - CSIC	Development of the model of the aquifer of La Palma and El Hierro, through the network of sensors installed on both islands, with the aim of estimating recharge and being able to make future water management predictions
Elittoral Estudios de Ingeniería Costera y Oceanográfica, S.L.N.E.	Elittoral	Development of a model of sea level rise in two selected cities on the island of La Palma and El Hierro. In addition, development of a crop quality index to serve as an indicator of groundwater quality

Models to be used

Within CS5 work was performed on the development and application of three models for use in the case study work. These are models for i) groundwater in La Palma and El Hierro (Figure 4-25), ii) sea level rise, iii) crop quality index as an indication of groundwater quality. The models for groundwater (FE Flow) and sea level (h2d) were already described in D3.4 – table 3.1.

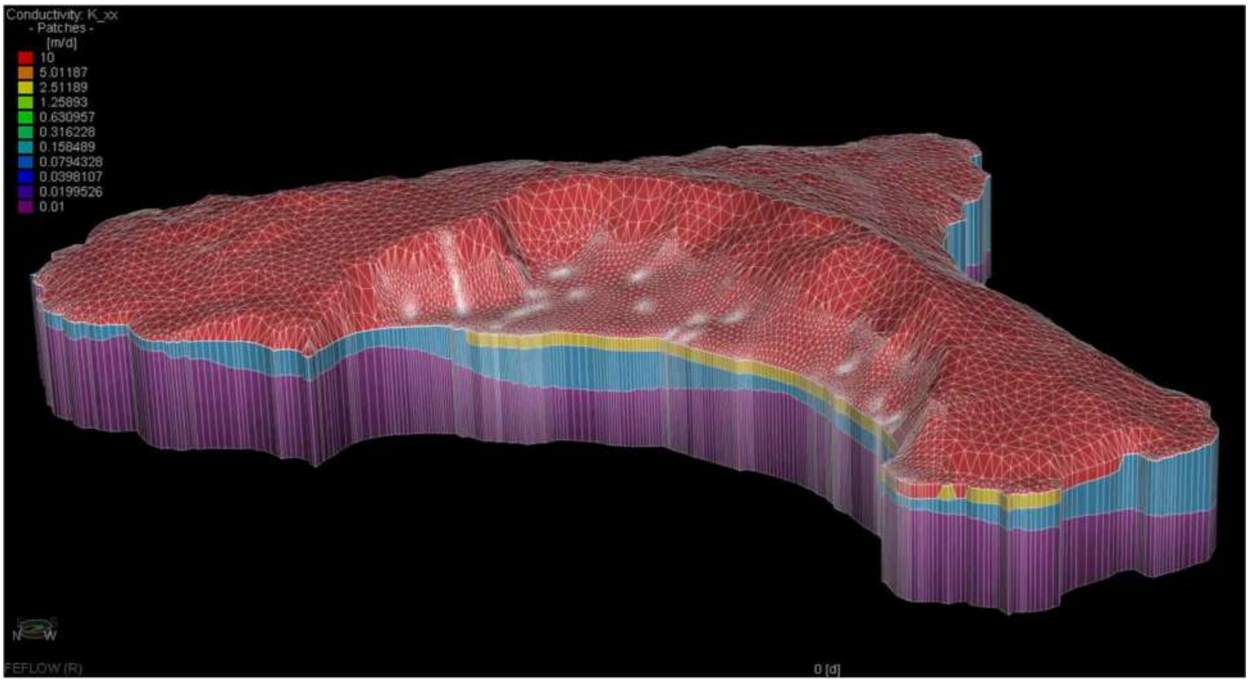

Figure 4-25: Hydrogeological model 3D FE grid.

Sea Level Rise

The approach shown in Figure 4-26 will be used for predicting the 2060 sea level rise in the study area:

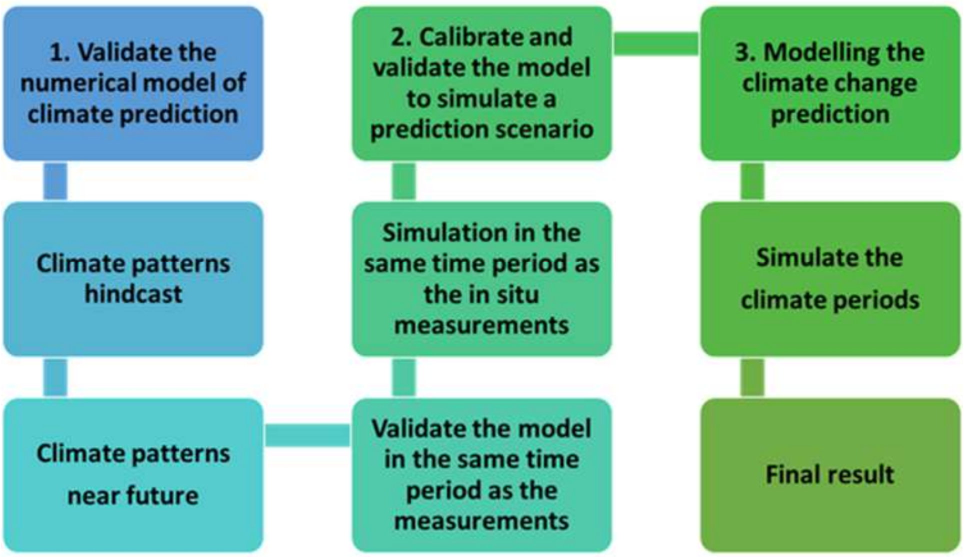

Figure 4-26: Conceptual model sea level rise modelling approach in CS5.

The first step is Topo-bathymetric processing. In this task, the study area's topography and bathymetry are obtained in raster format. This is subsequently interpolated to create de Digital Terrain Model and define the most relevant outlines and geographic elements.

The second step performed was the validation of the model stability using instrumental data (historical records) to reconstruct the previous SLR and then develop the SLR projections for the study areas. Once the numerical scenarios were running correctly, the effect with the average and extreme tide regimen effect were introduced to obtain the forecasting intensity for overwash events.

The team ran the complete wind data series from the ERA5 satellite from 1959 to 2021 and parallel ran the forecast from 1959 to 2015 to validate the methodology and found a good match between the historical data and the forecast data (Figure 4-27). The validation process allows the simulation to forecast sea level rise scenarios from today to 2060.

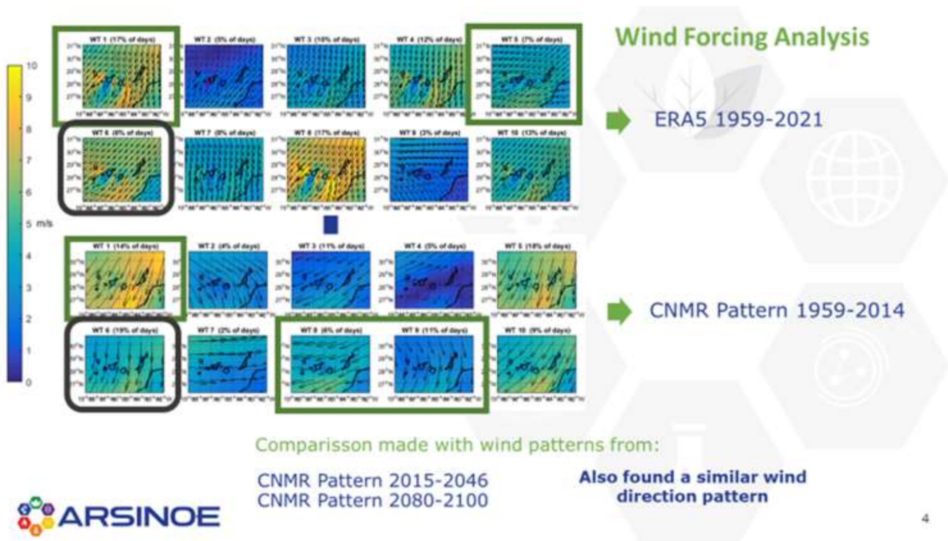

Figure 4-27: Wind pattern comparison with the developed sea level rise model – comparison ERA5 measured data and the CNMR forecast data.

Quality crop index

The annual analysis (May 2021 to April 2022) of plantain crops in La Palma Island was carried out aiming to comprehend how the volcanic eruption of Cumbre Vieja (on September 19, 2021), which last for 85 days, has affected these crops, the water irrigation system of the area, and to possibly identify signs of aquifer water properties' change using plantain crops as an indicator. The region of interest (ROI) was selected based on proximity of plantain crops to the affected area. In this sense two districts where selected, Tazacorte and Valle de Aridane, on the west side of the referred island.

To achieve our target, we chose remote sensing satellite data to carry out the affected area's monitoring, as it was unfeasible the access to the crops after the beginning of volcanic activity, and due to several derived information the satellite data can provide us, such as different index of a crop's health state. Hence, the Copernicus Sentinel-2 Mission was selected due to the spatial and temporal resolution which ensured enough information input to the crop health index algorithm. Furthermore, the Copernicus mission was selected due to its open-source data availability.

Figure 4-28 presents the flowchart of the steps taken so far and the phase we are in regarding the development of the Crop Health Index. The final product will be achieved by combining the vegetation indexes, NDVI (Normalized Difference NIR/Red Normalized Difference Vegetation Index, Calibrated NDVI – CDVI) and NDRE (Normalized Difference NIR/Red-Edge Normalized Difference Red-Edge).

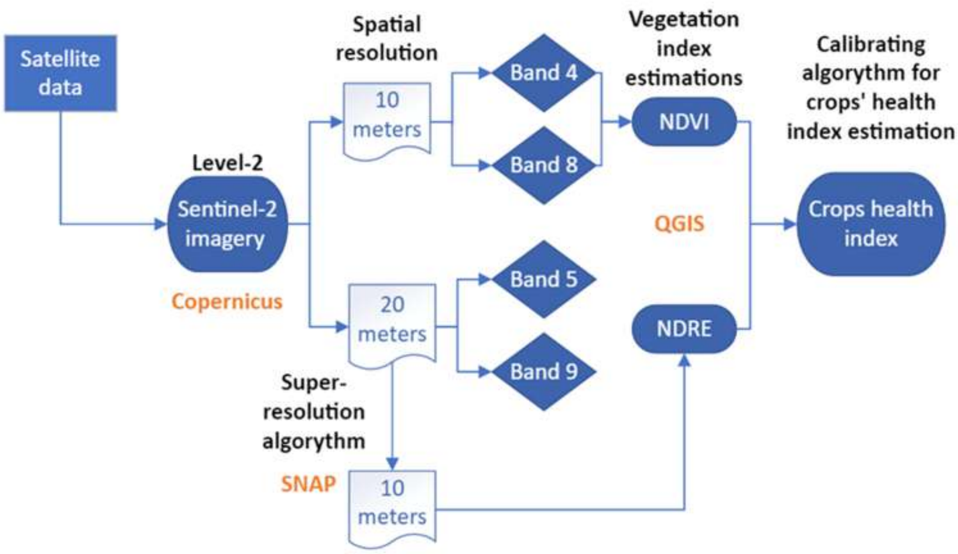

Figure 4-28: Conceptual model Crop Health Index.

However, the sensor deployed in the Sentinel-2 satellites, the Multispectral Imager (MSI) operates with 10-, 20- or 60-meters spatial resolution. Thus, the spatial resolution varies depending on the light spectrum employed (Figure 2); the bands 5 and 9 (for the NDRE) needed to be adjusted to present the same resolution as the bands 4 and 8 (for the NDVI). This processing was carried out on SNAP using the *plugin sen2res*. Finally, the imagery dataset with the same spatial resolution were obtained and the respective indexes were calculated according to the Index DataBase (IDB) for Sentinel-2.

CS5 is working on the calibration of the Crop Health Index for La Palma to then be able to implement it for the study area in El Hierro (Valle del Golfo).

Data Collection

Groundwater

The aquifers of La Palma and El Hierro will be monitored during the ARSINOE project. To provide monitoring data, sensors were installed in both aquifers in march 2022 (Figure 4-29). These sensors measure water level, temperature and electrical conductivity. A total of 12 and 11 monitoring wells, piezometers, and dry galleries, are include in the monitoring programmes on La Palma Island and El Hierro Island, respectively. Groundwater was sampled at each monitoring well and piezometer for measuring cations and anions. In addition, a total of 12 samples in the La Palma Island and 4 in the El Hierro Island were taken for measuring microplastics.

In order to date the main landslide in the El Hierro Island, samples were collected from the landslide deposits (mortalón) that outcrops in Tamaduste and Padrones galleries.

A hydrogeological survey was performed on La Palma and El Hierro by inspection on a regional scale by car to characterize the hydrostratigraphic units that are being incorporated into their respective 3D geological models and to establish the key hydrogeological characteristics for the ongoing recharge calculation and numerical flow modelling tasks. Special detail was given to the dikes that affect the volcanic units prior to the giant slide, which were assessed from the surface and from within some dry galleries.

Figure 4-29: A) Data logger installation in the La Palma Island. B) Water table and data logger installation in the El Hierro Island. C) Visit to a gallery in the El Hierro Island. D) Rock sampling in the Padrones gallery.

Sea level rise

After selecting the scenarios RCP4.5 and RCP8.5 for sea level rise modelling (Deliverable 3.4), the sources for the data collection to feed the hydrogeological model were selected. Data from the following sources will be used:

- IPCC (mean temperature, total precipitation)
- Santander Met Group (mean temperature, total precipitation)
- AEMET (precipitation, Tmin & Tmax)
- SITCAN (mean temperature, total precipitation)
- Climate Change Service (mean temperature, total precipitation)
- WorldClim (precipitation, Tmin & Tmax)
- ESFG (air temperature, precipitation)
- WDC Climate (air temperature, precipitation)

Quality crop index

The study area in La Palma Island was monitored using Copernicus Sentinel-2 satellites imagery data within a 10 meters spatial resolution, from May 2021 until April 2022, in order to analyse the plantain crops health state before and after the volcanic eruption.

The Sentinel-2 family is composed by 2 twin satellites, coupled with the MSI - a passive sensor which cannot capture image through obstacles, such as clouds -, that operates within 13 spectral bands (443 – 2190 nm), where 5 of them lay on the visible light spectrum. The MSI has a swath width of 290 km and operates with a radiometric resolution of 12 bits. Moreover, the Sentinel-2 constellation is polar-orbiting satellites placed in the same sun-synchronous orbit, with an inclination of 98.62°, phased 180° from each other. Their mean orbit reaches an altitude of 786 km from the Earth, and they cover an area from 56°S to 84°N, revisiting time changes with latitude (ESA, n.d. (b); ESA 2015).

Additionally, all data acquired by the MSI sensor are systematically processed from Level-0, Level-1A and Level-1B to Level-1C by the Payload Data Ground Segment (PDGS). Only the Level-1C and Level-2A products are released to end users (ESA,n.d.(b)). The Level 2 images for the ROI were available each five days and they were downloaded from Copernicus website. Aiming on keeping track of the satellite imagery condition, a table was made to visualize the days where the ROI was visible or covered by clouds (Table 4-18). The image was acquired for the days when the ROI was captured by the constellation, whereas the days where the atmosphere above the ROI was covered in clouds/ashes were dismissed.

In total the ROI was visible in 29 images from the 69 available for the year-long analysis. Furthermore, it for the months of October, November, and December there were no images without cloud and/or ash cloud coverage. For September, after the volcano started, we have only one image. For the other months we did have at least 3 images available.

Table 4-18: Sentinel-2 mission imagery data acquisition.

	January	February	March	April	May	June	July	August	September	October	November	December
2021					~~3~~	~~2~~	2	1	5	~~5~~	~~4~~	~~4~~
					~~8~~	~~7~~	7	~~6~~	10	~~10~~	~~9~~	~~9~~
					13	12	~~12~~	~~11~~	15	~~15~~	~~14~~	~~14~~
					~~18~~	~~17~~	17	16	~~20~~	~~20~~	~~19~~	~~19~~
					23	~~22~~	22	21	25	~~25~~	~~24~~	~~24~~
					~~28~~	27	27	26	~~30~~	~~30~~	~~29~~	~~29~~
								31				
2022	3	7	~~4~~	~~3~~								
	~~8~~	12	~~9~~	8								
	13	17	14	~~13~~								
	18	22	~~19~~	18								
	~~23~~		24									
	~~28~~		~~29~~									

Legend	
(struck through)	< 30% of the ROI covered, product not acquired
(orange)	Volcano smoke detected over the ROI
(light green)	> 30% of the ROI covered, product acquired
(dark green)	Clean atmosphere over the ROI, product acquired

4.3.6 CS6 – Modelling and Data Collection progress

The partners involved in the Case Study and their specific role and contribution in it are listed in Table 4-19. The model to be used was described in D3.4. The work in the case study focussed on data acquisition and first calibration of the model. Further details on the modelling and data collection activities in the reporting period are provided below.

Table 4-19: List of CS6 partners involved in activities related to WP3/modelling and their role.

Partner	Abbreviation	Role
Aristotle University of Thessaloniki	AUTh	Aliakmon River Modelling
Cleantech Bulgaria	CTBG	Ropotamo River fieldwork/in-depth analysis
Middle East Technical University	METU	Marine sampling, analysing, and contributing to the model.
National Institute of Research and Development for Biological Sciences	INCDSB	Danube Delta, research on salted soils and biofiltration

Ropotamo River (Bulgaria)

Fieldwork was stared in August 2022. The mission was followed by the drafting of a technical report. It contains the preliminary work done before the mission and its results. The four major components of the report are:

- In-depth spatial analysis of the territory of the Ropotamo, using available data from accessible national and international information platforms
- Preliminary information on the main components of ecosystems, their capacity and scope of ecosystem services
- An up-to-date climate projection with a horizon of 50 for two scenarios (RCP4.5 and RCP8.5)
- Initial survey and mapping of the territory with UAV (Figure 4-30)

All these were needed to structure the work in the reserve for the next field missions, as described in the plans for the next months of the project.

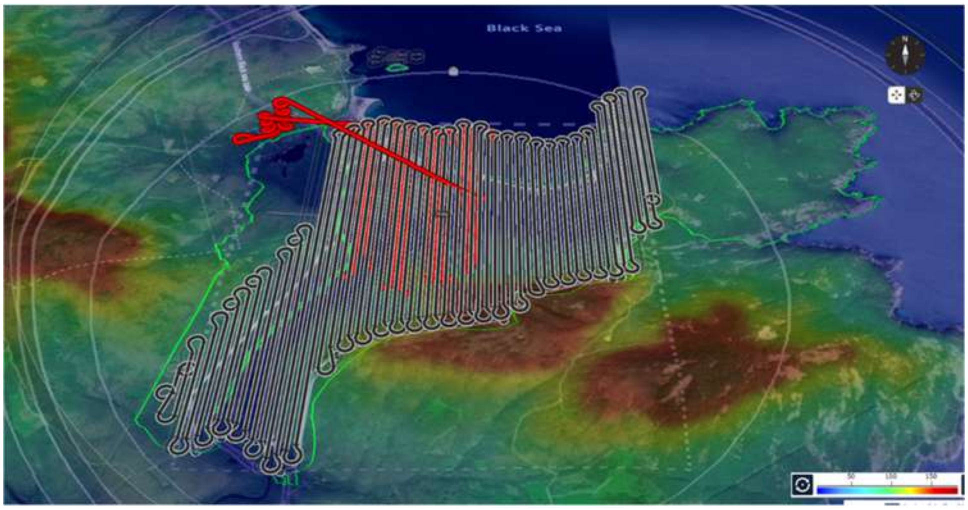

Figure 4-30: Sample image showing the traces of the trajectory of the UAV in a field mission in the Ropotamo wetland (eMotion format).

Danube Delta (Romania)

The data collection in this case study is focusses on various aspects of farming on salted soils.

The 1st trial in real environment on innovative farming on salted soils in Danube Delta was carried out using the outputs from a completed ERANet project (HALOSYS). Thus, seeds of selected halophyte species were used for a first assessment on the ability of plants to adapt to the specific conditions of the area, from germination to the plant's maturity (Figure 4-31).

Implementation in real environment on a plot of land on a plot of land with a length of 180m and a width of 9m, made available by the municipality of Murighiol (Tulcea county, Romania. The sowing was carried out in April 2022.The land was mapped and soil samples were taken from 12 points, at 3 depths level (0-10cm, 10-20cm and 20-30cm). The sampling was carried out before sowing and after the plant growth period, in order to investigate the evolution of the soil microbiota during the plant development.

Figure 4-31: development of plants in the field trial in 2022, situation in July 2022.

During the reporting period a 1st approach on evaluating the resilience of bacteria involved in biofiltration was performed (Figure 4-32). This activity consisted of:

- Water sampling and bacteria separation
- Aquatic plant sampling for studying the symbiotic relation with bacteria and the roots of aquatic plants

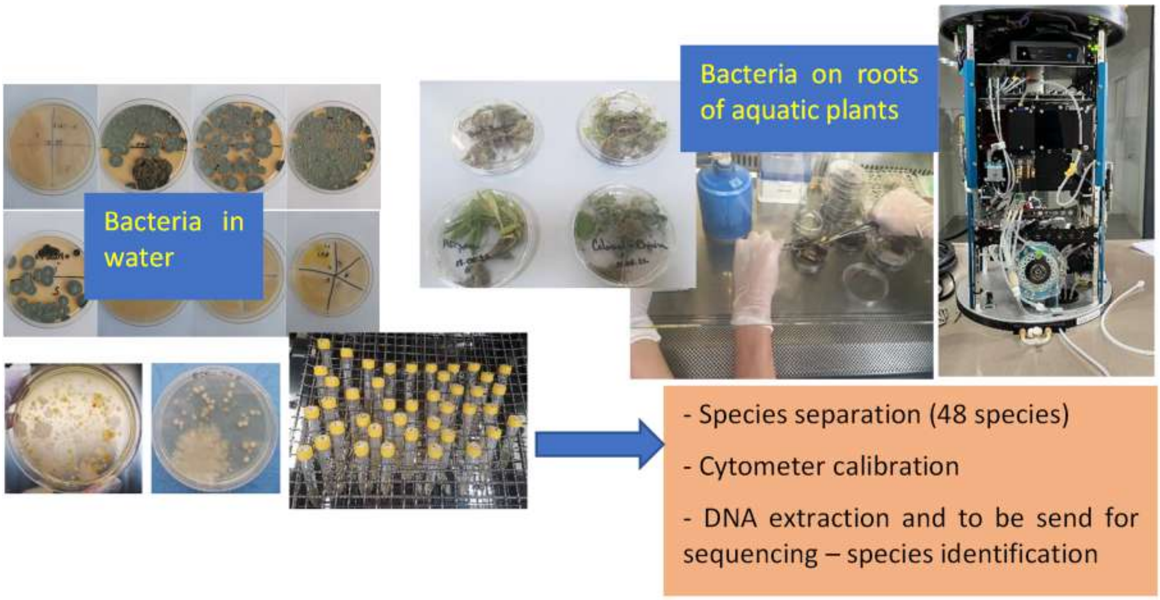

Figure 4-32: impression of bacteria and aquatic plant sampling undertaken in CS6 – Danube Delta site.

South-Western Black Sea (Turkey)

A first cruise to collect data from the case study area was scheduled by METU Institute of Marine Sciences in December 2022. Despite the adverse weather conditions, the cruise lasted in 3 weeks as intended. During the cruise pre-determined stations were visited (Figure 4-33) and samplings and analyses were be conducted for ARSINOE as well as for other projects. The goals of this expedition were:

- To observe Northwestern Shelf input along the coast and to monitor the quality of the water entering the Marmara and outflow of the Mediterranean waters in the Black Sea.
- To quantify climate change/global warming influence in the Western Gyre (Shallowing of the Oxygen Layer)
- To monitor the Western Shelf water limit at Sakarya Canyon Region

Furthermore, a wide database for the marine environment belonging to Türkiye is available, and this existing information can be used for the modelling work in WP3.

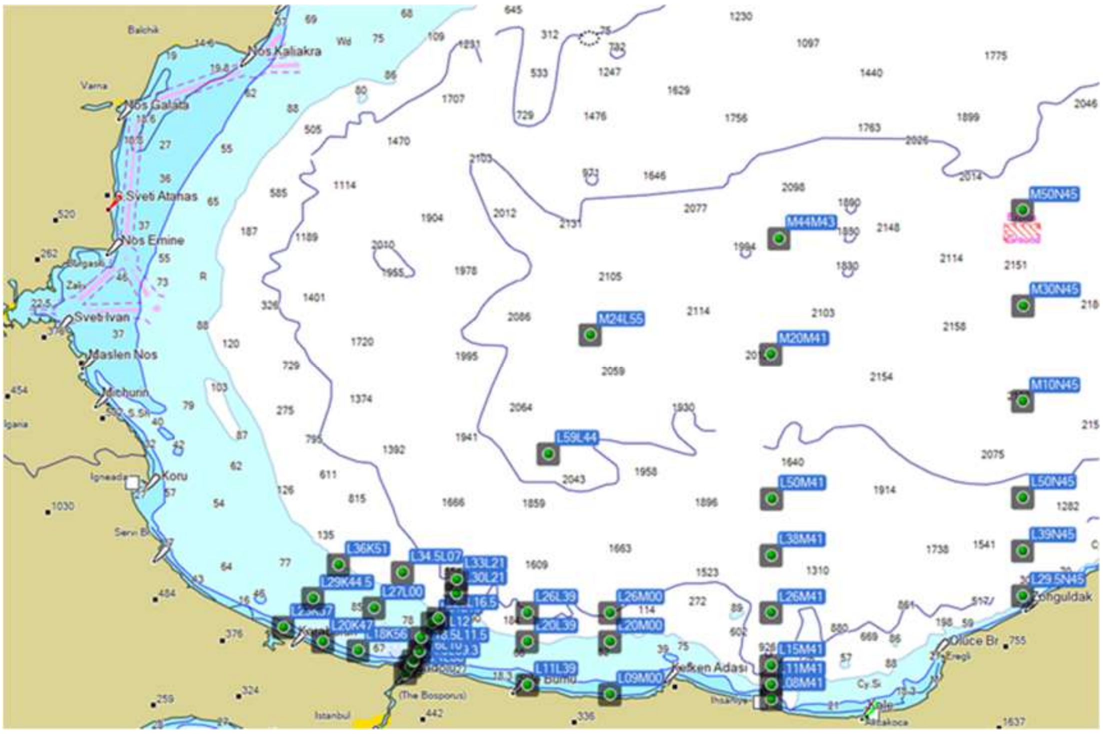

Figure 4-33: Map showing the sampling stations visited during the first data collection cruise in the black sea.

Aliakmon River (Greece)

The hydrologic and hydraulic modelling of the Aliakmon River and its tributaries represents the headwater elements in river modelling within the Black Sea case study, and will include the development and use of a digital twin model. Work on the development of the digital twin, and the necessary data collection, has started in the reporting period. The following actions have been performed:

- The necessary software has been selected.
- The information required have been collected.
- The model has been calibrated and evaluated based on statistical measures (Figure 4-34).
- A first optimization method has been applied using the HEC-HMS (Figure 4-35).

Figure 4-34: Hydrological Model calibrated in HEC-HMS.

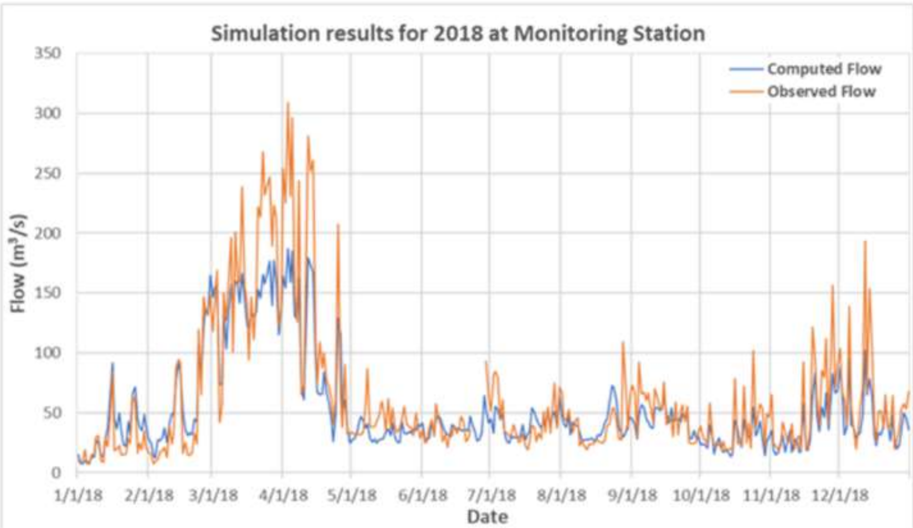

Figure 4-35: Simulation results for 2018 at Monitoring Station.

The following tasks have been started, but were not yet completed by M18:

- link the model with the meteorological data and hydroelectric energy production in the river.
- Integration of weather forecast data from open forecast databases (for example the Open-Skiron–OpenWRF service (https://openskiron.org/en/openwrf) into the operation of the digital twin.

4.3.7 CS7 – Modelling and Data Collection progress

The partners involved in the Case Study and their specific role and contribution in it are listed in Table 4-20. The relevant models to be used were described in D3.4. The following modelling activities initiated in M1-M18 are described below.

Table 4-20: List of CS7 partners involved in activities related to WP3/modelling and their role.

Partner	Abbreviation	Role
Technical University of Denmark	DTU	Various modelling tasks, data provider, co-developer of DCAM / "SkadesØkonomi", WP3 lead
Esbjerg Municipality	EM	Co-development of models, data provider, acceptance and quality assurance
LNH Water	LNH	Developer of DCAM / "SkadesØkonomi", cost-benefit analyses
Danish Coastal Authority	DCA	Data provider, coastal modelling
Ludwig-Maximilians-Universität München	LMU	Modelling, WP3 co-lead

Danish economic Damage Cost Assessment and Modelling tool

The Danish economic Damage Cost Assessment and Modelling tool ("SkadesØkonomi") – henceforth for simplicity abbreviated DCAM - is the main tool used in CS7 to assess the (economic) risks related to flooding under current and future physical conditions, different socio-economic scenarios, including the effects of different climate change adaptation options.

DCAM is a micro-economic and spatially explicit GIS based tool that integrates a number of damage cost curves inferred from statistical and physical data using econometric modelling. The model estimates economic losses based on detailed flood maps (flood depth) at varying scales and complexity but is usually used at scales corresponding to individual buildings and assets. DCAM is open-source and was jointly developed by economists and geographers from DTU, LNH Water and several Danish municipalities in a national flagship research initiative called COHERENT. A more generic version applicable beyond the Danish context is planned and will be partly developed in a synergetic Horizon Europe project called DIRECTED, which started in 2022. DCAM covers several sectors in different ways including buildings, losses due to traffic delays, health, recreational values, tourism, biodiversity, etc. Several new features were identified in M1-M18 and will be added to DCAM to be compliant with the requirements of the resilience assessment and the LL in the next reporting periods:

- Additional tool functionality to underpin the implementation of different urban development scenarios (and more generally land use change scenarios). A prototype was developed in the later part of 2022 and will be further refined in the coming reporting periods.
- Additional tool functionality for estimating the varying benefits to local property owners of installing new coastal protection; this is tightly linked to the issue of economic burden sharing, which is a central principle under Danish legislation, and which will be touched upon also in WP7 in the coming reporting periods.
- Additional tool functionality for supporting sensitivity analyses to be carried out in relation to various CS7 analyses as well as task 3.6 (uncertainty analysis).
- New industrial damage cost curves that estimate the losses to productivity as a consequence of flooding.
- New agricultural damage curves estimating the losses to agricultural yields as a consequence of fields being flooded.

In M1-M18, activities related to data collection have mainly been focused on DCAM modelling and include:

- A high-resolution digital elevation model (DEM)
- Existing inundation maps for Esbjerg for different return periods
- Building data for Esbjerg
- Extreme sea level statistics for Esbjerg
- Historical data on losses in the agricultural sector due to flood events
- Historical data on losses in the industry sector due to flood events

Regional sea level rise projections

New regional sea level rise projections for Esbjerg and the Wadden Sea is being prepared using state-of-the-art methods and compared to current official estimates calculated by the Danish Meteorological Institute and the Danish Coastal Authority for a more comprehensive estimate of the sea level rise uncertainty (e.g., task 3.6). This includes a new data-driven methodology proposed by DTU partners, which is will be applied and tested for Esbjerg and other locations.

4.3.8 CS8 – Modelling and Data Collection progress

The partners involved in the Case Study and their specific role and contribution in it are listed in Table 4-21.

Table 4-21: List of CS8 partners involved in activities related to WP3/modelling and their role.

Partner	Abbreviation	Role
Exeter University	UNEXE	Modelling (D3.1), Development of real-time simulation engine for cascading failure, Resilience assessment wheel (D3.5) for integrating other tasks in WP3 and WP4, Data collection
KWR	KWR	Modelling assistance (D3.1), lead authoring 1, 2.1,2.2, 3.1 and provided input to other sections of D3.1, co-authored MS8, data collection, input for resilience assessment wheel (D3.5)
Torbay Council	TC	Partner; Stakeholder, emergency responder (D3.1), Provided info for the Milestone, reviewed the Milestone, Provided info for the two models.
Westcountry Rivers Trust LBG	WRT	Partner, provided input information for the models and the Milestone
Environment Agency	EA	Stakeholder, emergency responder (D3.1), participation with info
South West Water	SWW	Stakeholder, CI and emergency responder (D3.1), participation with info
Torbay & South Devon NHS Foundation Trust	NHS	Stakeholder, CI (D3.1), participation with info
Western Power Distribution	WPD	Stakeholder, CI and emergency responder (D3.1), participation with info
SWISCo	SWISCo	Stakeholder, emergency responder (D3.1), participation with info

The work in Case Study 8 focussed on the development of the DMRM&AF (resilience wheel) as described in section 3.4.2 and its application on CS8. Furthermore, the general resilience assessment framework was completed and reported in D3.1. A short summary is provided below.

Simulation model to assess and improve resilience of critical infrastructure to cascading failures

CS8 is developing two simulation models to assess and improve the resilience of CI services to cascading failure in the context of climate induced perturbations. These models assume a co-dependence relationship between physical infrastructure assets, businesses, and communities. The aim is to find ways to enhance the resilience of such systems by allowing the resource allocation and permutation of CI services as well as human assets and physical resources available at the level of businesses and communities. Two different types of simulation models have been developed and presented: a "lightweight" real-time cascading failure engine that can be reused in real-time applications, and a more complex and detailed hybrid modelling framework that can be used to explore how to optimize resource allocation to mitigate damages. These modelling frameworks should be sufficiently generic to be used as a template so that can then be reused by other case studies, should they have enough relevant data available to compute the cascading failure of CIs and services in a similar manner.

Real-time model

Action 1 (completed): initial collection of data from the Torbay case study. The area has been divided into small "output areas" with relevant census data about the population and workforce. For each area, an initial list of Critical Infrastructures (CIs) has been built, as well as the state and availability of critical services required for the Cis to function, and the list and state of the critical services that these Cis deliver to other areas. The resulting picture forms a network of service interdependencies between areas and was reported in detail in D3.1.

Action 2 (completed) development of the first version of a generic real-time cascading engine for cascading failure of infrastructure. The first part of the engine implemented were functions that propagate the cascading failure of CIs iteratively until the sum of all critical services does not decrease any more. The second part implemented were functions that quantify the impact of damages to the integrity of CIs and gives an estimation of the resulting loss of services they deliver. The third part implemented were functions that quantify the impact of service loss on population and workforce, and feedback the effects of workforce loss on the ability of CIs to deliver services. This was reported in D3.1

Further work still needs to be done in conjunction with stakeholders so as to refine the model, particularly regarding the selection of infrastructure assets with permutable roles and the allocation of permutable workforce resources. Further efforts are needed to incorporate road traffic modelling, check the resilience of CI services to multiple compounded events (such as recurrent flooding events and how the system cope with it), and the addition of the impact of services on business activity, as well as the impact of business activity on services that impact CIs. Further work also needs to be done with stakeholders to look into adjusting the sensitivity of the services delivered to workforce impairment.

Hybrid Modelling

The hybrid modelling solutions is developed and implemented with Anylogic platform (in Java programming language). Further work is needed to refine the model and enhance the applicability, mainly in two spheres. The first sphere is working with responders, to check response process and resource pool; the second sphere is working with CIs, to improve the data used for cascading effects in the SD module. Future work for other WPs includes integrating with predictions from traffic modelling and flood modelling, adapting the hybrid modelling to other climate resilience issues and case studies, as well as in conjunction with other tools to be developed in the project (e.g., dashboard, digital twins).

4.3.9 CS9 – Modelling and Data Collection progress

The partners involved in the Case Study and their specific role and contribution in it are listed in Table 4-22. The relevant models to be used were described in D3.4. The following modelling activities initiated in M1-M18 are described below.

Table 4-22: List of CS9 partners involved in activities related to WP3/modelling and their role.

Partner	Abbreviation	Role
Agris Sardegna - Agricultural Research Agency of Sardinia	AGRIS	Durum wheat crop modelling (Task 3.4) and SDM (Task 3.5)
University of Cagliari	UNICA	Durum wheat crop modelling and hydrological modeling for water harvesting (Task 3.4) and SDM (Task 3.5)
Centre for Advanced Studies, Research and Development in Sardinia	CRS4	
BlueGold	BLGL	
University of Tours	UT	
Ludwig Maximilians Universität München	LMU	

CERES-Wheat model

The CERES-Wheat model (Ritchie et al., 1984) will be applied in CS9 to simulate durum wheat growth and productivity in Sardinia under present and projected climate conditions. The available calibrations of CERES-Wheat model for Sardinia (Dettori et al., 2011; Mereu et al., 2019), a Crop Simulation Model (CSM) will be updated including new durum wheat cultivars and experimental data in irrigated conditions that is collected in ARSINOE. CSMs simulate growth, development and yield as a function of the soil-plant-atmosphere dynamics. CSMs require daily weather data, soil surface and profile information, and detailed crop management and crop genetic information as input. The Minimum dataset for model calibration and operation includes:

- Daily data of maximum and minimum temperature, total precipitation, and global solar radiation
- Soil data (texture, pH, soil organic carbon, etc.)
- Crop and management data

AQUACROP

AquaCrop is a crop growth model developed by FAO's (Food and Agricultural Organization of United Nation) Land and Water Division to address food security and assess the effect of the environment and management on crop production (https://www.fao.org/aquacrop). AquaCrop simulates the yield response of herbaceous crops to water and is particularly well suited to conditions in which water is a key limiting factor in crop production. AquaCrop has been widely used in the literature to simulate durum wheat yield production, especially in arid and semi-arid countries (Benabdelouahab et al., 2016, Bouazzama et al., 2017, Kourat et al., 2022) but needs to be calibrated for the local conditions in the Case Study area. The Minimum dataset for model calibration and operation includes:

- Climatic data:
    - daily data of maximum and minimum temperature,
    - daily precipitation,
    - daily evapotranspiration rate (it can be also estimated with ETo calculator, a software developed by the Land and Water Division of FAO)
    - CO_2 concentration
- Soil data (soil type, pedotransfer function, etc)
- Crop data (growing cycle, sowing date, water-crop productivity)

Data sources

The following data required for calibration of Aquacrop and CERES-Wheat are already available from the experimental sites of Ussana and Benatzu and have been consolidated for use in ARSINOE:

- Plot data:
    - Durum wheat phenology and yield observations in rainfed conditions (1973-2022)
    - Durum wheat crop management (1973-2022)
    - Literature data (Soddu et al. 2013)
- Weather data:
    - Daily data of maximum and minimum temperature, daily precipitation, and global solar radiation (1984-2022)
- Soil data:
    - soil profiles
- historical generic data for Sardinia
    - population variability
    - tourism variability
    - yearly production of the most common agricultural products (wheat, rice, tomato, artichoke, and olives) and animal products (meat, milk, eggs, honey)
    - food import and export

Other meteo-climate data and remote sensing data collected

A WEB infrastructure and end-user portal that contains data and applications regarding the Sardinian test case has been developed. The portal is hosted at CRS4 and is available at the url: http://arsinoe.crs4.it/. Table 4-23 lists the physical parameters currently available, via specific API calls, in the web server and the time extension of the corresponding database.

Table 4-23: Remote sensing resources acquired for the Sardinian case study.

Data Source	Timeseries acquired
Sentinel-2 (multi-spectral remote sensing data)	11-2018 / 01-2023
Sentinel-2 NDVI (calculated using the previous data)	2018 / 2022
Era5Land (meteorological reanalysis)	03-2017 / 12-2021
ICON (high resolution meteorological forecast)	04-2022 / 01-2023
GFS (meteorological forecast)	04-2022 / 01-2023
GENS (ensemble meteorological forecast)	04-2022 / 01-2023

The main spatial dataset used in the ARSINOE Sardinia test case is the Copernicus/sentinel-2 Level2A data, of which we gathered in the arsinoe.crs4.it web server the following bands for the time period indicated in Table 4-23: B01 – B08, B8A, B09, B11 and B12.

5.0 Actions related to WP4 and data management

5.1 ARSINOE Data Hub

In the ARSINOE project modelling tools are developed based on two overarching research paradigms, namely, deductive research and inductive research. WP3 applies theory-driven approaches to develop deductive models (T3.1-T3.4) whereas WP4 has modelling tasks that are devoted to data-driven inductive models (e.g., T.4.1.2, T4.3.1 and T4.3.2). To facilitate data driven models, the ARSINOE Intelligent Data Hub (T4.2) is created as the central data store. All datasets produced, collected, and used in the context of the Case Studies will be stored in the ARSINOE's Data Hub and will be made available using the data catalogue available at: https://catalogue.arsinoe-project.eu. The catalogue for each Case Study will contain both newly produced / collected local datasets and references to existing open datasets (e.g., datasets downloaded from Copernicus).

The available datasets together with their metadata can be extracted through a rest Web Service to enable the machine-to-machine interaction between the Hub and the Sustain Graph, thus ensuring a continuous data flow and update of the available information between the various services that support the models and the sustainability framework.

In addition, external stakeholders could take advantage of the collected public datasets and get access to the set of information used in the Case Study.

Actions to date concerning data management in the catalogue:

- Information on dataset types and composition have been provided by the case studies to WP4.

No physical data has been uploaded to the data catalogue at the time of writing (M17).

5.2 ARSINOE Knowledge Graph

Part of the data collected within the case studies are used for the population of the ARSINOE Knowledge Graph (SustainGraph). This work is part of Task 4.3. The first implementation of the knowledge graph was performed for CS1 and CS8, which acts as frontrunners.

5.2.1 CS1 SustainGraph

The data collected for inclusion in SustainGraph include data for the considered SDG indicators for the Athens case study, data for the identified climate hazards (based on the classification provided by the European Environment Agency), data for the identified stakeholders, and data for specific Key Performance Indicators (KPIs) that are specific to the region of Attica, Athens.

An overview of the data sources used for the population of SustainGraph is depicted in Table 5-1. Data is introduced in regional and local level for the various areas across the Attica region.

Table 5-1: Indicative Data sources for SustainGraph data population.

Data Provider	Description	Data Type
United Nations SDG API	UN SDG Indicators (SDG data reported by the United Nations Statistics Division)	Tabular (data retrieved through an API)
Eurostat Sustainable Development Indicators	EU SDG Indicators (SDG data reported by Eurostat)	Tabular (CSV data processing)
National Determined Contributions	NDC data based on the Paris Agreement (time series data for specific indicators, as well as data related to the linkage between NDCs and SDGs)	Tabular and Classification (linkage) data (data retrieved through an API)
World Happiness Report	World Happiness Index (survey data reporting how people evaluate their own lives)	Tabular (CSV data processing)
Transparency International	Corruption Perceptions Index (time series data for the perception of corruption levels worldwide)	Tabular (CSV data processing)
European Environmental Agency	Climate Hazards Classification (data for the classification of climate hazards and the associated indicators)	Tabular and Text (data import based on a script)
Climate Innovation Window	Innovations (reference portal for innovations on climate change adaptation)	Tabular (data import based on a script)
European Union	European Green Deal Documents (policy documents)	Text (processing based on NLP)
National Data	Country Specific Recommendations (documents with recommendations per country)	Text (manual data processing and NLP)
Research and Innovation Projects	Case Study Data (e.g., data provided in the ARSINOE project	Tabular and Text (csv data processing, text processing based on NLP)
6Transformation	Data from 6Transformations Report (mapping between transformations and SDGs)	Tabular (csv file produced from the report)
Copernicus Services	Data from the Copernicus service regarding environmental parameters	Tabular (data retrieved through an API) with geolocation
Global Atlas	Socio-environmental data	Tabular (data retrieved through an API) with geolocation

Regarding the SDG indicators, mapping of the UN SDG and the associated EU SDG indicators is included in SustainGraph. This information is very helpful to easily examine the relationship among these indicators and get access to the relevant time series data for analysis purposes. Regarding the stakeholders, we have introduced information regarding the name and type of the stakeholder, the area of operation, the classification of their economic activities according to NACE (Nomenclature of Economic Activities) and their area of scientific/research activities (it applies to institutes from research/academia). A set of time series data are also introduced for specific indicators coming from the Copernicus system in various time and spatial scales. Such indicators include data (e.g., average temperature, humidity) for various areas around Athens and are stored along with their geolocation characteristics to be used in the future for socio-environmental systems analysis purposes. A set of hazards are also identified, focusing mainly on the hazards related to heat waves. Data from text documents, such as the Greek National Determined Contributions (NDCs) and the Greek Country Specific Recommendations (CSRs) are introduced.

Indicative analysis has taken place over the data available in SustainGraph to evaluate and validate its proper usage by interdisciplinary scientists. A set of visualizations are produced based on the visualization kit provided by SustainGraph. Part of these visualizations are depicted in the following figures.

Figure 5-1 shows the relationship between the SDG indicators defined by the UN and EU SDG indicators set, for the indicators that are associated with the case study that is implemented in the area of Athens in Greece. Figure 5-2 shows the stakeholders that are related with the work realized in the Athens Case Study. The stakeholders are classified based on three main categories: Economic Activity (purple nodes); Policy, Public and Civil Society (yellow nodes); Research/Academia (orange nodes).

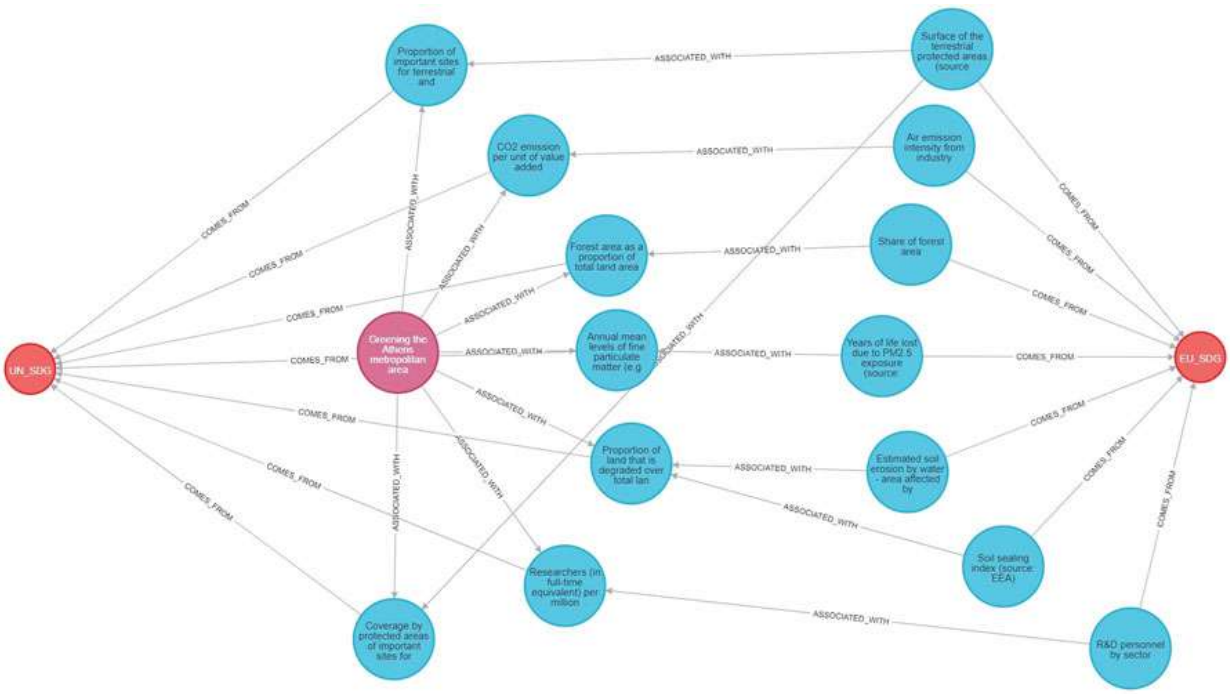

Figure 5-1: Interlinking of the UN and the EU SDG indicators for a specific Goal in the CS in Athens.

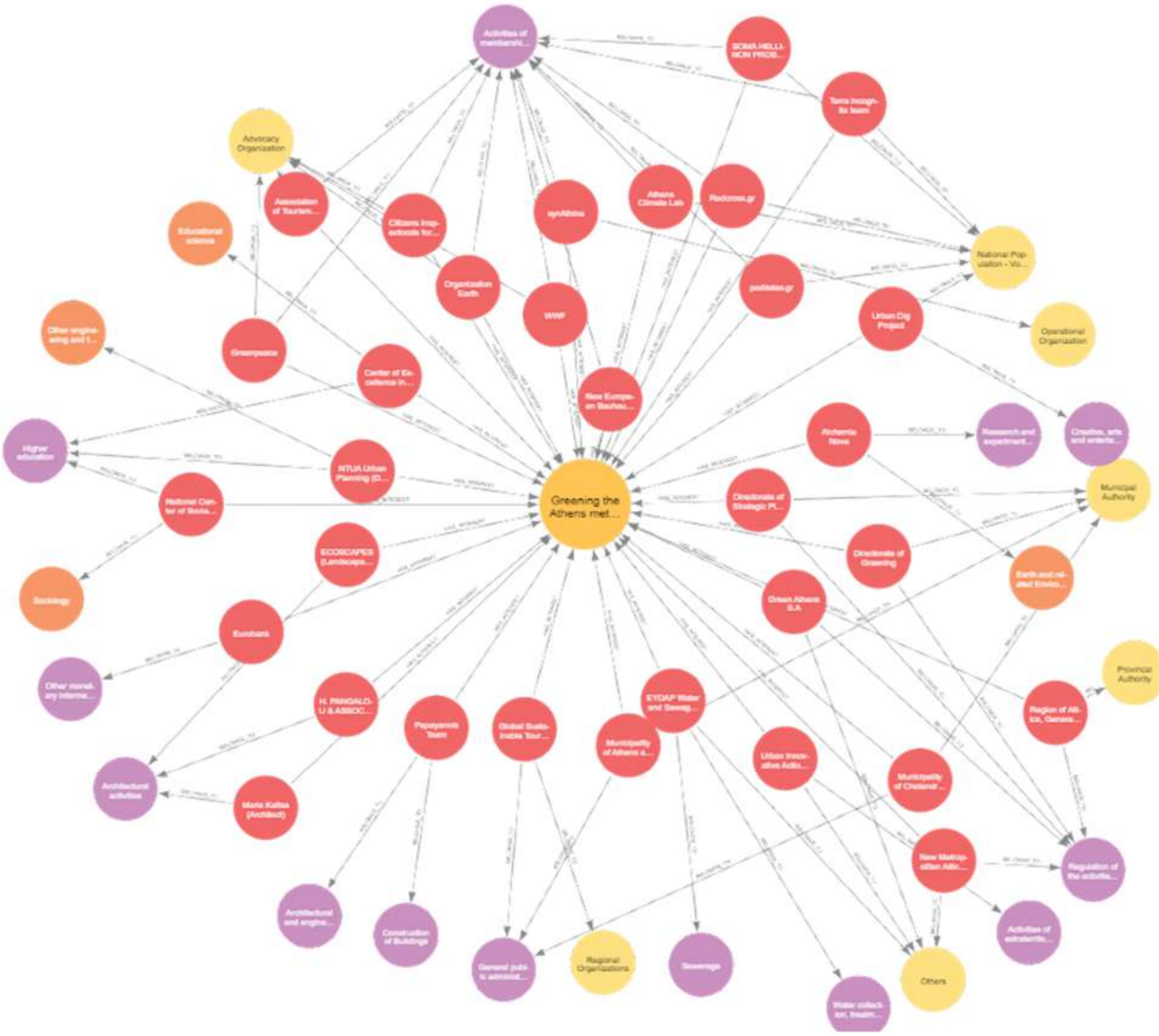

Figure 5-2: Stakeholders Classification in the Athens CS.

In Figure 5-3, we want to identify what are the main climate hazards considered in the case study and if there are available existing technological solutions to help to mitigate their impact. By navigating through the SustainGraph, we can see that “Heat and cold” is the main hazard category considered, while the associated hazard types regard the “Extreme heat” and the “Mean temperature” increase. For tackling these hazard types, four innovations are made available through the “Climate Innovation Window” platform with Technology Readiness Level (TRL) levels ranging from four to 7. These innovations refer to heatwave management through a blockchain-based system in urban areas, modeling solutions for assessing vulnerability indexes for heatwaves, and nature-based solutions for development of vertical garden and efficient water management systems.

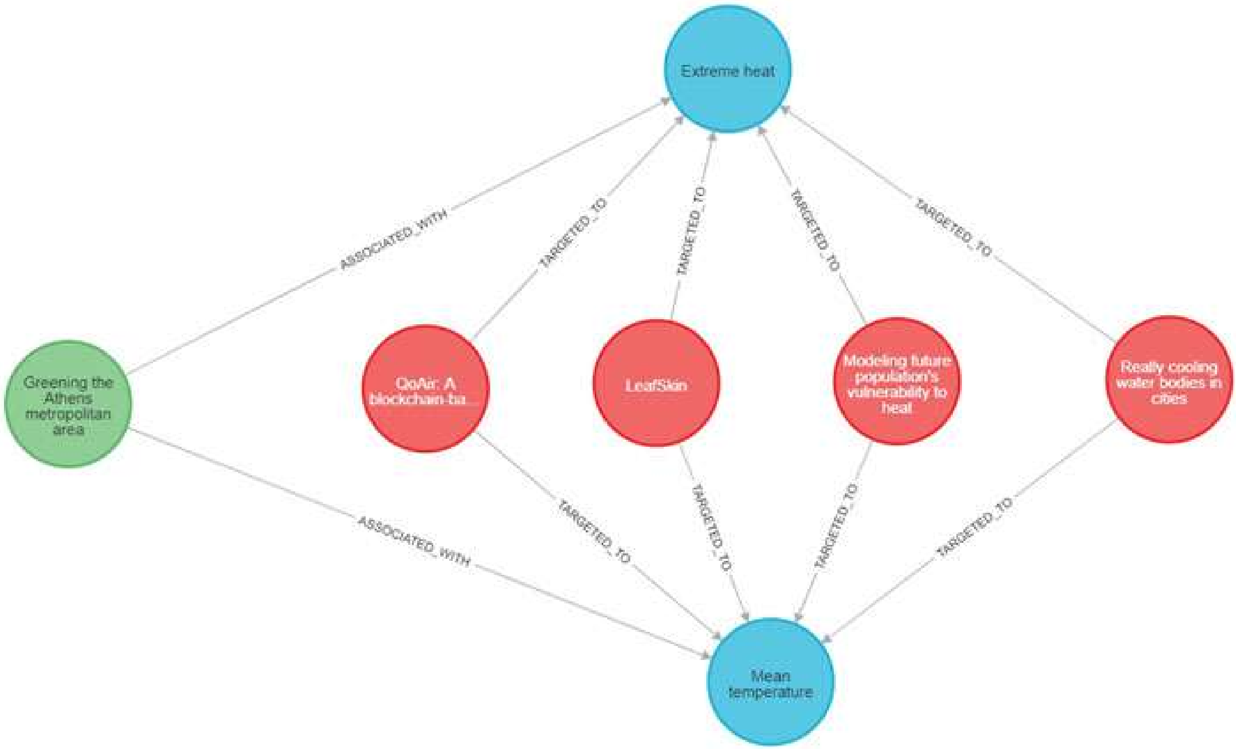

Figure 5-3: Climate hazards and associated innovations.

Figure 5-4 shows a Sankey Chart that depicts the association between the Arsinoe Case Studies and the indicators of the SDG Goal 13.

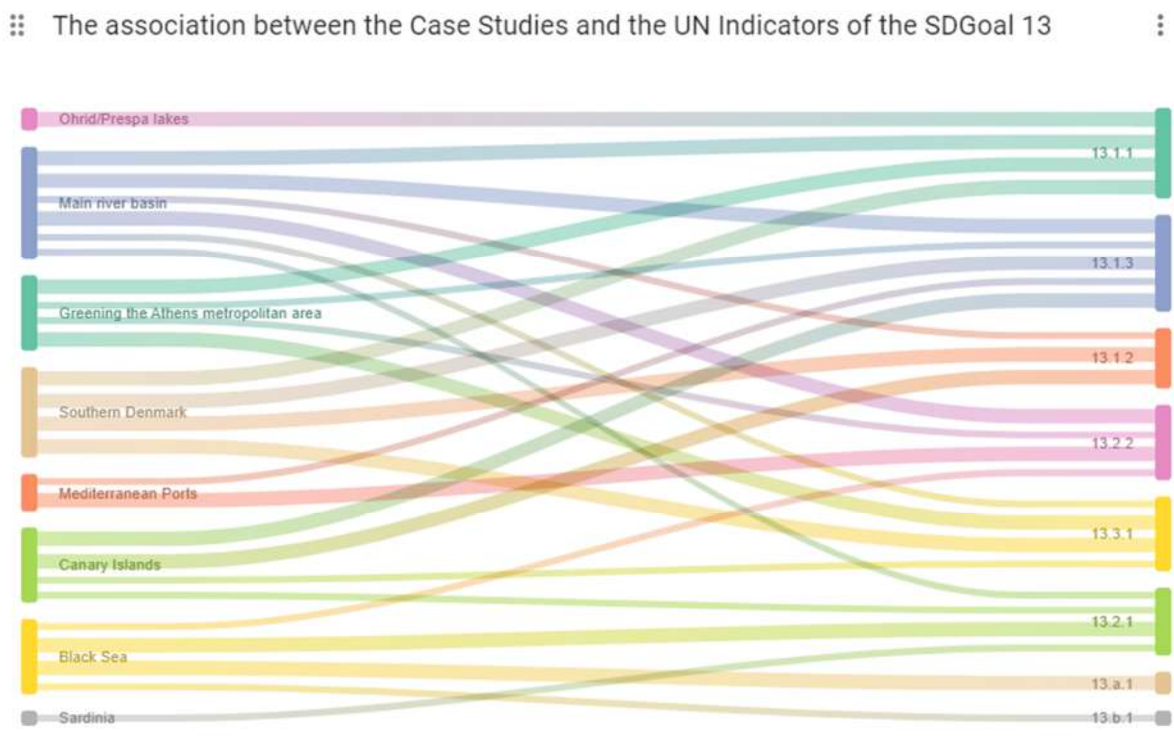

Figure 5-4: Association between case studies and SDGs.

It should be also noted that there is work in progress regarding the support of participatory modeling approaches that are able to take advantage of the knowledge provided in SustainGraph. A proof of concept based on a subset of the overall modeling approach in the Athens CS is planned to be developed in this way.

5.2.2 CS8 - Dashboard

UNEXE worked with Torbay Council to undertake a co-design activity to better understand the needs and issues from the council's perspective with regards to flooding and over-topping. This has resulted in the development of a set of dashboard mock-ups, Figure 5-5 & Figure 5-6, developed from a user experience perspective.

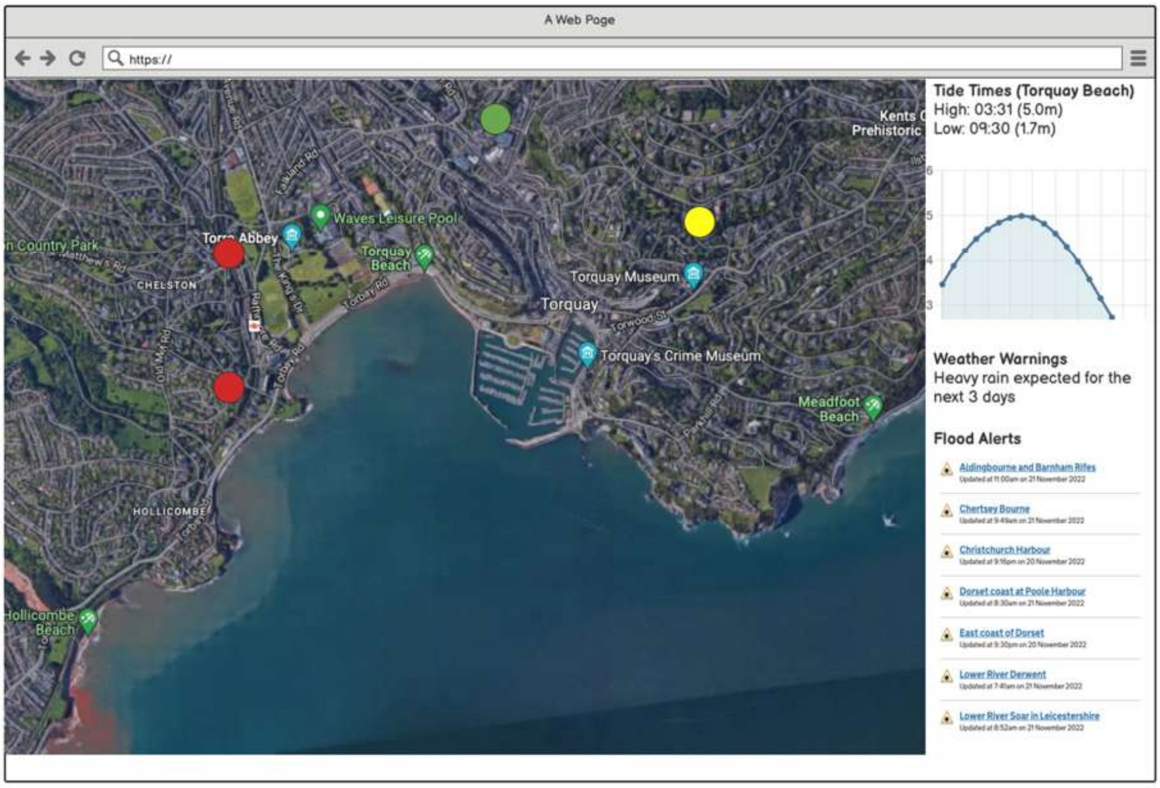

Figure 5-5:Torbay dashboard mock-up showing rain gauges, high tide, and local flood alerts.

The overall approach for the dashboard mock-ups was to display a webapp with a single page that could combine information that was useful for flood awareness. This was primarily achieved through the content on the right of the shared page, comprising of high tide data, taken from the Admiralty's 'Easy Tide' website and flood alert data, taken from the Government's check for flooding service. This data was presented as it tended to capture the two of the main drivers of floods in the Torbay region: high tides with an onshore wind and upstream flooding.

Figure 5-5 adds to this generic presentation with a satellite map of the Torbay region that visualizes the state of the council's rain gauge system, visualized as colour-coded circles with a traffic light colourisation for low, medium, and high levels of concern.

In comparison, Figure 5-6 leverages traffic flow data to visualise potential flood issues as reductions in traffic flow are often present during short and heavy rain shower when the local wastewater network is unable to cope with water removal demands. This leads to highly localised flooding which stops or severely slows traffic. In addition, high tides with onshore wind will often lead to overtopping on the main coast road (Torbay Road), again leading to reduced traffic flow. The mock-up presented shows traffic flow using the traffic light colourisation approach to show roads of low, medium, and high impact.

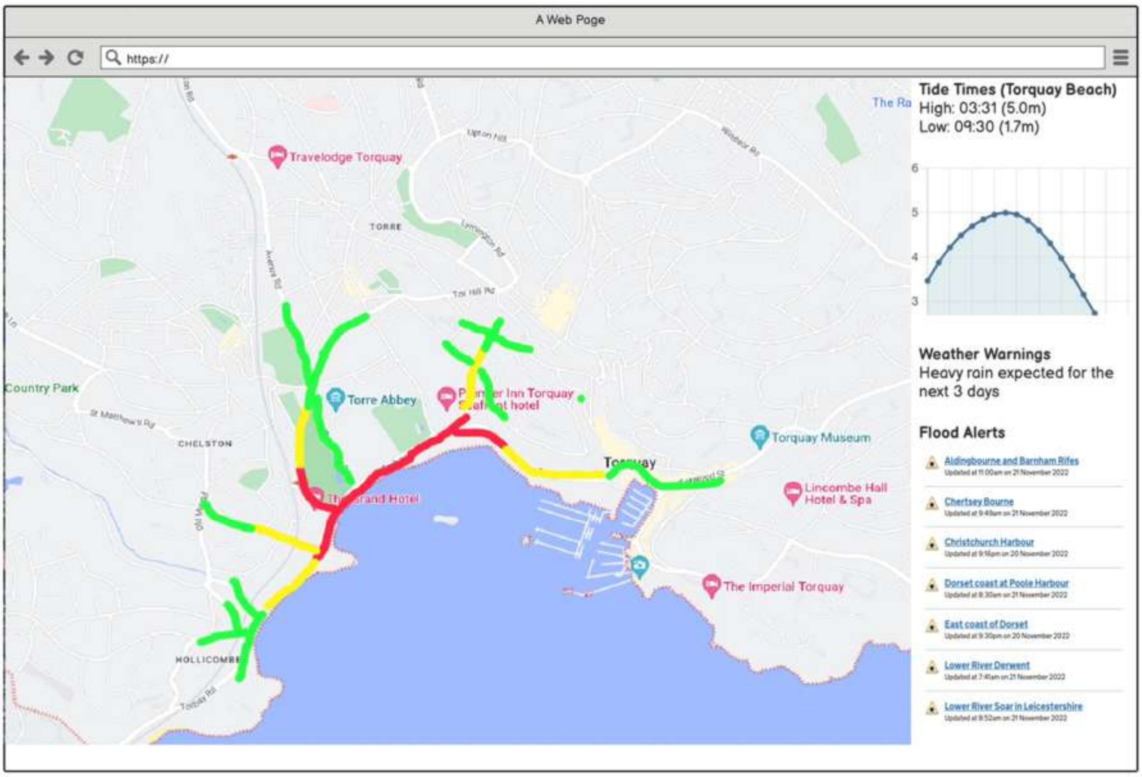

Figure 5-6: Torbay dashboard mock-up showing traffic flow impacted by flooding events.

Whilst the mock-ups developed from this activity do not follow the operations research / management science framework as developed in Task 3.1, it is a fairly straightforward process to extract the stakeholder, data, risk and decision-making components out of the co-design process, suggesting that WP4 can benefit from both top-down (stakeholder-led co-design) and bottom-up (OR/MS analysis) based approaches to capture meaningful data.

6.0 Actions related to WP5 and open tenders

A number of Open Tenders for Innovations will be organised in WP5 as a means to identify promising or mature innovations to be included in ARSINOE's Portfolio of Innovations. This will be prepared in conjunction with the stakeholder processes running in WP2 and WP6, and then fund relevant actions for final co-development and integration of these solutions in the regional Innovation Packages. The process will be undertaken in three phases: i) stocktaking for the identification of relevant solutions well adapted to each local context, ii) preparation and publication of the Open Tenders, and iii) the evaluation and selection of the solutions to be financially supported for their inclusion in the Innovation Packages with the engagement of the ARSINOE Selection Committee.

In March 2022, ARSINOE organized a workshop to assess the priorities and adaptation capacities of the nine case studies (Task 5.1). The insights collected have been used for the effective design of the first open tender for innovations in Phase ii (i.e., preparation and publication of the Open Tenders). In addition, individual meetings were held between August and September with the case studies to discuss the most important adaptation needs, which were identified collaboratively in the Living Labs of the stakeholder processes running in WP2.

It was decided that there will be multiple rounds of open calls, and that the first round was to be published in Q1 of 2023. The case studies participating in this first call are CS3 Main River (Germany), Albanian side of the CS4 Prespa and Ohrid Lakes and CS5 Canary Islands. These case studies were selected since stakeholders during the 1st Living Lab agreed on challenges to address.

To prepare for the publication of the first open tender, case studies 3, 4 and 5 participated in the following activities:

- Several meetings with the WP5 team to decide on the material needed for the publication of the call, and the responsibilities of the case studies participating in the call.
- Preparation of a live FAQ document detailing relevant aspects to consider regarding the process and including those questions raised by the CS.
- Initial discussions of the evaluation criteria needed for the phase 3.
- Discussions regarding national legislation and procedures in each organisation for awarding contracts and procuring services under 50k EUR to ensure full compliance. It was also raised the relevance to check national legislation and procedures in each organisation for the management of acquired materials and equipment for the demonstrators.
- Preparation of one-pager template, which helps the CS to specify their needs for this call.
- The one-pager template was then used by the CS to draft 1-2 paragraphs describing the challenges to be addressed in each case study and what kind of requirements or characteristics the solutions should have (e.g, social innovations, nature-based on nature, etc.). This text is the one that will be published in the main text of the call.
- Contribution to drafting the online application form that participants (innovators) will have to fill to be evaluated

The first Open Tender of the project is currently under work and is planned to be launched in March 2023. The Open Tenders will be published at the European level, differentiating thematic segments based on the needs identified in phase 1 in the regions of the case studies. At the time of reporting the publication was still pending due to legal and administrative issues on the side of the local partners, which took longer than expected to clarify. This is mainly due to the fact that the organisations responsible for awarding the contracts were not familiar with this type of funding scheme, and appropriate preparations were needed.

Specific information on the open tender process concerning the participating case studies is detailed below.

6.1 Participation CS3 in the 1st Open Tender for Innovation

Following the first workshop in the Living Lab LMU, VKU and Brigaid Connect met to discuss the outputs of the workshop and their relevance for the 1st open tender for innovations on 25th August 2022. Prior to the second workshop the partners met once more on 3rd November 2022 to discuss how the open tender could be introduced to stakeholders during the second workshop in the Living Lab. The tender process was presented during the workshop on 18th November 2022 to peak stakeholders' interest in the process and motivate them to think about possible and/or desirable innovations for the case study region.

On 23rd November 2022 LMU and VKU officially committed to taking part in the first open tender for innovations. On 14th December 2022 LMU and VKU provided information about the results of the Living Labs, possible selection criteria and open questions about the tender process to Brigaid Connect by completing a questionnaire circulated for that purpose.

LMU and VKU formulated a key challenge for the first open tender for innovation that innovators should address with their proposals. The key challenge was based on the knowledge of LMU and VKU about the case study, the results of the Living Lab workshops and further debates with stakeholders. LMU and VKU organized a meeting with stakeholders on 20th January 2023 to discuss the content of the key challenge. In the following days stakeholders who could not take part in the meeting were interviewed. Stakeholders agreed that the first key challenge should focus on the protection of the regional water balance and sustainable resource management. They agreed that social and governance innovations were preferable to technical innovations. The following key challenge was written and agreed upon:

> *“The key challenge is preserving the regions water balance and ensuring sustainable resource management. Different climate adaptation measures, changes in land-use, changes in governance structures and shifts in consumption could contribute to solving this challenge. Some measures are known but are not being implemented widely enough or with sufficient speed. Implementation requires the motivation and cooperation of different actors, exchange of knowledge between sectors and a framework conducive to implementation. The creation of these conditions may require social or behavioural change or new governance structures. Additionally, innovations could include projects for protecting the regions water balance. Areas of action could be water absorption and retention, changing water-use and saving water, education or resource-management systems. Thus, we seek social and governance innovations contributing to the protection of the regions water balance as well as technical innovations. The adaptation of a pre-existing concept or project to specific local conditions can be considered an innovation. Innovations should result in measurable positive impacts and include a plan for evaluation.”*

Additionally, LMU and VKU contributed a background document about case study three. It gives potential applicants information about the case study and the role of stakeholder engagement in the case study and ARSINOE. It stresses that innovations should fit the region and address the challenges of the “Main River Basin” and outlines that innovators can respond to the demands of a diverse group of stakeholders from the region when developing their innovations. The document includes the problem statement from the first workshop in the Living Lab and the vision of 2050 from the second workshop in the Living Lab. This background document will be added to the tender for innovation by Brigaid Connect.

The translation of the tender for innovations into local languages was discussed in 2022 and early 2023 because it might make it easier for some organizations to participate in the tender process. VKU and LMU argued that a translation into local languages might help stakeholders who are not used to working in

English-speaking contexts to access funding through the tender for innovation. They were aware of multiple smaller organizations with limited resources that might not respond to a tender published in English. However, the working language of ARSINOE is English and innovators must complete the application form in English to allow the selection committee to evaluate applications. Translating only parts of the call for innovation into local languages would not lead to the desired outcome and decrease hurdles in the application procedure. Thus, a translation into different national languages was no longer considered. Instead VKU and LMU will actively disseminate the call on a national and local level and encourage potential innovators to apply.

VKU members are frequently part of public procurement processes. Consequently, they and VKU's legal department have experience and knowledge relating to procurement processes. VKU used these resources to find out if and how public procurement processes compare to the tenders for innovation, what rules had to be followed. Considering the information about the tender process available at the time, it was concluded that the tenders for innovation are not comparable to public procurement processes under German law. Brigaid Connect held the same view in a later call.

6.2 Participation CS4 in the 1st Open Tender for Innovation

Ideas for the open tender challenge were developed during the national workshops and Transboundary LL. During the National Workshop in North Macedonia: Monitoring of waters, Nature based solutions for preserving biodiversity; Circular economy for water recycling and reuse, applicable for industry and hotels; During the National Workshop in Greece: Drop irrigation project, projects on water supply improvements, biological sewage treatment, scientific research such as recording the fish fauna, agro-environmental nature-based solutions, alternative forms of tourism; Irrigation methods and techniques for efficient use of water; During the National Workshop in Albania: Create a ground water mapping and have more information on water use, data base with information of underground water, more activity with local actor engagement, technical innovation irrigation system, conservative farming, monitoring system of water level, awareness for locals and farmers, etc. Transboundary LL: Water monitoring system, to have a clear understanding of water and climate indicators and have a sustainable use of every affected sector; Alternative farming for efficient use of water and nature based resources; Irrigation methods and techniques for efficient use of water; Nature based solutions for preserving biodiversity; Circular economy for water recycling and reuse, applicable for industry and hotels.

It was decided that the Albanian partner would participate in the first open tender of the project, and in a meeting with WP5 representatives (online) on 30.01.2023 the contribution to the publication information for the open tender was completed.

6.3 Participation CS5 in the 1st Open Tender for Innovation

Following up on the first CS5 Living Lab a video call was organised on 18 July 2022 with WP5 to detect the possible innovations that would arise during the development of the first Living Lab session, which took place on 21 June 2022. Subsequently, it was decided to participate in the first round of the open tender. In an (online) meeting with WP5 on 14 December 2022 the details of the draft documents were finalised. On 30 January 2023 there was a further online meeting to answer the questions on the questionnaire to be filled in by those who want to propose an innovation in this first call.

7.0 ROADMAP FOR M18 – M24

7.1 CS activity planning

Each case study has its own objectives, which are related to the local and regional environment. Therefore, although all CS contribute to activities in WP2 – WP5 and WP7, each CS has its own individual planning. In the reporting period all CS have, in collaboration with WP2, started up their activities concerning co-creating with stakeholders in the Living Labs, focussing on developing a common understanding, shared objectives and identifying SDGs pertaining to the challenges and which can be used as the basis for impact assessment (KPIs) as part of Task 6.2. Furthermore, all case studies have selected the models they will use in preparation for the implementation of the innovation packages. They have started data collection and most cases have performed initial modelling work (WP3 and WP4) as part of Task 6.3. The implementation of the innovation packages (Task 6.4) will commence in M25.

The CSs are required to provide a workplan every six months (see section 7.2). Below we present the plans for the coming period (M18 – M24). This period will see the continuation of the activities already initiated in connection Tasks 6.2 and 6.3 related to WP2, WP3 and WP4. It will also see the publication of the first open innovation tenders (WP5) and the start-up of the activities in connection with WP7. A general overview of the activities and their planning is shown in Table 7-1. An overview of the action per case study for the period M18-M24 is provided below.

Table 7-1: Gantt chart with main actions and activities performed as part of WP7.

Roadmap for implementation of actions at the CS	M4	M8	M12	M18	M24	M30	M36	M42	M48
Task 6.1 Development and Monitoring of a roadmap of actions in all case studies									
Internal regular meetings for each CS									
Development of initial roadmap									
Updating and monitoring of the implementation roadmap									
Task 6.2 Implementation of the system innovation approach									
Long list of stakeholders									
Stakeholder engagement activities									
Visualisation requirements defined									
Implementation of virtual reality environment									
Definition of Case Study specific KPIs									
Task 6.3 Resilience Framework implementation in each Case Study									
Climate projections and scenarios decided									
Data types and needs defined									
Conceptual graph of modelling requirements									
Modelling implementations for each Case Study									
Pathways to resilience defined									
Task 6.4 Innovation packages development and validation in each case study									
Innovation packages defined and selected									
Implementation of innovation packages									
Validation of the innovation packages									
Task 6.5 Lessons Learned-Evidence based recommendations									
Synthesise experiences from T6.2, T6.3 and T6.4									

7.1.1 CS1 activity planning

Stakeholder engagement, communication, dissemination and open tender for innovation activities

- Athens Educational Network, starting on April 2023 (UTH, ELIAMEP, UOA);
- 2nd Youth Assembly, 20-21/04/2023, Athens, Greece (ELIAMEP);
- Citizen engagement activities, 20-21/05/2023 attached to World Biodiversity Day, Athens, Greece (UTH, all);
- 3rd WS of Athens LL: 16/06/2023, face-to-face, Athens, Greece (UTH & ADDMA);
- DOMA Summer School, 3-14/07/2023, Athens, Greece (ADDMA & UTH);
- Design and implementation of choice experiments and virtual reality environment creation;
- Open Call for Tenders (innovators) (in M25-M48).

Activities connection to resilience framework implementation

- Governance analysis (November 2023) (on site visit of WP2 representatives);
- Urban heat island complex network analysis (fed by climatic model, green infrastructure, building height, road network, traffic, traffic composition and blue infrastructure, fauna monitoring);
- Air quality analysis;
- Noise impact analysis;
- Development of hazard model;
- Identification and assessment of vulnerabilities;
- Establishment of Citizen Observatory;
- Data incorporation into Data Hub;
- Data integration into Dashboard;
- Application of resilience framework;
- Involvement into the creation of pathways of funding requirements and development of portfolios of potential sources.

7.1.2 CS2 activity planning

Stakeholder engagement, communication, dissemination and open tender for innovation activities

- Finalise the set of KPIs for the Global Indicator Framework;
- Initiate discussions in relation to Tasks 7.3 and 2.6. Port of Piraeus is decided to be a frontrunner (together with CS1) for the implementation of the VR experiments;
- Process the outputs of the 2nd National LLs, and plan the implementation of the Transboundary LL to validate results;
- Start the preparations for the 3rd National Living Lab;
- Explore synergies with CSIC and the use of MINKA application to CS2 activities.
- Initiate discussions with WP5 in relation to the second round of the Open Calls.

Activities connection to resilience framework implementation

- Start Collecting the required datasets;

- Starts with the implementation of the Hybrid Reporting Tool (Task 7.4) in CS2 as a frontrunner.

7.1.3 CS3 activity planning

Stakeholder engagement, communication, dissemination and open tender for innovation activities

- Disseminate and advertise 1st call of innovations; Suitable local multipliers of the call have been detected;
- Investigate and establish synergies with other HORIZON-EUROPE calls with a focus on the same case study region (Main) or neighbouring regions. One possible project to mention here is the Project RETOUCH Nexus (M19 – M48);
- Presentation of CS3-Main River related activities at the international conference EGU 2023 (23rd – 28th April 2023);
- Evaluation and selection of possible application for the 1st open tender;
- WP2 governance analysis with local stakeholders;
- Preparation of and contribution to the WP2 Governance Analysis conducted by Université de Tours (Task 2.3);
- 3rd Workshop in the Living Lab (M20/M21);
- Develop topics for the 2nd open call of tenders based on the stakeholder feedback from the 3rd Living Lab workshop and discussions beyond the workshops.

Activities connection to resilience framework implementation

- Development of frameworks for the analysis of low flow conditions.
- Further hydrological modelling for the Main River Basin extending the climate related impacts by including multiple land use and land management scenarios under current and future climate conditions.
- Hydrological modelling of the inflows into the Main River Basin to analyse water availability under current and future climate conditions. Water availability in the southern parts of Bavaria determine the water security of the Main River Basin (I.e., water diversion from the Danube to the Main catchment).
- Analysis of water availability and changes to its patterns in the Main River Catchments and adjacent catchments.

7.1.4 CS4 activity planning

Stakeholder engagement, communication and dissemination activities

- Preparation for 3rd living lab workshops;
- Evaluation and Selection of possible applications for the 1st open tender (Albania);
- Develop topics for the open tenders for innovation for the North Macedonia and Greece case areas. Partners are considering 2nd or 3rd Call. Strategies under consideration: individual yet complementary topics or a common innovation deployment.

Activities connection to resilience framework implementation

- Complete Water balance of the two lakes under the two climate scenarios;
- Mathematical model completed, input data sets included, first runs launched and results analysed;
- Contribution to Tasks 7.1 to 7.4 Financial issues and financing instruments/ Business models.

7.1.5 CS5 activity planning

Stakeholder engagement, communication and dissemination activities

- 3rd Session of the LL, tentative date 21st June 2023;
- Evaluation and selection of possible application for the 1st open tender.

Activities connection to resilience framework implementation

- Final validation of the numerical model for Sea Level Rise;
- Quality crops index literature review initial validation;
- Characterizing groundwater recharge for El Hierro Island;
- Aquifer Model calibration of the island of La Palma from historical groundwater data;
- Field data analysis (density and electrical conductivity) and model implementation for El Hierro and La Palma Islands;
- Development of numerical models of variable density groundwater flow for both islands.

7.1.6 CS6 activity planning

Stakeholder engagement, communication and dissemination activities

- Preparations for 3rd Session of the LL.

Activities connection to resilience framework implementation

Ropotamo River Complex

- Field studies in full water period;
- Field studies in maximum drought period;
- Develop the integrated GIS application in which to input gathered data.

Danube Delta

On salted soils:

- Real environment 2nd trial (using the plants that gave best results in the lab). Monitoring the plants growth and soil quality.

On biofiltration:

- Interpreting the data form sequencing – 1st scientific paper;
- Continuing the study of symbiotic relation between bacteria and roots of aquatic plants (winter / spring, spring, summer and autumn seasons);

- DNA extraction and sequencing for every season and work on identifying the bacteria's paths for improving the resilience to climate stress.

South-western Coast of the Black Sea

- continue local network development and co-creation process through living labs;
- continue scheduled cruises for data collection and analysis;
- continue modelling the focus area and its connection to the land;
- continue providing input for risk assessment studies;
- undertake dissemination of the resilience framework to the Working Group for the case study.

Aliakmon River

- Connection of the hydrological model and the optimization algorithm;
- Development of the Digital Twin model.

7.1.7 CS7 activity planning

Stakeholder engagement, communication and dissemination activities

- LL workshop no. 3 will be prepared, planned, and carried out in Esbjerg; this will happen either in June 2023 or August 2023
- A dedicated modelling workshop focused on sea level and coastal flood risk modelling for CS7 partners will be organized

Activities connection to resilience framework implementation

- The planned new DCAM features will be implemented and tested, including:
    - An agricultural sector model based on statistical data collected from Danish agricultural organizations, estimating the losses to agricultural yields as a consequence of fields being flooded. It will be tested and used in the resilience assessment.
    - An industrial sector model estimating the losses to productivity as a consequence of flooding will be completed and tested.
- Novel estimates of storm surge heights for current and future climates and the associated uncertainties at Esbjerg will be piloted using the novel data-driven approach (i.e., based on modified tree-based machine learning) under development in WP3 (task 3.3). This methodology will subsequently be ported to and tested in CS8 and optionally CS5.
- A decision will be made on which additional numerical models or empirical-statistical methodologies will be used for estimating the following under current and future climates:
    - Inundation depth due to different kinds of flooding
    - Groundwater levels
    - Impacts on nature
- Further data will be collected in line with the planned CS7/WP3 modelling activities.

7.1.8 CS8 activity planning

Stakeholder engagement, communication and dissemination activities

- Preparation for the 3rd Session of the LL;
- Develop the conceptual model for the ARSINOE Serious Game.

Activities connection to resilience framework implementation

- Further development of the ARSINOE Multi-System Dynamic Modelling Framework;
- Further development of the Visualisation Dashboard for Codesigning Solutions/ Scenarios for Digital Twin;
- Develop the concept models for Two Digital Twins (Torbay case study + 1 case study to be selected);
- Develop the concept model for the risk-based early warning system.

7.1.9 CS9 activity planning

Stakeholder engagement, communication and dissemination activities

- Film on durum wheat short chain
- Living Lab - third workshop
- Upstream and downstream meetings

Activities connection to resilience framework implementation

- Genotype selection
- Phenotyping
- Harvest
- Lab analyses
- Data gathering - weather, soil, crop
- Populating server: climate-field data
- Data pre-processing for modelling activities and experimental fields monitoring

7.2 Monitoring plan

The monitoring plan will be carried out by the WP6 leader (KWR). At the moment, the plan consists of some regular actions, but also includes some periodic actions. It can be detailed or modified according to potential needs and/or risks that may occur for specific actions and/or Case Studies, which may need closer monitoring and attention, or even remedial actions. It will also be revised for the next version of this deliverable.

Table 7-2: Monitoring of activities at the Case Studies.

Monitoring activity	Frequency	Action	Comments
Internal CS team meetings	Weekly	All the CS have organised their own internal meetings, hosted by the main partner for each CS. These take place regularly	Summary of these meetings is reported in the plenary weekly meeting
Plenary meeting for all the CS and representatives from all other WPs	Weekly	Regular reporting of CS activities/Guidance and coordination Monitoring of the action plan	Minutes kept online, updated all the time
Periodic longer meetings with each CS	Quarterly	WP6 leaders meet with each CS separately for longer discussions, together with the leader of Task 6.3	Specific issues to be discussed and if necessary, reported back to the STC
Risk assessment	Every 6 months	Carried out by the Risk Officer with information provided by the WP6 Leader	Reporting to the STC
KPI monitoring	Every 6 months	Carried out by each CS, with guidance from Task 6.2	Each CS reports to T6.2 and to the WP6 leader Any issues are to be discussed at the STC

8.0 DISCUSSION AND CONCLUSIONS

During the reporting period the focus has been on the execution of the Systems Innovation Approach (Task 6.2) and on preparations for the modelling activities and data collection and initial modelling and data collection activities themselves (Task 6.3). The main achievements from the reporting period are the following:

System innovation approach

Starting with the identification of relevant stakeholder by the partners involved in each Case Study, co-creation activities regarding the SIA implementation were undertaken. Each case study organised a living lab, and the international case studies (CS2, CS4, CS6) set up additional regional living labs alongside an overarching transboundary living lab. For the living labs a selection of stakeholders were invited from the long lists stemming from a structured mapping. In the first living lab, the key challenges specific for each case study, sectors concerned and stakeholders involved (and possible missing stakeholders not at the table) were defined using a mental mapping process. In a second living lab workshop the guiding principles derived from the first workshop were validated and these were then used to determine the Sustainable Development Goals relevant for the case study. Also, for each case stdy a collective vision statement was defined. At the time of reporting all case studies have organised their first and second national living lab workshops and CS4 has also organised its second transboundary living lab. The transboundary living labs for CS2 (1st) and CS6 (2nd) are being prepared. The SIA implementation work as part of task 6.2 is on track.

Modelling and data collection

In the ARSINOE case studies, stakeholders from diverse backgrounds and disciplines are brought together to co-design an accepted vision of the future. The objective of this task is to enable project partners from diverse disciplines to converge on a unified view, before implementing resilience modelling and assessment frameworks using multi-disciplinary modelling methods. To define the context and map out all relevant aspects, each case study developed a conceptual model of the types of technical/modelling activities that they envisage for their CS. These form the basis for all modelling activities. Alongside the conceptual model definition, the case studies selected climate projection models and scenarios that can be used horizontally across all case studies, as well as the time frame for these selections for the risk assessments. The outcome was reported in Deliverable 3.4.

The Modelling Work Package (WP 3) of ARSINOE aims to further cross-disciplinary research in hybrid simulation and hybrid modelling by developing the Dynamic Multi-Sectoral Resilience Modelling and Assessment Framework, which will allow for the project partners from diverse application domains to converge at a unified view of the multi-disciplinary modelling methods. The various resolutions and disciplines required for the modelling, including supporting activities to connect the modelling work to the stakeholders and their environment are brought together in a framework referred to as the resilience wheel. The operationalisation of this framework will be performed in each case study. To gain experience, CS1 and CS8 act as frontrunners in this implementation. The first preparations have taken place and were reported. The models to be used by all case studies have been selected, and have been reported in D3.4, and a few additional models have been identified in the meantime and have been added to the updated overview included in this deliverable.

Finally, all case studies have performed the preparing activities for their case specific data acquisition and modelling actions. Available datasets have been identified, and their specifics are described to support a common data management strategy. Where data needs to be acquired from the field, the necessary tools have been developed (e.g. the MINKA citizen science application) and the first monitoring campaigns have been started. Most cases have initiated first modelling studies, which will be further calibrated and validated in the coming reporting period. The case studies are on track in the preparations for the development of the innovation packages in their local conditions.

Open Tender for Innovation

A number of Open Tenders for Innovations will be organised as a means to identify promising or mature innovations to be included in ARSINOE's Portfolio of Innovations. The process is undertaken in three phases: i) stocktaking for the identification of relevant solutions well adapted to each local context, ii) preparation and publication of the Open Tenders, and iii) the evaluation and selection of the solutions to be supported. A first workshop to assess the priorities and capacities of the case studies was organised and preparation of the first round of the open tender was started. Input was obtained from the living labs as well as bilateral meetings between the case studies and the partners in WP5 responsible preparation and support of the open tender. Three case studies decided they were ready to participate in the first round of the open tender, and all documents for publication were prepared. Publication of the open call was scheduled for Q1 in 2023. At the time of reporting, the publication was still pending due to legal and administrative issues on the side of the local partners, which took longer than expected to clarify. This is mainly due to the fact that the organisations responsible for awarding the contracts were not familiar with this type of funding scheme, and appropriate preparations were needed and are now in operation.

Coordination and monitoring

Weekly teleconferences for WP6 in which progress and issues from all case studies and actions related to the other work packages are discussed have been continued (see Section 2.1 for details). These meetings are a constant fixture in the ARSINOE execution and allows close monitoring of progress, provides a persistent building block for the mutual exchange and helps to solve any issues that might occur. It also provides all case studies insight into the activities in their fellow case studies in ARSINOE and support the community building within the project consortium.

All the CS have continued their own internal meetings, hosted by the main partner for each CS. These take place regularly (mostly every week). Minutes and details about them are reported in the plenary weekly WP6 teleconferences.

In the coming reporting period will continue to execute the work described herein, in particular the preparations for the 3rd living lab workshops, the modelling work and the data collection. This in preparation for the development and implementation of the innovation package, which is scheduled to start in M25.

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ANNEX A: Modelling needs for all the Case Studies

(reproduced from MS22)

Case Study#1: Athens Metropolitan Area

Table 1.1 Climatic Model

<table>
<tr><td colspan="2">Case study no.: CS1</td><td colspan="3">Sub-unit (if applicable): Athens Metropolitan Area</td></tr>
<tr><td colspan="5">Model name: climatic model</td></tr>
<tr><td colspan="5">Description: (please provide a short technical description of the model/planned modelling)
N/A</td></tr>
<tr><td colspan="5">Documentation: Varotsos et al. 2022 accepted in Climate Dynamics</td></tr>
<tr><td colspan="3">Area coverage: whole Attica region</td><td colspan="2">Time coverage: 1981-2100</td></tr>
<tr><td colspan="5">Reference/calibration data: 1x1km gridded observational dataset for Attica</td></tr>
<tr><td colspan="2">Model input parameter(s):</td><td colspan="2">Source:</td><td>Resolution:</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td></td></tr>
<tr><td colspan="5">How are the input data bias corrected and/or pre-processed? (or leave blank)
-Construct a daily high resolution (1kmx1km) gridded dataset (for the period 1981-2000) based on observations for temperatures (Tmax, Tmin, rel. Humidity) for Attica
-Statistically downscaled climate change projections (1x1km) using the bias-correction and disaggregation framework as used in Varotsos et al. (2022)
- In case that time series data is introduced in the Knowledge Graph, filtering options can be applied during the data population (e.g., outliers removal).</td></tr>
<tr><td colspan="5">Will the model be updated/improved during ARSINOE? (if yes, please explain how)</td></tr>
<tr><td colspan="5">Modelling dependencies: (does the model depend on other simulations or data collected?)
No</td></tr>
<tr><td>Climate scenarios currently used[1]:</td><td colspan="4">CMIP5: RCP2.6 - RCP4.5 - RCP8.5</td></tr>
<tr><td>Source (s) of future climate projections:</td><td colspan="4">Regional climate models: CORDEX X
Global climate models: CMIP5
Selected climate models – Model ensembles</td></tr>
<tr><td>Reference period:</td><td colspan="4">1981-2000</td></tr>
<tr><td>Future time periods:</td><td>2031-2050
2081-2100</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Extremes/ impacts considered by the model: (if any)</td><td></td><td>Urban heat islands</td><td>Heatwaves</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>(please add)</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Output parameter(s):</td><td colspan="2">Resolution:</td></tr>
<tr><td colspan="3">Daily data of minimum/maximum temperature, relative humidity</td><td colspan="2">1km</td></tr>
<tr><td colspan="3">Daily humidex (compound index of temperature and rel. humidity) values</td><td colspan="2">1km</td></tr>
<tr><td colspan="3">Derived indices (e.g. number of days per year with maximum temperature >35C, number of days per year with humidex >38C)</td><td colspan="2">1km</td></tr>
<tr><td colspan="5">Analysis objectives:</td></tr>
</table>

-identify regions affected by urban heat island and quantify its evolution under different climate change scenarios *-identify hot spots of extreme temperatures under current and future climate conditions* *-quantify human discomfort and its evolution under climate change*		
Modelling timeline:		
-M12: 1x1km daily gridded observational data for max and min temperature and rel. humidity for the period 1981-2000 -M20: statistical downscaling of Regional Climate Model (RCM) data -M22: calculation of climatic indices/quantification of human discomfort/identification of hot spots of extreme temperatures -M24: identification of regions affected by UHI and quantification of its evolution under different climate change scenarios		
Could your model easily be adapted to another CS?	**Y / N**	In theory Y but a dense network of meteorological stations with long time series is needed and the post processing of the data is time consuming

Table 1.2 Citizens' Accessibility to Green Urban Areas

Case study no.: *CS1*	**Sub-unit (if applicable):** *Athens Metropolitan Area (AMA)*	
Model name: *Citizens' Accessibility to Green Urban Areas (15-minutes city concept)*		
Description: *The model aims at measuring how conveniently located green urban areas are for the citizens of AMA. The model calculates the surface area of green urban areas within a walking distance of 15 minutes and the number of citizens with no access to green urban areas. In this way, the proximity of green urban areas for AMA will be assessed along with the percentage of people living in AMA with no accessibility to green urban areas.* *The spatial analysis is performed using ESRI ArcGIS tool, including the toolbox Network Analyst, and scripted using Python language and the ArcPy library for ArcGIS.* *The workflow includes the following steps:* *- definition of green urban areas in AMA: based on the highest-resolution available datasets the model selects public green areas, such as gardens, parks, and suburban natural areas, but also small patches of urban green* *- proximity of green urban areas: the model determines green urban areas within a 15-minutes distance performing a network analysis in ArcGIS* *- estimation of the population with accessible or not green urban areas in AMA: the model estimates the total residential population of AMA at a 15-minutes walking distance from a green urban area and the population with no proximity to green urban areas.*		
Documentation: *PAFI Maria, SIRAGUSA Alice, FERRI Stefano, HALKIA Matina; Measuring the Accessibility of Urban Green Areas. A comparison of the Green ESM with other datasets in four European cities; EUR 28068 EN; doi:10.2788/279663* *POELMAN Hugo; A walk to the park? Assessing access to green areas in Europe's cities; WP 01/2016* *POELMAN Hugo; A short walk to the park? Describing the updated methodology; EC 2018*		
Area coverage: *AMA*	**Time coverage:** *2018 for green urban areas, currently for road network, 2020 for population*	
Reference/calibration data: *N/A*		
Model input parameter(s):	**Source:**	**Resolution:**
Green urban areas	*European Settlement Map (ESM) 2018*	*10m*
Open spaces	*London School of Economics, LSE Cities (tbc)*	*tbc*

<table>
<tr><td colspan="2">Road network</td><td colspan="2">Open Street Map (OSM)</td><td>Polyline (vector dataset)</td></tr>
<tr><td colspan="2">Population</td><td colspan="2">Global Human Settlement Layer Data Package 2022 (GHS-POP R2022A), panorama.statistics.gr</td><td>100m, per municipal unit</td></tr>
<tr><td colspan="2">Social and urban infrastructure: residential density, mobility, inequality, refugees, jobs</td><td colspan="2">London School of Economics, LSE Cities (tbc)</td><td>tbc</td></tr>
<tr><td colspan="5">How are the input data bias corrected and/or pre-processed? (or leave blank)
- creation of a Geodatabase with green urban areas dataset
- definition of AMA boundaries
- overlapping the datasets with AMA
- creation of a new road network dataset from OSM within AMA boundaries
- creation of the network dataset (ESRI Network Analyst) to define which areas are accessible within 15 minutes walking distance
- zonal statistics between the network and the population dataset.</td></tr>
<tr><td colspan="5">Will the model be updated/improved during ARSINOE? (if yes, please explain how)
The model can be updated/improved if higher spatial resolution and/or more recent datasets and/or other additional layers are available from local authorities or elsewhere. Also, the model will be updated if the latest (2021) census data for population becomes available at the municipality level, within a reasonable timing in the course of the case study implementation.</td></tr>
<tr><td colspan="5">Modelling dependencies: (does the model depend on other simulations or data collected?)
NO</td></tr>
<tr><td>Climate scenarios currently used[1]:</td><td colspan="4">CMIP5: RCP2.6 - RCP4.5 - RCP8.5</td></tr>
<tr><td>Source (s) of future climate projections:</td><td colspan="4">Regional climate models: CORDEX
Global climate models: CMIP5
Selected climate models: Model ensembles</td></tr>
<tr><td>Reference period:</td><td colspan="4">1981-2000</td></tr>
<tr><td>Future time periods:</td><td>2031-2050
2081-2100</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Extremes/ impacts considered by the model: (if any)</td><td></td><td>Urban heat islands</td><td>Heatwaves</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>(please add)</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Output parameter(s):</td><td colspan="2">Resolution:</td></tr>
<tr><td colspan="3">Accessibility of green urban areas</td><td colspan="2">tbd</td></tr>
<tr><td colspan="3">Number of citizens with and without accessibility to green urban areas</td><td colspan="2">tbd</td></tr>
<tr><td colspan="3">Social characteristics in relation to the accessibility to green urban areas</td><td colspan="2">tbd</td></tr>
<tr><td colspan="3">(please add additional lines if necessary)</td><td colspan="2"></td></tr>
<tr><td colspan="5">Analysis objectives:</td></tr>
<tr><td colspan="5">The model provides information about the presence, quantity and availability of green urban areas in AMA, which may be useful for future planning and urban design and strategic priorities regarding the greening of the city. Green urban areas play a key role in climate resilience and sustainability, especially due to the unprecedented expansion of cities. Green urban areas are few and under threat; this model offers an easy-to-conduct analysis to confront with security issues, environmental pollution (temperature, air, noise), climate change impacts, social inequality, and urban poverty and to contribute towards the well-being of citizens and visitors of AMA. Focusing on case of AMA, the identification of green urban areas as well as their accessibility provides the appropriate background and required baseline to propose Nature based Solutions (NbS) to mitigate, among others, the urban heat island effect and heat waves of the city.</td></tr>
</table>

Modelling time line:		
*1. Definition of green urban areas: Report & shapefile [**M18**]* *1.1 preparation of the data* *1.2 definition of the AMA boundaries* *1.3 overlapping datasets with AMA mask* *2. Network analysis: Report & shapefile [**M21**]* *2.1 preparation of the road network* *2.2 intersection of green urban areas with the road network* *2.3 creation of the network dataset* *3. Calculation of the population and social characteristics: Report & shapefile [**M22**]* *3.1 zonal statistic as table (population/results of network analysis)* *4. Final report and integrated ArcGIS ArcMap document of the model [**M24**]*		
Could your model easily be adapted to another CS?	**Y / N**	**Y**

Table 1.3 Connectivity of Protected Areas

Case study no.: *CS1*	**Sub-unit (if applicable):** *Athens Metropolitan Area (AMA)*	
Model name: *Connectivity of Protected Areas*		
Description: *The model aims at measuring the connectivity of protected areas in AMA. The model is a GIS-based toolbox, named GuidosToolbox (Graphical User Interface for the Description of image Objects and their Shapes - GTB) with a wide variety of generic raster image processing routines, including related free software such as GDAL (to process geospatial data and to export them as raster image overlays in Google Earth), and FWTools (pre/post-process and visualize any raster or vector data). The GuidosToolbox Workbench (GWB) contains the most popular image analysis modules set up as command-line-only scripts for automated mass-processing on Linux 64bit servers.* *The model is performed using ESRI ArcGIS tool.* *The workflow includes the following steps:* *- definition of protected areas in AMA: overlapping the Natura 2000 network with AMA boundaries the protected areas are geographically identified, along with the most valuable species and habitats according to the 1979 Birds Directive and the 1992 Habitats Directive* *- spatial pattern analysis of protected areas in AMA: the model estimates isolated small fragments, core areas, connecting pathways among the protected areas of AMA.*		
Documentation: *https://forest.jrc.ec.europa.eu/en/activities/lpa/gtb/* *Lin, J., Huang, C., Wen, Y., & Liu, X. (2021). An assessment framework for improving protected areas based on morphological spatial pattern analysis and graph-based indicators. Ecological Indicators, 130, 108138. https://doi.org/10.1016/j.ecolind.2021.108138* *Ferrari, B., Quatrini, V., Barbati, A., Corona, P., Masini, E., & Russo, D. (2019). Conservation and enhancement of the green infrastructure as a nature-based solution for Rome's sustainable development. Urban Ecosystems, 22(5), 865-878. https://doi.org/10.1007/s11252-019-00868-4*		
Area coverage: *AMA*	**Time coverage:** *2021 for Natura 2000 network, 2017-2018 for Corine Land Cover (CLC)*	
Reference/calibration data: *N/A*		
Model input parameter(s):	**Source:**	**Resolution:**
Protected areas	*Natura 2000 network*	*Minimum mapping unit (MMU): 0.5 ha*
Land uses	*Corine Land Cover (CLC)*	*Minimum mapping unit (MMU): 25 ha*
How are the input data bias corrected and/or pre-processed? *(or leave blank)*		

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*				
Modelling dependencies: *(does the model depend on other simulations or data collected?)* *NO*				
Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 - RCP4.5 - RCP8.5			
Source (s) of future climate projections:	Regional climate models: CORDEX Global climate models: CMIP5 Selected climate models: Model ensembles			
Reference period:	*1981-2000*			
Future time periods:	*2031-2050* *2081-2100*			
Extremes/ impacts considered by the model: *(if any)*		Urban heat islands	Heatwaves	Biodiversity loss
(please add)				
Output parameter(s):			**Resolution:**	
Landscape fragmentation of AMA			*tbd*	
Analysis objectives:				
The model provides information about the distribution but also the connectivity of protected areas –crucial for the urban biodiversity of AMA, since a coherent network protected areas can ensure gene flow, species migration and flow, and ecosystem services provision. This information will be important in the selection of intervention areas and types, along with other models (climatic models, land cover, land uses, air quality models, trees-Citizen Science model, and complex network analysis for UHI model description) to perform Nature based Solutions(NbS).				
Modelling time line:				
*1. Identification of protected areas, species and habitats in AMA: Report & shapefile [**M20**]* *1.1 preparation of the data* *1.2 definition of the AMA boundaries* *1.3 overlapping datasets with AMA mask* *2. Morphological Spatial Pattern Analysis (MSPA): Report & shapefile [**M22**]* *2.1 preparation of the land uses (CLC) for AMA* *2.2 intersection of CLC with the Natura 2000 network* *2.3 connectivity of protected areas in AMA* *3. Final report and integrated ArcGIS ArcMap document of the model [**M24**]*				
Could your model easily be adapted to another CS?			**Y / N**	**Y**

Table 1.4 Air Quality Model

Case study no.: *CS1*	**Sub-unit (if applicable):** *Athens Metropolitan Area (AMA)*
Model name: *EPISODE-CityChem (v1.5)*	
Description: *A Chemistry Transport Model to enable chemistry/transport simulations of reactive pollutants on the city scale. EPISODE is a Eulerian dispersion model developed at the Norwegian Institute for Air Research (NILU) appropriate for air quality studies at high-resolution (up to 100m x 100m). The CityChem extension, developed at Helmholtz-Zentrum Geesthacht (HZG) is designed for treating complex atmospheric chemistry in urban areas and improved representation of the near-field dispersion.*	
Documentation: *Hamer, P.D.; Walker, S.-E.; Sousa-Santos, G.; Vogt, M.; Vo-Thanh, D.; Lopez-Aparicio, S.; Ramacher, M.O.P.; Karl, M. The urban dispersion model EPISODE. Part 1: A Eulerian and subgrid-scale air quality model and its application in Nordic winter conditions. Geosci. Model Dev. Discuss. 2019, 13, 1–57.*	

Karl, M.; Walker, S.-E.; Solberg, S.; Ramacher, M.O.P. The Eulerian urban dispersion model EPISODE—Part 2: Extensions to the source dispersion and photochemistry for EPISODE–CityChem v1.2 and its application to the city of Hamburg. Geosci. Model Dev. 2019, 12, 3357–3399. *Ramacher, M.O.P.; Kakouri, A.; Speyer, O.; Feldner, J.; Karl, M.; Timmermans, R.; Denier van der Gon, H.; Kuenen, J.; Gerasopoulos, E.; Athanasopoulou, E. The UrbEm hybrid method to derive high-resolution emissions for city-scale air quality modeling. Atmosphere 12, 1404 (2021)* *Gratsea, M.; Athanasopoulou, E.; Kakouri, A.; Richter, A.; Seyler, A.; Gerasopoulos, E. Five Years of Spatially Resolved Ground-Based MAX-DOAS Measurements of Nitrogen Dioxide in the Urban Area of Athens: Synergies with In Situ Measurements and Model Simulations. Atmosphere 2021, 12, 1634. https://doi.org/10.3390/atmos12121634*				
Area coverage: *Athens Metropolitan Area*			**Time coverage:** *tbd*	
Reference/calibration data: *In situ data from air pollution observations by the National Monitoring Network, the Thissio Supersite and the PANACEA sensors' network will be used to systematically evaluate model predictions*				
Model input parameter(s):		**Source:**		**Resolution:**
Initial and boundary air pollution conditions (surface and atmospheric input)		*Copernicus/CAMS*		*10km x 10km, Surface, 50m, 250m, 500m, 1000m, 2000m, 3000m, 5000m, hourly*
Anthropogenic emissions		*Copernicus/CAMS after spatial disaggregation*		*7km x 7km spatially disaggregated to 1 by 1km^2, surface, yearly which is temporally distributed on an hourly basis*
Meteorological (and land) parameters		*WRF simulations*		*1 by 1km^2*
How are the input data bias corrected and/or pre-processed? *(or leave blank)*				
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* Yes, details to be defined along the first stages of implementation and according to needs.				
Modelling dependencies: *(does the model depend on other simulations or data collected?)* *Yes, see above (inputs)*				
Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 - RCP4.5 - RCP8.5 *CMIP6:* SSP3-7.0 - SSP5-8.5			
Source (s) of future climate projections:				
Reference period:	*2019*			
Future time periods:				
Extremes/ impacts considered by the model: *(if any)*	Air pollution			
Output parameter(s):			**Resolution:**	
NO_2, NO, CO, O_3, SO_2, $PM_{2.5}$, PM_{10}, VOCs, etc			*hourly, 1km and 100m*	
Analysis objectives:				
The model will be used in the Athens Metropolitan Area to provide: • *Present air pollution conditions* • *Identification of hotspot/intervention areas* • *Impact assessment of simulated mitigation/adaptation scenarios on urban air pollution*				
Modelling time line:				
1. *Model setup details for the particularities of CS1 [**M18**]* 2. *Reference date runs of the model and outputs assessment (i.e., spatial, temporal analysis, etc) [**M22**]*				

3. *Scenario/intervention based dedicated runs [**M24, tbd**]*		
Could your model easily be adapted to another CS?	**Y / N**	**N** *(replicable, too time/computing demanding)*

Table 1.5 Trees through Citizen Science

Case study no.: *CS1*	**Sub-unit (if applicable):** *Athens Metropolitan Area*
Model name: Trees- Citizen Science	
Description: *MINKA (https://minka-sdg.org/) Is a citizen observatory were citizens are able to upload biodiversity observations. In the ARSINOE context, citizens from Athens will upload geolocated pictures of urban trees, which will be identified at species level when possible. The MINKA API allows to download the dataset and analyze the data.* *During the ARSINOE project a historic dataset from Athens government with information about urban trees will be uploaded to MINKA. In a second phase, a BioBlitz will be organized where students form Athens will take pictures of urban trees in Athens. In a second phase, the historic and recent data about urban trees in Athens will be analyzed and compared.*	
Documentation: *MINKA python library to extract data.* *Data processing with visual programming using MECODA.*	
Area coverage: *(e.g. Main river catchment …): Green areas*	**Time coverage:** *2013-2025*
Reference/calibration data: data created by mobile mapping (portable mapping from a mobile vehicle equipped with a range of GNSS, photographic, radar, laser, LiDAR or other remote sensing systems)	

Model input parameter(s):	Source:	Resolution:
date	*Mobile mapping*	geolocated
picture	Mobile mapping	geolocated
geometry	Mobile mapping	geolocated
species		

How are the input data bias corrected and/or pre-processed? *(or leave blank)* Data from different datasets has to be unified in one dataset. Species names have to be traslated and homogenized to scientific names.
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* The dataset will be uploaded to MINKA observatory to allow further analysis.
Modelling dependencies: *(does the model depend on other simulations or data collected?)* No

Climate scenarios currently used[1]:	we do not use climatic data			
Source (s) of future climate projections:	we do not use climatic data			
Reference period:	*2013-2019*			
Future time periods:	*2022-2025*			
Extremes/ impacts considered by the model: *(if any)*	**Droughts**	**Urban heat islands**	**Heatwaves**	
				Storm surges
			Storms	
(please add)				

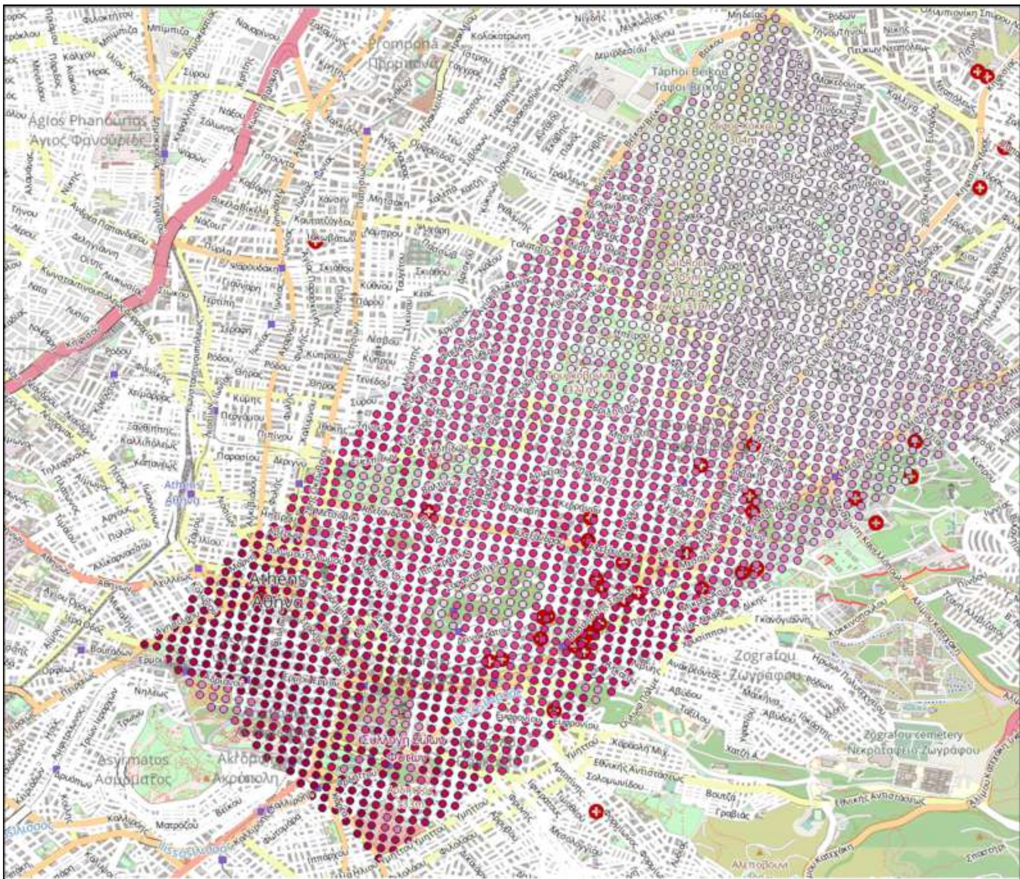
Output parameter(s):	Resolution:
Trees and tree attributes	*coordinates*
Analysis objectives:	

- Identification of most common species in Athens environment *- Localization in map of every tree registered.* *- Evaluation of state of the trees observed.* *- Socio-Economic factors in relation to presence of trees in Athens city.*
Modelling time line:
Starting September 2022: Registered trees uploaded to Minka citizen observatory. *Starting September 2022: Creation of data processing methods: visual programming or python scripts.*

Could your model easily be adapted to another CS?	**Y / N**	Yes

Table 1.6 Urban Heat Island through Complex Network Analysis

Case study no.: *CS1*	**Sub-unit (if applicable):** Athens Metropolitan Area
Model name: Complex Network Analysis for the simulation of the Urban Heat Island effect	
Description: *(please provide a short technical description of the model/planned modelling)* In the context of the present WP, in an effort to detect and quantitatively evaluate the spatial and temporal patterns related to Urban Heat Island (UHI) effect, we are going to analyze time series of temperature, humidity, wind speed as well as the land covers and land uses of a region, using mainly complex network analysis based on time series. The data have been collected from the Copernicus database, for the area of the central region of Athens, point by point in a 100-meter grid. At each point, the temperature, humidity and wind speed have been recorded.	
Documentation: Boccaletti, S., Bianconi, G., Criado, R., Del Genio, C. I., Gómez-Gardenes, J., Romance, M., ... & Zanin, M. (2014). The structure and dynamics of multilayer networks. *Physics reports*, *544*(1), 1-122. Kivelä, M., Arenas, A., Barthelemy, M., Gleeson, J. P., Moreno, Y., & Porter, M. A. (2014). Multilayer networks. *Journal of complex networks*, *2*(3), 203-271. De Domenico, M., Nicosia, V., Arenas, A., & Latora, V. (2015). Structural reducibility of multilayer networks. *Nature communications*, *6*(1), 1-9.	
Area coverage: *Hadrian aqueduct demo site*	**Time coverage:** April to in September of four consecutive years (2014-2017) There are available data from 2008 if needed



Reference/calibration data: average surface temperature data are used for the calibration/training of the model (COPERNICUS).

Model input parameter(s):	**Source**:	**Resolution:**
Daily humidex (compound index of temperature and rel. humidity) values	Modeling outputs (see model 1 description)	Hourly, 1.0 *x* 1.0 km
Daily data of minimum/maximum temperature, relative humidity	Modeling outputs (see model 1 description)	Hourly, 1.0 *x* 1.0 km
wind speed	Copernicus database	Hourly, 1.0 *x* 1.0 km
land uses: Landscape fragmentation including protected areas	Corine Land Cover and Natura 200 network, Model outputs (see model 3 description)	Static, 0.5 *x* 0.5 - 25 *x* 25 ha (tbc)
Green infrastructure	mobile mapping (portable mapping from a mobile vehicle equipped with a range of GNSS, photographic, radar, laser, LiDAR or other remote sensing systems) in 2017 (the trees of the historic centre) and 2019 (the rest of the trees of the Municipality) Department of Urban Geospatial Data Management of the Directorate of	GIS files are coming with images for almost all the trees (around

	Strategic Planning, Resilience, Innovation and Documentation of the Municipality of Athens enhanced by the citizen science model (see model 5 description)	80% of trees have their own image)
Blue infrastructure	Data provided by the Department of Urban Geospatial Data Management of the Directorate of Strategic Planning, Resilience, Innovation and Documentation of the Municipality of Athens regarding fountains that exist within the boundaries of the Municipality of Athens.	GIS files are coming with coordinates for every fountain
Building heights	COPERNICUS	

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
A set of data management functions can be applied, such as filtering, removal of outliers, aggregation/downscaling for time and space for raw data, but also for modeled data to achieve homogenization. Such functionalities may be provided through the data population mechanisms supported by the Data Hub and the Knowledge Graph.

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*
The model will be developed for Arsinoe. Additionally, it will update and improve data resolutions, scales, visualizations etc.

Modelling dependencies: This model depends on models 1, 2, and 5

Climate scenarios currently used[1]**:**	*CMIP5:* RCP2.6 - RCP4.5 - RCP8.5			
Source (s) of future climate projections:	Regional climate models: CORDEX X Global climate models: CMIP5 Selected climate models: Model ensembles			
Reference period:	2014-2017, April to September			
Future time periods:	*2031-2050* *2081-2100*			
Extremes/ impacts considered by the model: *(if any)*	Droughts	**Urban heat islands**	**Heatwaves**	Wild fire
	Floods from rain	River floods	Coastal floods	Storm surges
	Groundwater	Land slides	Storms	Compound events
(please add)	airpolution			

Output parameter(s):	**Resolution:**
Average Surface Temperature	Hourly, 100 *x* 100 m
Difference between Average Surface Temperature at the target location and the peri-urban, which operates as an indicator for the Urban Heat Island effect	Hourly, 100 *x* 100 m

Analysis objectives:

The methodology initially will employ the construction of complex networks based on univariate analysis (use of each variable separately: temperature, humidity, and wind speed). The aim of the analysis is to identify the nodes of the network that correspond to points of increased interaction with other points (hubs); the presence of hubs in a system indicates points of importance in the system under study and could be linked to the UHI effect. Next the relationship of such points with land uses and land covers, as well as their spatial location, will be explored. Since a hub represents a point of strong interaction such points may also be candidate points for natural green

interventions in the frame of the project, since affecting such points a large number of linked points-locations will be affected too. In addition to this approach, using the multilayer network methodology, we will construct networks using simultaneously all variables at each point, in such a way that the relationships and interactions between the individual networks (representing properties) can be explored. This type of analysis can reveal non-linear or complex interactions of the various variables with the temperature as well as their spatial location and land use. This analysis will be applied both to the whole dataset simultaneously, and to individual time series based on their seasonality and periodicity, in order to examine and possibly comment on different results, since the available data have hourly records for a period of six months, from April to in September of four consecutive years. An important aspect to be investigated is the temporal evolution of the complex networks which can provide important information on the seasonal or time-dependent behavior as well or the effect of an external parameter which will lead to further conclusions. At the same time an alternative strategy to identify specific points and behaviors will be used as a complementary approach. We will apply the hierarchical clustering methodology so that time series from different locations will be sorted into clusters and then using these subgroups we will perform more detailed complex network analysis as described above for the specific series in order to identify more fine scaled dynamics/interactions.		
Modelling time line:		
Month 24		
Could your model easily be adapted to another CS?	**Y / N**	Yes if there are available datasets

Table 1.7 Nature based Solutions (NbS) selection and microclimate simulations (WRF)

Case study no.: *CS1*	**Sub-unit (if applicable):** *Athens Metropolitan Area (AMA)*
Model name: *Nature based Solutions (NbS) selection and microclimate simulations (WRF)*	
Description: *The Weather Research and Forecasting (WRF) regional model (Version 4.4), is a numerical weather prediction and atmospheric simulation system, which integrates the Advanced Research WRF (ARW) dynamics solver. WRF incorporates the Noah-Multiparameterization Land Surface Model (Noah-MP LSM) allowing the representation of several physical processes, such as canopy radiative transfer with shading geometry considered, separate treatment of the vegetation canopy based on vegetation element density, distribution and crown radius (vertical and horizontal), leaf reflectance and transmittance properties, surface run-off, soil moisture flux, and more. Noah-MP LSM is coupled with the single-layer urban canopy model UCM. The single layer UCM uses a simplified two-dimensional urban geometry approach considering building height, roof and road width to represent heat fluxes over impervious surfaces and inside the street canyon environment. It includes trapping/reflection of radiation and shadowing effects defined by the street canyon dimensions and orientation. By computing roof, wall and road surface temperatures and their resulting heat fluxes, it is possible to calculate the energy and momentum transfer between an urban environment and the atmosphere. The coupling of the single-layer UCM with the Noah-MP LSM completes the urban surface energy balance by calculating fluxes from the vegetated portion of the urban surface in a given grid cell. Therefore, the WRF-LSM regional modelling system allows for a multi-parameter approach when investigating the urban climate in high resolution applications.* *The WRF model is applied to simulate present climatic conditions by performing, short term and long term, high spatial resolution (< 1km) runs. The aim is to validate the outcomes of all the prerequisite models (1,2,3,4,5) -meaning sites with absence of green urban areas, low urban biodiversity value and air quality, and significant levels of urban thermal stress- with the ultimate goal to identify sites of AMA that require mitigation/adaptation measures to implement NbS. Specific NbS per site of AMA are selected based on existing repositories and relevant platforms (e.g., BISE, ClimateScan, ClimateADAPT, DRMKC, Natural Hazards — Nature-based Solutions, Nature-based Solutions Initiative platform, Naturvation Urban Nature Atlas, NWRM, OPPLA, ThinkNature, weADAPT,*	

Connecting Nature, Global Program on Nature-based Solutions for Climate Resilience) and/or proposal of new interventions, if needed according to local characteristics, environmental status and current climatic conditions. Next, the potential impact of selected NbS on the city's microclimate, such as the enhancement of green and blue infrastructures, is investigated by simulating different land use scenarios. Model runs need accurate and updated land use, vegetation and soil type input data. Predefined datasets of Moderate Resolution Imaging Spectroradiometer (MODIS) with 21 land use classes and 16 soil categories are generally used by the WRF preprocessor (WPS). At the same time, numerical simulations can also be supplemented by high-resolution soil, vegetation and urban land use data, derived from satellite image analysis, national urban databases and land cover databases. The future microclimate simulations will contribute towards testing the effectiveness of NbS, thus concluding on the most suitable NbS to be implemented in each site to improve climate resilience in AMA.		
Documentation: *Dandou, A., Papangelis, G., Kontos, T., Santamouris, M., Tombrou, M., 2021. On the cooling potential of urban heating mitigation technologies in a coastal temperate city. Landscape and Urban Planning 212, 104106. https://doi.org/10.1016/j.landurbplan.2021.104106* *Niu, G.-Y., Yang, Z.-L., Mitchell, K. E., Chen, F., Ek., M. B., Barlage, M., … Xia. (2011). The community Noah land surface model with multiparameterization options (Noah- MP): 1. Model description and evaluation with local-scale measurements. Journal of Geophysical Research, 116, D12109.* *Papangelis, G., Tombrou, M., Dandou, A., Kontos, T., 2012. An urban "green planning" approach utilizing the Weather Research and Forecasting (WRF) modeling system. A case study of Athens, Greece. Landscape and Urban Planning 105, 174–183. https://doi.org/10.1016/j.landurbplan.2011.12.014* *Skamarock, W. C., Klemp, J. B., Dudhia, J., Gill, D. O., Liu, Z., Berner, J., … Huang, X. -yu. (2021). A Description of the Advanced Research WRF Model Version 4.3 (No. NCAR/TN-556+STR). doi:10.5065/1dfh-6p97* *Tewari, M., Chen, F., Kusaka, H., and Miao, S., 2007. Coupled WRF/Unified Noah/Urban-Canopy Modeling System. http://www.ral.ucar.edu/research/land/technology/urban/WRF-LSMUrban.pdf.*		
Area coverage: *AMA*	**Time coverage:** *Present climate*	
Reference/calibration data: *1 x 1km gridded observational dataset for Attica*		
Model input parameter(s):	**Source:**	**Resolution:**
Initial and boundary conditions (surface and atmospheric input)	*ERA5* *GCM/RCM data (CMIP6, CORDEX)*	*31 x 31km, 137 vert.lvls (up to 80km), hourly* *Defined by the downscaling methodology that will be applied*
Static input (topography, land use, soils)	*MODIS, USGS*	*>= 1km*
Accessible green areas	*Outputs of model 2*	*tbd*
Landscape fragmentation	*Outputs of model 3*	*tbd*
Areas of low air quality	*Outputs of model 4*	*tbd*
Trees distribution	*Outputs of model 5*	*tbd*
Areas of thermal stress and UHI effect	*Outputs of model 6*	*tbd*
How are the input data bias corrected and/or pre-processed? *(or leave blank)*		
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* *During project -runtime, the model will be modified to provide an improved representation of:* • *Land use, vegetation and soil types derived from satellite image analysis, national urban databases and land cover databases (e.g., CORINE, Satellite imagery)* • *Urban land use categories (single layer UCM model input) will be added to represent the Athens Metropolitan Area in greater detail.*		
Modelling dependencies: *(does the model depend on other simulations or data collected?)* *The model will take advantage of all the prerequisite model outputs, thus it depends on data outputs of models 1, 2, 3, 4, 5, 6 of the CS1.*		

High resolution data of urban morphology and land cover will also be an important model input (satellite image analysis, national urban databases and land cover databases).				
Climate scenarios currently used[1]**:**	*CMIP5:* RCP2.6 ☐ - RCP4.5 X - RCP6.0 ☐ - RCP8.5 X *CMIP6:* SSP1-1.9 ☐ - SSP1-2.6 X - SSP4-3.4 ☐ - SSP5-3.4 ☐ - SSP2-4.5 ☐ - SSP4-6.0 ☐ - SSP3-7.0 X - SSP5-8.5 X			
Source (s) of future climate projections:				
Reference period:	*present*			
Future time periods:				
Extremes/ impacts considered by the model: *(if any)*	*UHI*	*Min/max temperatures*	*Heatwaves*	
	Land cover change	*Urban biodiversity*	*Air quality*	
Output parameter(s):			**Resolution:**	
air temperature, precipitation, relative humidity, surface temperature, soil moisture, PBL height, etc.			hourly, < 1km	
Analysis objectives:				
The model will be used in the Athens Metropolitan Area to provide: • *Present and future urban climate conditions* • *Identification of areas characterized by urban thermal stress* • *Indication of mitigation/adaptation strategies (e.g., land use scenarios) to be configured and simulated* • *Impact assessment of simulated mitigation/adaptation scenarios on urban microclimate.*				
Modelling time line:				
*1. Validation of the current environmental status of AMA: Report & shapefile [**M24**]* *1.1 short term high resolution runs of present climatic conditions* *1.2 long term high resolution runs of present climatic conditions* *2. Identification of sites for implementing NbS: Report & shapefile [**M26**]* *2.3 collection of all prerequisite models' outputs and homogenization of datasets* *2.4 comparison and validation of AMA sites that require mitigation/adaptation measures* *3. Identification of potential NbS for AMA sites: Report [**M28**]* *3.1 Detection of the local environmental characteristics of each site* *3.2 Selection of potential NbS* *4. Various microclimate simulations: Report & shapefile [M30]* *4.1 Urban land use scenarios and comparison with present climatic conditions* *4.2 Selection of urban mitigation scenarios as effective NbS* *5. Final report with the selected NbS [**M30**]*				
Could your model easily be adapted to another CS?			**Y / N**	**N** *(replicable, too time/computing demanding)*

Case Study#2: Mediterranean ports

Table 2.1 ALADIN63

Case study no.: *CS2*	**Sub-unit (if applicable):** Valencia and Piraeus/Limassol if data available
Model name: ALADIN63	
Description: *(please provide a short technical description of the model/planned modelling)* CNRM (Centre national de Recherches Météorologique), France	

http://www.umr-cnrm.fr/spip.php?article125&lang=en The numerical model ALADIN (Aire Limitée Adaptation dynamique Développement InterNational) is a limited area bi-spectral model. Since the beginning of the years 2000s, the ALADIN model is used at CNRM as a Regional Climate Model (RCM) with the name CNRM-ALADIN (or ALADIN-Climat). In the climate model family of CNRM, ALADIN can be seen as the limited area version of the ARPEGE-Climate model with which it shares most of the dynamics and physics or as the hydrostatique version of AROME. The main advantage of RCMs is to limit the numerical cost of simulations with respect to global climate model at the same resolution. Therefore they allow to explore the climate representation at very fine scale. The version 6 of CNRM-ALADIN that is based on cycle 37t1 of ARPEGE-IFS and on the version 6 of the CNRM climate physics that is common to ARPEGE-Climat, CNRM-CM6 or CNRM-ESM2, all global models used in CMIP6. In its simplest version, CNRM-ALADIN represent the atmosphere component of the climate as well as the land surface and its interactions with the atmosphere thanks to the SURFEX-ISBA model.
Documentation: PIANC. (2020) “Climate change adaptation planning for ports and inland waterways”. The World Association for Waterborne Transport Infrastructure. PIANC REPORT N° 178. ISBN 978-2-87223-001-3 Mathiesen, Martin & Goda, Yoshimi & Hawkes, Peter & Mansard, Etienne & Martín, María & Peltier, Eric & Thompson, Edward & Vledder, Gerbrant. (1994). Recommended practice for extreme wave analysis. Journal of Hydraulic Research - J HYDRAUL RES. 32. 803-814. 10.1080/00221689409498691.

Area coverage: *Port of Valencia/Sagunto in the same area. Port of Gandía in a separate one*	**Time coverage:** *1996-2021*

Reference/calibration data: *(if applicable to your model, please indicate what data sets were used to develop/calibrate the model)* Oceanographic parameters: Puertos del Estado has developed and maintains systems for measuring and forecasting the marine environment with the fundamental objective of providing the Spanish Port System with the ocean-meteorological data essential for its design and operation, thus reducing costs and increasing the efficiency, sustainability and safety of port operations. The system consists of measurement networks (buoys, tide gauges and high-frequency radars), prediction services (waves, sea level, currents and water temperature) and climate sets, which describe both the current maritime climate and scenarios of change in the 21st century. Atmospheric parameters: AEMET (State Meteorological Aagency) manages conventional surface observation stations (data from Manises is taken for developing the models) as well as many others for solar radiation, ozone content and background pollution. There are also images from meteorological satellites, different precipitation observation products from the radar network and storm activity from the lightning detection network. In addition, unique atmospheric phenomena (extraordinary and/or rare) collected in the SINOBAS Notification System, such as tornadoes, waterspouts, hailstorms of a certain size, blowouts, etc., can also be viewed.

Model input parameter(s):	Source:	Resolution:
(e.g. temperature, precipitation, wind, radiation)	*(e.g. CMIP5/CORDEX)*	*(e.g. daily, 12 x 12 km)*
Precipitation	AEMET	daily
Wind	AEMET	daily
Humidity	AEMET	daily
Wind surface	AEMET	daily
Wave	Puertos del Estado	daily
Sea level	Puertos del Estado	daily

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*

No				
Modelling dependencies: *(does the model depend on other simulations or data collected?)*				
Climate scenarios currently used[1]**:**	*CMIP5:* RCP2.6 ð - RCP4.5 ð - RCP6.0 ð - RCP8.5 ð - *other*: *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð - *other*:			
Source (s) of future climate projections:	Regional climate models: CORDEX ð – Nationally provided ð - *other:* Global climate models: CMIP5 ð – CMIP6 ð – *other*: CNRM-CERFACS-CNRM-CM5 Selected climate models ð – Model ensembles ð - *other*:			
Reference period:	*1996-2021*			
Future time periods:	*2040-2060*	2080-2100		
Extremes/ impacts considered by the model: *(if any)*	Extreme temperatures	Fog	Heatwaves	Rainfall
	Storm surges			
(please add)				
Output parameter(s):			**Resolution:**	
(e.g. water quantity, water flows, economic damage cost …			*(e.g. 3h, 12 x 12 km)*	
(please add additional lines if necessary)				
Analysis objectives:				
(please provide a short description of the planned analyses that will be carried out with this model within your case study and/or Living Lab)				
Modelling time line:				
(please outline the expected time line for the planned modelling with "modelling milestones") Results for the atmospheric models are available. Still pending of oceanographic climate variables forecast, which is expected to be finished before the end of the year.				
Could your model easily be adapted to another CS?			**Y / N**	

Table 2.2 DMI-HIRHAMS

Case study no.: *CS2*	**Sub-unit (if applicable):** Valencia and Piraeus/Limassol if data available
Model name: DMI-HIRHAM5	
Description: *(please provide a short technical description of the model/planned modelling)* DMI (Danish Meteorological Institute), Denmark https://www.dmi.dk/fileadmin/Rapporter/TR/tr06-17.pdf HIRHAM is a regional atmospheric climate model (RCM) based on a subset of the HIRLAM (Undén et al, 2002) and ECHAM models (Roeckner et al, 2003), combining the dynamics of the former model with the physical parameterization schemes of the latter. The HIRLAM model - High Resolution Limited Area Model - is a numerical short-range weather forecasting system developed by the international HIRLAM Programme (http://hirlam.org) and is used for routine weather forecasting at a number of meteorological institutes, i.e. DMI (Denmark), FMI	

(Finland), IMS (Iceland), KNMI (The Netherlands), met.no (Norway), INM (Spain), and SMHI (Sweden). The ECHAM global climate model (GCM) is a general atmospheric circulation model developed at the Max Planck Institute of Meteorology (MPI) in collaboration with external partners. The original HIRHAM model was collaboration between DMI, the Royal Netherlands Meteorological Institute (KNMI) and MPI.	
Documentation: PIANC. (2020) "Climate change adaptation planning for ports and inland waterways". The World Association for Waterborne Transport Infrastructure. PIANC REPORT N° 178. ISBN 978-2-87223-001-3 Mathiesen, Martin & Goda, Yoshimi & Hawkes, Peter & Mansard, Etienne & Martín, María & Peltier, Eric & Thompson, Edward & Vledder, Gerbrant. (1994). Recommended practice for extreme wave analysis. Journal of Hydraulic Research - J HYDRAUL RES. 32. 803-814. 10.1080/00221689409498691.	
Area coverage: *Port of Valencia/Sagunto in the same area. Port of Gandía in a separate one*	**Time coverage:** *1996-2021*
Reference/calibration data: *(if applicable to your model, please indicate what data sets were used to develop/calibrate the model)* Oceanographic parameters: Puertos del Estado has developed and maintains systems for measuring and forecasting the marine environment with the fundamental objective of providing the Spanish Port System with the ocean-meteorological data essential for its design and operation, thus reducing costs and increasing the efficiency, sustainability and safety of port operations. The system consists of measurement networks (buoys, tide gauges and high-frequency radars), prediction services (waves, sea level, currents and water temperature) and climate sets, which describe both the current maritime climate and scenarios of change in the 21st century. Atmospheric parameters: AEMET (State Meteorological Aagency) manages conventional surface observation stations (data from Manises is taken for developing the models) as well as many others for solar radiation, ozone content and background pollution. There are also images from meteorological satellites, different precipitation observation products from the radar network and storm activity from the lightning detection network. In addition, unique atmospheric phenomena (extraordinary and/or rare) collected in the SINOBAS Notification System, such as tornadoes, waterspouts, hailstorms of a certain size, blowouts, etc., can also be viewed.	

Model input parameter(s):	Source:	Resolution:
(e.g. temperature, precipitation, wind, radiation)	*(e.g. CMIP5/CORDEX)*	*(e.g. daily, 12 x 12 km)*
Precipitation	AEMET	daily
Wind	AEMET	daily
Humidity	AEMET	daily
Wind surface	AEMET	daily
Wave	Puertos del Estado	daily
Sea level	Puertos del Estado	daily

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* No
Modelling dependencies: *(does the model depend on other simulations or data collected?)*

Climate scenarios currently used[1]**:**	*CMIP5:* RCP2.6 ð - RCP4.5 ð - RCP6.0 ð - RCP8.5 ð - *other*: *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð - *other*:			
Source (s) of future climate projections:	Regional climate models: CORDEX ð – Nationally provided ð - *other:* Global climate models: CMIP5 ð – CMIP6 ð – *other*: MOHC-HadGEM2-ES Selected climate models ð – Model ensembles ð - *other*:			
Reference period:	*1996-2021*			
Future time periods:	*2040-2060*	2080-2100		
Extremes/ impacts considered by the model: *(if any)*	Extreme temperatures	Fog	Heatwaves	Rainfall
	Storm surges			
(please add)				

Output parameter(s):	**Resolution:**
(e.g. water quantity, water flows, economic damage cost …	*(e.g. 3h, 12 x 12 km)*
(please add additional lines if necessary)	

Analysis objectives:		
(please provide a short description of the planned analyses that will be carried out with this model within your case study and/or Living Lab)		
Modelling time line:		
(please outline the expected time line for the planned modelling with "modelling milestones") Results for the atmospheric models are available. Still pending of oceanographic climate variables forecast, which is expected to be finished before the end of the year.		
Could your model easily be adapted to another CS?	**Y / N**	

Table 2.3 SMHI-RCA4

Case study no.: *CS2*	**Sub-unit (if applicable):** Valencia and Piraeus/Limassol if data available
Model name: SMHI-RCA4	
Description: *(please provide a short technical description of the model/planned modelling)* Rossby Centre regional atmospheric model, SMHI (Sveriges Meteorologiska och Hydrologiska Institut), Sweden https://www.smhi.se/en/research/research-departments/climate-research-at-the-rossby-centre/rossby-centre-regional-atmospheric-model-rca4-1.16562	
Documentation: PIANC. (2020) "Climate change adaptation planning for ports and inland waterways". The World Association for Waterborne Transport Infrastructure. PIANC REPORT N° 178. ISBN 978-2-87223-001-3 Mathiesen, Martin & Goda, Yoshimi & Hawkes, Peter & Mansard, Etienne & Martín, María & Peltier, Eric & Thompson, Edward & Vledder, Gerbrant. (1994). Recommended practice for extreme wave analysis. Journal of Hydraulic Research - J HYDRAUL RES. 32. 803-814. 10.1080/00221689409498691.	
Area coverage: *Port of Valencia/Sagunto in the same area. Port of Gandía in a separate one*	**Time coverage:** *1996-2021*

Reference/calibration data: *(if applicable to your model, please indicate what data sets were used to develop/calibrate the model)*

Oceanographic parameters: Puertos del Estado has developed and maintains systems for measuring and forecasting the marine environment with the fundamental objective of providing the Spanish Port System with the ocean-meteorological data essential for its design and operation, thus reducing costs and increasing the efficiency, sustainability and safety of port operations. The system consists of measurement networks (buoys, tide gauges and high-frequency radars), prediction services (waves, sea level, currents and water temperature) and climate sets, which describe both the current maritime climate and scenarios of change in the 21st century.

Atmospheric parameters: AEMET (State Meteorological Aagency) manages conventional surface observation stations (data from Manises is taken for developing the models) as well as many others for solar radiation, ozone content and background pollution. There are also images from meteorological satellites, different precipitation observation products from the radar network and storm activity from the lightning detection network. In addition, unique atmospheric phenomena (extraordinary and/or rare) collected in the SINOBAS Notification System, such as tornadoes, waterspouts, hailstorms of a certain size, blowouts, etc., can also be viewed.

Model input parameter(s):	Source:	Resolution:
(e.g. temperature, precipitation, wind, radiation)	*(e.g. CMIP5/CORDEX)*	*(e.g. daily, 12 x 12 km)*
Precipitation	AEMET	daily
Wind	AEMET	daily
Humidity	AEMET	daily
Wind surface	AEMET	daily
Wave	Puertos del Estado	daily
Sea level	Puertos del Estado	daily

How are the input data bias corrected and/or pre-processed? *(or leave blank)*

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*

No

Modelling dependencies: *(does the model depend on other simulations or data collected?)*

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - RCP4.5 ð - RCP6.0 ð - RCP8.5 ð - *other*: *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð - *other*:			
Source (s) of future climate projections:	Regional climate models: CORDEX ð – Nationally provided ð - *other:* Global climate models: CMIP5 ð – CMIP6 ð – *other*: IPSL-IPSL-CM5A-MR Selected climate models ð – Model ensembles ð - *other*:			
Reference period:	*1996-2021*			
Future time periods:	*2040-2060*	2080-2100		
Extremes/ impacts considered by the model: *(if any)*	Extreme temperatures	Fog	Heatwaves	Rainfall
	Storm surges			
(please add)				
Output parameter(s):			**Resolution:**	

(e.g. water quantity, water flows, economic damage cost …	*(e.g. 3h, 12 x 12 km)*	
(please add additional lines if necessary)		
Analysis objectives:		
(please provide a short description of the planned analyses that will be carried out with this model within your case study and/or Living Lab)		
Modelling time line:		
(please outline the expected time line for the planned modelling with "modelling milestones") Results for the atmospheric models are available. Still pending of oceanographic climate variables forecast, which is expected to be finished before the end of the year.		
Could your model easily be adapted to another CS?	**Y / N**	

Case Study#3: Main river

Table 3.1 WaSiM (Water Flow and Balance Simulation Model)

Case study no.: *CS3 (Main)*	**Sub-unit (if applicable):**
Model name: WaSiM (**Wa**ter Flow and Balance **Si**mulation **M**odel)	
Description: WaSiM is a deterministic spatially distributed hydrological catchment model to simulate the water cycle above and below the land surface. The model can be used in various spatial and temporal scales. It is able to model hydrologic processes for basins with sizes of <1 km² up to more than 100,000 km². Detailed simulations for locations are also possible (e.g. habitats). The temporal resolution of the model ranges from minutes to several days. WaSiM can be used for both short-term (floods) and long-term simulations (long-term water balance simulations). Depending on the general availability of data and the hydrological problem to be solved, WaSiM allows a selection from several algorithms for the simulation of a specific process. The minimum data requirements for the model are time series of precipitation and temperature, as well as raster data for topography, land use and soil properties. WaSiM uses physically based modelling approaches appropriate for the selected space and time scales. Wherever possible, model components with difficult to estimate parameters are avoided. Thus, a relatively fast and robust transferability of the model to other areas is made sure. The spatial differentiation is realized in WaSiM by the division of the area into a grid using widely used ASCII formats. Thus, an optimal data exchange with many other models and software packages is ensured. Also, input data can be adjusted quickly and with little loss to the desired model resolution. WaSiM is available for Windows and Linux or Unix systems. It is available for 32-bit and 64-bit versions of these operating systems and there are versions that take advantage of multi-core processors as well as of super computers by utilizing as much processors as are provided by using OpenMP and/or MPI technology.	
Documentation: Schulla, J. (2021): Model Description WaSiM (Vers. 10.06.00, June 2021). Technical Report, pp. 396. http://wasim.ch/downloads/doku/wasim/wasim_2021_en.pdf Poschlod, B.; Willkofer, F.; Ludwig, R. (2020) Impact of Climate Change on the Hydrological Regimes in Bavaria. *Water*, *12*, 1599. https://doi.org/10.3390/w12061599 Willkofer, F.; Wood, R.R.; von Trentini, F.; Weismüller, J.; Poschlod, B.; Ludwig, R. (2020) A Holistic Modelling Approach for the Estimation of Return Levels of Peak Flows in Bavaria. *Water*, *12*, 2349. https://doi.org/10.3390/w12092349	

Brunner, M.I., Swain, L. Wood, R.R., Willkofer, F., Done, J.M., Gilleland, E. and R. Ludwig (2021) An extremeness threshold determines the regional response of floods to changes in rainfall extremes. *Communications Earth & Environment*, Vol. 2, 173, https://doi.org/10.1038/s43247-021-00248-x	
Area coverage: Main river basin (~25.000 km^2)	**Time coverage:** *1950-2100*

Reference/calibration data:
Calibration of the model is typically done against a (large) number of stream flow gauges. Multi-criteria cal/val strategies exist for selected cases. For the Main river, (global) calibration is done using the Dynamically-dimensioned search – simulated annealing (DDS-SA) approach.

Model input parameter(s):	Source:	Resolution:
Meteorological forcing (Temperature, Precipitation, Radiation, rel. Humidity, Wind)	Reference data (interpolated station observations) GCM/RCM data (CMIP6, CORDEX, ClimEx-SMILE, reanalyses)	>= 1 hour >= 50m; typically 500m; statistically downscaled from climate model grids
Static/dynamic information on topography, land use, soils	Mostly European (e.g. CORINE, ESDB)/national/regional surveys and data catalogues; parameterization from literature & field experiments	Static, periodic updates
Information on water management structures (e.g. reservoirs)	Bavarian Environmental Agency, Regional Water Authorities, (private companies)	Static, periodic updates

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
In cases of hydrological impact analyses, information from the climate models is bias-corrected at the RCM grid scale against interpolated reference (observational) data using a univariate Quantile-Mapping approach. This procedure is currently revised/replaced with the Multivariate Quantile Mapping Bias Correction Method (MBCn; Cannon et al. 2018) to better account for consistency in the correction of multiple variables, particularly in the correction of precipitation and temperature.
Bias-adjusted climate data is then statistically downscaled to the resolution of the hydrological model (typically 500m) to account for topographic landscape features.

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*
During project-runtime, the model will be updated to provide an improved representation of:

- water management structures (e.g. transfer, reservoirs)
- spatially-explicit irrigation patterns and volumes
- dynamical land use / land cover changes and management
- groundwater dynamics

Modelling dependencies: *(does the model depend on other simulations or data collected?)*
See above

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - RCP4.5 X - RCP6.0 ð - RCP8.5 X *CMIP6:* SSP1-1.9 ð - SSP1-2.6 X - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 X - SSP5-8.5 X			
Source (s) of future climate projections:	Regional climate models: CORDEX X – Nationally provided X - *other:* self-provided SMILE (ClimEx) Global climate models: CMIP5 X – CMIP6 X Selected climate models X – Model ensembles X			
Reference period:	*Typically 1980 – 2009 (eventually transitioning to 1991-2020)*			
Future time periods:	Typically transient runs	2041-2060 (2041-2070)	2081-2100 (2071-2100)	
Extremes / impacts considered by the model: *(if any)*	droughts (hydrol.)	extreme precipitation	heatwaves	snow-/ glacial melt
	pluvial floods / flash floods	river floods	soil moisture / groundwater recharge	**Compound events**
	irrigation	water transfer		

Output parameter(s):	Resolution:	
Stream discharge	up to 1h time series for (selected) gauges	
Precipitation, temperature, radiation, humidity, wind	up to 1h, 500m	
Evapotranspiration, soil moisture, groundwater recharge, snow storage/melt, direct runoff, interflow, …	typically 3h, 500m	
(please add additional lines if necessary)		
Analysis objectives:		
The model will be used in the Main river basin to provide: • *changes in the course, magnitude and seasonality of water balance terms* • *flood dynamics and relevant indicators (changing likelihoods of occurrence)* • *drought dynamics and relevant indicators (changing likelihood of occurrence)* • *extreme event impact assessment and analysis to build novel hydroclimatic indicators and services* • *assessments of compound events and cascading impacts (rain on snow, extreme precipitation on saturated soils, heat and drought, etc.)* • *impact assessment of new adaptation strategies (altered land use, agricultural practices, water withdrawal (irrigation, transfer), etc.)*		
Modelling time line:		
M18 - Specific model adjustments for the Main application *M24 – Definition, refinement and production of hydro-climatic services (consultation with stakeholders)* *M30 – Update of hydroclimatic services using the new CMIP6-CORDEX data and ClimEx-2 data*		
Could your model easily be adapted to another CS?	**Y / N**	In theory Y, in practice N (too time consuming)

Case Study#4: Ohrid and Prespa Lakes

Table 4.1 IWaMM (Integrated Water Management Model)

Case study no.: *CS4 (Ohrid and Prespa Lakes)*	**Sub-unit (if applicable):**
Model name: IWaMM (Integrated Water Management Model)	
Description: IWaMM Is an integrated water management model across sectors (climate – water –energy – food). It calculates and presents results of simulation of a complex hydro system behaviour under superposed climate and socio – economic scenarios. It integrates hydrological processes, climate changes, and use of water in economic sectors and environmental ecosystems, hydropower generation and agriculture, at a hydrological unit (basin, region) scale. Simulation includes BAU as well as adaptiveness scenarios, applied in form of measures / actions for rationale and effective use of water across sectors, thus ensuring water availability within the analysed time frame. The model can estimate a long term water balance under conditions of climate impacts (affecting both supply and demand side of the system), demographic changes and economic sectors' foreseen growth (agriculture, industry, seasonal sectors as tourism) and energy generation (hydropower), while taking in consideration environmental constrains (water needs and dependence of environmental ecosystems). It integrates hydrological, meteorological, climate changes and socio –economic processes and impacts thereof to water availability and couples multi sectors water use to provide equilibrium and fair water allocation among water users, in long term. The core loop is the mass balance as the governing equitation set for a hydro system that includes a reservoir (natural (lake) or artificial – dam impounded), supply and demand side, as well as losses, optimizing water preservation in terms of providing a long term availability and preventing overflows as well as water deficit. Calculations include water stocks and flows across sectors, in discrete time steps	

(mean monthly), identifying deficits (and time spots of occurrence) that may appear as a result of climate influence or / and sector policy.
The model uses nationally or regionally available data related to climate and economy parameters.
In an additional module, the feasible measures are identified, evaluated and ranked by the multi-criteria assessment (AHP method), using multiple inputs, that enables inclusive approach (in compliance with SIA) of a number of stakeholders, in order for their co –creation and appreciation of their possibly different opinions and come to a consensual priority list of activities for improvement of climate adaptiveness of water use in coupled sectors

Documentation:
Development of an integrated multi criteria numerical model for environmental – economy assessment of complex hydro systems, Funded by Ministry of Environment and Physical Planning of North Macedonia, 2015 - 2016

Area coverage: River basin scale, Prespa watershed (~1.000 km²) and Ohrid (Black Drin) Watershed (~4.000 km²)	**Time coverage:** 1960 – 2100

Reference/calibration data:
Calibration of the model will be done against six stream flow gauges and two meteorological gauges in the watershed.

Model input parameter(s):	Source:	Resolution:
Meteorological forcing (Temperature, Precipitation); Hydrological data (inflows), Climate scenarios	Reference data (interpolated hydrological and meteorological stations measurements) GCM/ data (CORDEX)	1 month 12 km; statistically downscaled from climate model grids
Static information on land use (agriculture) and water use	Regional surveys and studies	Static, periodic updates
Information on water consumption by users (households, agriculture, industry, hydro power)	Municipalities (water management utilities), Power Generation Utilities in North Macedonia, Greece, Albania	Static, periodic updates

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
Information from the climate models will be bias-corrected at the RCM grid scale. Bias-adjusted climate data will be then statistically downscaled to the resolution of the hydrological model ($0,1^{\circ}$ = 12 km). Forecast of mean monthly values of two climate indicators (temperature and precipitations) will be made, for two points, near the locations of the existing meteorological measuring stations.

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*
During project-runtime, the model will be updated to provide an improved representation of:

- Integration of different sets of input data (for both supply and demand side), collected from CS4 partner countries,
- Harmonization of decided RCP scenarios and adjustments of data inputs accordingly,
- Modification of supply and demand patterns and data series (e.g. supply directly from groundwater, return / discharge to lakes, etc.),
- Interpretation of natural hydrogeological connection and interdependences of two separate hydro systems,
- Prioritization of water users, and their requirements (e.g. specific environmental ecosystems)
- Identification of feasible alternatives for climate resilience improvement of water use patterns,
- Transboundary aspect of water management issues

Modelling dependencies: *(does the model depend on other simulations or data collected?)*
See above

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 X - RCP4.5 X - RCP6.0 ð - RCP8.5 X
Source (s) of future climate projections:	Regional climate models: CORDEX X – Nationally provided

Reference period:	*1981 - 2010*			
Future time periods:	2021 - 2100			
Extremes / impacts considered by the model: *(if any)*	droughts (hydrol.)			
	irrigation	Water supply	Hydro power	Ecosystems
Output parameter(s):			**Resolution:**	
Water level in the lakes			Monthly time series of mean values	
Precipitation, temperature, radiation, humidity, wind			up to 1h, 500m 0,11', 12 km	
Evapotranspiration, soil moisture, groundwater recharge, snow storage/melt, direct runoff, interflow, … n/a			1 month , 12 km	
(please add additional lines if necessary) Water consumption per type of consumers			Mean monthly values (million m^3)	
Analysis objectives:				
The model will be used in the Ohrid and Prespa watersheds to provide: • changes in the course, magnitude and seasonality of water balance terms • drought dynamics and relevant indicators • impact assessment of new adaptation strategies (altered land use, agricultural practices, water withdrawal (irrigation, transfer), etc.)				
Modelling time line:				
M12 – Collection and purchase of data needed for modelling completed (hydrology, meteorology, consumption) M18 –Specific model adjustments for the Ohrid and Prespa application – Climate indicators (temperature, precipitation) applied for mean monthly values until 2100, hydrological arrays continued on a mean monthly basis, water consumption and allocation included M24 – Water balance of the two lakes under climate scenarios – Mathematical model completed; First run launched M30 –Improvements of the water consumption, simulation of climate adaptivity alternatives, selection of optimal adaptation strategy, stakeholders engagement and consultations M36 – Second run of the model, tests on improvements; results ready for internal assessment M42 – Refinement and completion M48 – Final report on method applied and results achieved				
Could your model easily be adapted to another CS?			**Y**	In theory Y, in practice N (too time consuming) Possibly methodologically applicable for CS5 (Canary Islands) and CS 9(Sardinia), dealing with water management under water scarcity. However, direct application would require prior modifications

Case Study#5: Canary Islands

Table 5.1 Insular scale groundwater model

Case study no.: *CS5*	**Sub-unit (if applicable):** La Palma and El Hierro islands	
Model name: *GW-EH-LP*		
Description: *Insular scale groundwater models for El Hierro and La Palma islands. We use geological and meteorological models to evaluate water balance in volcanic islands. We use FEFLOW software for numerical modelling of groundwater flow and solute transport. Climate change predictions implemented in the model CMCC-CM with scenarios RCP4.5 and 8.5 in the period 2006-2100.*		
Documentation: *(e.g. reference(s) to academic literature, technical documentation)*		
Area coverage: *Insular scale*		**Time coverage:** *1970-2100*
Reference/calibration data: *groundwater level, EC and Temperature are being monitored in continuous during the project and we use datasets from insular water authorities*		
Model input parameter(s):	**Source:**	**Resolution:**
Maximum temperature	*CMCC-CM*	*daily downscale to weather station scale*
Minimum temperature	*CMCC-CM*	*daily downscale to weather station scale*
Precipitation	*CMCC-CM*	*daily downscale to weather station scale*
Sea level rise	*CMCC-CM*	*daily downscale to weather station scale*
How are the input data bias corrected and/or pre-processed? *(or leave blank)*		
Will the model be updated/improved during ARSINOE? *It is being constructed for the first time*		
Modelling dependencies: *Model depends on pumping rates datasets*		

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - **RCP4.5 X** - RCP6.0 ð - **RCP8.5 x** - *other*: *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð - *other*:			
Source (s) of future climate projections:	Regional climate models: CORDEX ð – Nationally provided ð - *other:* Global climate models: CMIP5 ð – CMIP6 ð – *other*: *CMCC-CM* Selected climate models ð – Model ensembles ð - *other*:			
Reference period:	*1970-2022*			
Future time periods:	*2022-20100*			
	Droughts	Urban heat islands	Heatwaves	Wild fire

Extremes/ impacts considered by the model: *(if any)*	**Floods from rain x**	River floods	**Coastal floods x**	Storm surges
	Groundwater x	Land slides	Storms	Compound events
(please add)				

Output parameter(s):	**Resolution:**
Water production cost (economic damage cost)	*Daily 12 x 12 km*
Water quality production (salt water intrusion)	*Daily 12 x 12 km*
(please add additional lines if necessary)	

Analysis objectives:
Economical models coupled with groundwater system prediction to evaluate the whole system resiliency to climate change
Modelling time line:
2023 Models calibrated with prediction according to RCP4.5 and RCP8.5 scenarios *2024 Models coupled with economical models to predict CC impacts on islands economy highly dependent on fresh groundwater resources. Adaptation measures proposed with MAR and use of unconventional water resources (desalination, etc.).*

Could your model easily be adapted to another CS?	**Not sure**	

Table 5.2 Hydrodynamic Model h2d

Case study no.: 5	**Sub-unit (if applicable):** La Palma and El Hierro islands
Model name: Hydrodynamic Model **h2d**	
Description: *(please provide a short technical description of the model/planned modelling)* The Oceanographic and Coastal Engineering group of the University of Cantabria (GIOC) developed this model to solve the momentum and continuity equations averaged vertically, using bottom friction and tangential wind stress term. The model solves long-wave equations and uses, for this study, the flooding-drying process as input. The planning modeling model starts with the wind forcing as the initial input for sea level simulations. Then, in the h2d model, past and present conditions are simulated to validate the model setup. Once the model has been validated and calibrated, forecast simulations will run to obtain free surface values using the wind projection data as forcing.	
Documentation:	
Area coverage: Port, Airport and plantain crops areas.	**Time coverage:** *(e.g. 1990-2020)* *1959-2014* *2014-2046* *2080-2100*

Reference/calibration data: Tide gauge and meteorological station for each island. Water level change indicators for the European coast from 1977 to 2100 derived from climate projections (Copernicus Climate Change Service.)

Model input parameter(s):	Source:	Resolution:
Wind	ERA 5	0.25° x 0.25°

How are the input data bias corrected and/or pre-processed? *(or leave blank)* For the project, elittoral will validate wind-wave and sea level data from the existing physical tide gauges and the information from the SIMAR points generated by Puertos del Estado.
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* No. We use standard interface
Modelling dependencies: *(does the model depend on other simulations or data collected?)* **No.**

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - **RCP4.5 X**- RCP6.0 ð - **RCP8.5 X** - *other*: *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð - *other*:			
Source (s) of future climate projections:	Regional climate models: CORDEX ð – Nationally provided ð - *other:* Global climate models: CMIP5 ð – **CMIP6 X** – *other*: Selected climate models ð – Model ensembles ð - *other*:			
Reference period:	*1959-2022*			
Future time periods:	*2015-2046* *2080-2100*			
Extremes/ impacts considered by the model: *(if any)*	Droughts	Urban heat islands	Heatwaves	Wild fire
	Floods from rain	River floods	**Coastal floods**	Storm surges
	Groundwater	Land slides	Storms	Compound events
(please add)				

Output parameter(s):	Resolution:
Free surface	Control points over pilot zones

Analysis objectives:
The modeling is part of a dynamic downscaling that allows obtaining a forecast of sea level near the coast and identifying the flooded surfaces in the pilot zones.
Modelling time line:
(please outline the expected time line for the planned modelling with "modelling milestones") **1 sep/22. Methodology design to be used with the numerical model** **1 Nov/22 initial validation of the numerical model** **30 Jul/23 Final validation of the numerical model** **1 Nov/23 Initial results of the numerical modeling for the pilot zones in the La Palma island.** **31 may/ 24 Final results of the numerical model for the pilot zones in the La Palma island.**

Could your model easily be adapted to another CS?	**Y / N**	Yes

Case Study#6: Black Sea

Table 6.1 HEC-HMS

Case study no.: *CS6*

Sub-unit (if applicable):

Model name: A HEC-HMS model for the river Aliakmonas digital twin

Description:
The HEC – HMS is open-source software, designed to simulate the complete hydrologic processes of dendritic watershed systems, freely available by U.S. ARMY Corps of Engineers.
The software includes not only conservative hydrologic analysis procedures such as event infiltration, unit hydrographs, and hydrologic routing but also processes necessary for continuous simulation including evapo-transpiration, snowmelt, and soil moisture accounting. Advanced capabilities are also provided for gridded runoff simulation using the linear quasi-distributed runoff transform (ModClark). Supplemental analysis tools are provided for model optimization, forecasting streamflow, depth-area reduction, assessing model uncertainty, erosion and sediment transport, and water quality.
The software features a fully integrated work environment including a database, data entry utilities, computation engine, and results reporting tools. A graphical user interface enables the user seamless movement between the different parts of the software. Simulation results are stored in HEC-DSS (Data Storage System) and can be used in conjunction with other software for studies of water availability, urban drainage, flow forecasting, future urbanization impact, reservoir spillway design, flood damage reduction, floodplain regulation, and systems operation.

Documentation:
Mike Bartles, Tom Brauer, David Ho, Matt Fleming, Greg Karlovits, Jay Pak, Nick Van, and Josh Willis: Hydrologic Modeling System HEC-HMS User's Manual.

Area coverage: *Specified by user – subbasin of river Aliakmonas.*

Time coverage: *Can include current or projected scenarios.*

Reference/calibration data: *Model calibration is a complex process that requires the determination of many parameters.*

- *Data on electricity production (in hourly time step), as well as data on reservoir capacity, which are available online from the website of the Greek Independent Power Transmission Operator (IPTO), (https://www.admie.gr/en) were used for the calibration of the model, which were inputted after their conversion into hourly flows.*
- *Finally, the calibration and evaluation of the hydrological model was based on the data of the monitoring station which belongs to the Soil and Water Resources Institute (SWRI; Hellenic Agricultural Organization "DEMETER") and it is located near the estuary of Aliakmon River.*

Model input parameter(s):	Source:	Resolution:
Canopy storage	*Corine Land Cover and the high-resolution layers obtained from Copernicus*	*Current or projected future, instantaneous.*
Constant rate of initial and constant loss correspond to saturated hydraulic conductivity	ESDAC	*3D Soil Hydraulic database of Europe at 1Km and 250m resolution*
Meteorological data (precipitation, temperature e.t.c)	ERA5 - Land	Native resolution of 9 km
Surface slope - EU-DEM	Copernicus	It is a continuous dataset, divided into raster-type files, each corresponding to an area of 1000x1000 km. Each pixel corresponds to an area of 25x25 m with vertical accuracy: +/- 7 m mean square error.

How are the input data bias corrected and/or pre-processed? *(or leave blank)*

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* During project-runtime, the model will be updated to likely provide an improved representation of: • The model will be connected with streaming meteorological data and energy production recordings. • An optimization algorithm through which one could be able to identify and promote strategic management alternatives for the Agia Varvara reservoir will be used. • A digital twin could be implemented for investigating rational management scenarios regarding the optimal operation of the Agia Varvara reservoir focusing on irrigation planning of the agricultural land in the region, as well as on flood prevention.				
Modelling dependencies: *(does the model depend on other simulations or data collected?)* Meteorological data (present day and/or future scenarios).				
Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - RCP4.5 X - RCP6.0 X - RCP8.5 ð - *other*: *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð - *other*:			
Source (s) of future climate projections:	Regional climate models: CORDEX ð – Nationally provided ð - *other:* Global climate models: CMIP5 X – CMIP6 X – *other*: Selected climate models ð – Model ensembles ð - *other*:			
Reference period:	*2018-2022*			
Future time periods:	*2040-2060*			
Extremes/ impacts considered by the model: *(if any)*				
Output parameter(s):			**Resolution:**	
River discharges			*In hourly time step*	
Analysis objectives:				
A digital twin could be implemented for investigating rational management scenarios regarding the optimal operation of the Agia Varvara reservoir focusing on irrigation planning of the agricultural land in the region, as well as on flood prevention.				
Modelling time line:				
M18: Data Collection *M24: Calibration of the hydraulic simulation model* *M35: Design of the Digital Twin* *M40: Optimization of the Digital Twin* *M45: Publications Submitted*				
Could your model easily be adapted to another CS?			**Y / N**	In theory Y, but it needs the appropriate input data.

Case Study#7: Southern Denmark

Table 7.1 DTUDamageCostModel

Case study no.: *CS7 (Main)*	**Sub-unit (if applicable):**
Model name: DTUDamageCostModel	
Description: The DTUDamageCostModel is a GIS-based tool enabling the calculation of economic damages from coastal floods and is fully open-source and freely available through GITHUB. Its most up-to-date version is available I QGIS and an older version is also available based on ESRI/ARCMAP software. The economic valuation is performed on up to nine sectors as specified by the user and includes currently: Buildings (refurbishment costs), industry, public goods, transport (cost of delays), health, critical infrastructure, ecosystems, recreational values and tourism. The output between sectors vary between monetary values and	

indications of flood or not. Currently, most work has been used to parameterise and validate the buildings sector for Danish cases.
The DTUDamageCostModel includes the option of having the entire net present value analysis chain including, including discount rates and flood levels at various return periods, as well as being able to implement and assess across various adaptation options.
More work is currently ongoing in including other land use types, such as agriculture, as well as flood from pluvial, fluvial and groundwater sources (having alternative damage cost functions), but is limited by lack of data and event cases.
Input data includes flood maps (including flood levels above ground) and land use maps for the sectors that need to be included. The level of detail is therefore fully related to the input data. The computational processing time is short, i.e. in the order of seconds-minutes depending on the data (and computer).

Documentation:
Halsnæs K., Larsen M.A.D., Sunding T.P. and Dømgaard M.L. (in review): Damage-cost modelling of coastal floods: assessing the value of detailed data and advanced flood models as a basis for cost-effective decision-making on climate adaptation. Climate Services.
Halsnæs K., Larsen M.A.D., Dømgaard M.L. and Kaspersen P.S. (2022): Methods and Assumptions in Danish Open-Source Flood Damage Cost Models - DTUDamageEconomics (ArcGIS version) and DamageEconomics (QGIS version). DOI:10.13140/RG.2.2.25260.54408.
Larsen M.A.D., Karamitilios G., Dømgaard M.L. and Halsnæs K. (2021): Data driven climate change adaptation Part B: National and local scale flood modelling as a basis for damage cost assessments. DMI report WP311.

Area coverage: Specified by user – currently most often used at the municipal level in Denmark.	**Time coverage:** Can include current or projected flood maps as well as current or projected land use distributions.

Reference/calibration data:
There is no calibration process in the economic valuation and output, but damage cost functions can be revised by the user depending on assumptions.

Model input parameter(s):	Source:	Resolution:
Flood depth (height above ground)	Dynamical flood modelling or official return period statistics.	Peak levels, instantaneous.
Land use	Typically available at the municipal level for best-possible level of information.	Current or projected future, instantaneous.

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
Flood levels need to be delivered by relevant experts within the field if no return period statistics is available. The latter often includes uncertainty estimates, which can be included to provide an output span.

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*
During project-runtime, the model will be updated to likely provide an improved representation of:

- Additional sectors
- Additional flood sources
- Potentially revised damage cost function reflecting additional land surfaces or damage types (such as forest fire or agricultural losses)

Modelling dependencies: *(does the model depend on other simulations or data collected?)*
Flood maps (present day and/or future scenarios); socioeconomic data for different sectors (if the model is transferred to a different location).

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - RCP4.5 X - RCP6.0 ð - RCP8.5 X *CMIP6:* SSP1-1.9 ð - SSP1-2.6 ð - SSP4-3.4 ð - SSP5-3.4 ð - SSP2-4.5 ð - SSP4-6.0 ð - SSP3-7.0 ð - SSP5-8.5 ð
Source (s) of future climate projections:	The Danish National Climate Atlas (sea-level rise).
Reference period:	*Present-day conditions*

Future time periods:	Mid-century + end-century			
Extremes / impacts considered by the model: *(if any)*	Storm surge floods from the sea	Can relatively easy be extended to include e.g. compound floods from sea+fluvial		
Output parameter(s):			**Resolution:**	
Cross-sectorial damage costs			At the spatial GIS-scale used, current or future level temporally	
Localisation of flooded assests including non-monetary ones.			At the spatial GIS-scale used, current or future level temporally	
Analysis objectives:				
The model will be used for selected Southwestern Danish CS7 cases to calculate cross-sectorial damage costs and cost-benefit-approach adaptation options. It will also feed into the resilience framework.				
Modelling time line:				
M12 – Application instigated *M24 – Updated code implemented* *M36 – Results ready for internal assessment* *M45 – Publications submitted*				
Could your model easily be adapted to another CS?			**Y / N**	Y (but would optimally require updates to damage cost assumptions)

Case Study#8: Torbay and Devon County

Table 8.1 CAFlood

Case study no.: CS8	**Sub-unit (if applicable):** *Torbay area*	
Model name: CAFlood		
Description: *(please provide a short technical description of the model/planned modelling)* CAFlood is a rapid two-dimensional flood model that adopts Cellular Automata and GPU processing to accelerate the simulations of flood propagation on a domain. The model will be applied to analyse flood dynamics in Torbay and Teignbridge, considering the possible current and future climate scenarios and types of flooding (pluvial, fluvial, coastal)		
Documentation: *(e.g. reference(s) to academic literature, technical documentation)*		
Area coverage: *Torquay, Paignton, Brixham*	**Time coverage:** *N/A*	
Reference/calibration data: *All the academic references, the applications and the code are online at: https://engineering.exeter.ac.uk/research/cws/resources/caddies/*		
Model input parameter(s):	**Source:**	**Resolution:**
(e.g. temperature, precipitation, wind, radiation) *LiDAR DEM*	*(e.g. CMIP5/CORDEX)* *Environment Agency* *https://environment.data.gov.uk/DefraDataDownload/?Mode=survey*	*(e.g. daily, 12 x 12 km)* 1m

Precipitation		historical observations Met Office		Hourly
Design rainfall		UKCEH Flood estimation handbook		Hourly
Land cover		Ordnance Survey		vector
UK Climate change allowance		Environment Agency https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances		
Downscaled UK climate projection		*UKCP 18* https://ukclimateprojections-ui.metoffice.gov.uk/ui/home		
How are the input data bias corrected and/or pre-processed? *(or leave blank)*				
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)* The model will be further improved to incorporate real-time observations for flood forecasting and early warning.				
Modelling dependencies: *(does the model depend on other simulations or data collected?)*				
Climate scenarios currently used[1]:	*CMIP5:* RCP2.6, RCP4.5, RCP6.0, RCP8.5 *CMIP6:* SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5			
Source (s) of future climate projections:	Regional climate models: Nationally provided UKCP18 Global climate models: CMIP6 Selected climate models			
Reference period:	*(e.g. 1991-2010)* *1981-2000*			
Future time periods:	*(e.g. 2040-2060)*	2021-2040	2061-2080	
Extremes/ impacts considered by the model: *(if any)*	Droughts	Urban heat islands	Heatwaves	Wild fire
	Floods from rain	River floods	Coastal floods	Storm surges
	Groundwater	Land slides	Storms	Compound events
(please add)				
Output parameter(s):			**Resolution:**	
(e.g. water quantity, water flows, economic damage cost … *Water depth, flood extent, flood duration for the modelled domain*			*(e.g. 3h, 12 x 12 km)* Same to DEM	
Water depth hydrograph at selected locations				
(please add additional lines if necessary)				
Analysis objectives:				
(please provide a short description of the planned analyses that will be carried out with this model within your case study and/or Living Lab)				

Analyse the flood situations for various current and future scenarios, with and without interventions to support the follow-up impact assessment and facilitate the dialogue with stakeholders via Living Lab to codesign solutions *Enable flood forecasting to support emergency response*		
Modelling time line:		
(please outline the expected time line for the planned modelling with "modelling milestones") Jan 2023 flood scenario simulations for present climate baseline Mar 2023 flood scenario simulations for present climate baseline with interventions, and future RCP/SCP scenarios May 2023 flood scenario simulations for future RCP/SCP scenarios with interventions		
Could your model easily be adapted to another CS?	Y	

Table 8.2 SUMO (Simulation of Urban Mobility)

Case study no.: CS8	**Sub-unit (if applicable):**	
Model name: SUMO (Simulation of Urban Mobility)		
Description: *(please provide a short technical description of the model/planned modelling)* SUMO is a freely available Open-Source traffic modelling software package. It allows for the simulation of a variety of vehicle types including but not limited to car, buses, lorries, bicycles, and additionally pedestrians. This software will be used to investigate the impacts/disruption to traffic flows that can occur as a result of pluvial, fluvial and coastal flooding for both current and future climate change scenarios. The effects of flooding will be model in SUMO using tool developed previously in RESCCUE that allows for the use of flood model outputs to dynamically adjust road network parameters such as closing roads or reducing speeds. Vehicles within the network will adapt their behavior either by reducing speed or changing routes depending on flooded condition of the network.		
Documentation: "Microscopic Traffic Simulation using SUMO" ; Pablo Alvarez Lopez, Michael Behrisch, Laura Bieker-Walz, Jakob Erdmann, Yun-Pang Flötteröd, Robert Hilbrich, Leonhard Lücken, Johannes Rummel, Peter Wagner, and Evamarie Wießner. IEEE Intelligent Transportation Systems Conference (ITSC), 2018. (https://ieeexplore.ieee.org/document/8569938) "Investigating the Effects of Pluvial Flooding and Climate Change on Traffic Flows in Barcelona and Bristol"; B. Evans, A. S. Chen, S. Djordjević, J. Webber, A. G. Gómez, J. Stevens. Sustainability, 2020		
Area coverage: Torbay	**Time coverage:** *(e.g. 1990-2020)*	
Reference/calibration data: The Dry Weather (Baseline) traffic model will be calibrated against traffic count data provided by Torbay Council		
Model input parameter(s):	**Source:**	**Resolution:**
Road Network Data	*OpenStreetMap (https://www.openstreetmap.org/)*	~6m (approximate resolution of osm data)
Traffic Count Data	Torbay Council	Hourly
Flood Data	CaFlood Model Outputs	Spatially 1m Temporally "variable"
	(please add additional lines if necessary)	
How are the input data bias corrected and/or pre-processed? *(or leave blank)*		
Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*		

Within the scope of ARSINOE we will look to build upon the behavior of vehicles in response to flooding and re-routing. We will look at expanding the modelled vehicle types to include analysis of emergency response vehicles.				
Modelling dependencies: *(does the model depend on other simulations or data collected?)* Baseline traffic flow data will depend on availability of traffic count data from Torbay. Modelling under flooded conditions will depend upon outputs from CaFlood model.				
Climate scenarios currently used[1]:	*CMIP5:* RCP2.6, RCP4.5, RCP6.0, RCP8.5 *CMIP6:* SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5			
Source (s) of future climate projections:	Regional climate models: Nationally provided UKCP18 Global climate models: CMIP6 Selected climate models			
Reference period:	1981 - 2000			
Future time periods:	*(e.g. 2040-2060)*	2021 - 2040	2061 - 2080	
Extremes/ impacts considered by the model: *(if any)*				
	Floods from rain	River floods	Coastal floods	
(please add)				
Output parameter(s):			**Resolution:**	
Time-Series Graphs showing Traffic Loading in Network/Cross comparison of Traffic Flows under Dry and Flooded Conditions			Minute	
Traffic Congestion Maps			Spatially - Same Resolution as Input Network from OSM data Temporally – Hourly	
Emergency Response Service Zone Maps			Spatially - Same Resolution as Input Network from OSM data Temporally – Hourly	
(please add additional lines if necessary)				
Analysis objectives:				
Analyse the disruptions caused from flooding events from Rainfall, River, and Coastal sources for a range of return periods. Investigate measures that can be applied to mitigate the disruption caused by flooding. Create a framework that can be transferable to other cities to allow them to assess the resilience of their transportation network with respect to flooding.				
Modelling time line:				
(please outline the expected time line for the planned modelling with "modelling milestones") Jan 2023 flood scenario simulations for present climate baseline Mar 2023 flood scenario simulations for present climate baseline with interventions, and future RCP/SCP scenarios May 2023 flood scenario simulations for future RCP/SCP scenarios with interventions				
Could your model easily be adapted to another CS?			**Y**	

Case Study#9: Sardinia

Table 9.1 CERES-Wheat model

Case study no.: *CS9*	**Sub-unit (if applicable):** *Ussana experimental farm*

Model name: *CERES-Wheat model (implemented in DSSAT software)*

Description: *The Decision Support System for Agrotechnology Transfer (DSSAT) (https://dssat.net/about/) (Hoogenboom et al., 2019, 2021; Jones et al., 2003) is a software application program that comprises crop simulation models for over 42 crops (including CERES-Wheat). The crop simulation models simulate growth, development and yield as a function of the soil-plant-atmosphere dynamics. The crop models require daily weather data, soil surface and profile information, and detailed crop management and crop genetic information as input. Simulations are conducted at a daily step, with the calculation of the plant and soil water, nitrogen, phosphorus, and carbon balances, as well as the crop's vegetative and reproductive development stage. DSSAT includes database management programs for soil, weather, crop management and experimental data, utilities, and application programs for seasonal, spatial, sequence and crop rotation analyses that allows users to ask "what if" questions by conducting virtual simulation experiments and to assess the economic risks and environmental impacts associated with irrigation, fertilizer and nutrient management, climate variability, climate change, soil carbon sequestration, and precision management. DSSAT and its crop simulation models have been used for a wide range of applications at different spatial and temporal scales. This includes on-farm and precision management, regional assessments of the impact of climate variability and climate change, gene-based modeling and breeding selection, water use, greenhouse gas emissions, and long-term sustainability through the soil organic carbon and nitrogen balances.*
CERES-Wheat model (Ritchie et al., 1984) is widely applied worldwide to simulate bread and durum wheat crops and is one of the main models included in the AgMIP wheat model intercomparison project (Asseng et al., 2013).

Documentation:
Asseng, S., Ewert, F., Rosenzweig, C., Jones, J.W., Hatfield, J.L., Ruane, A.C., Boote, K.J., Thorburn, P.J., Rotter, R.P., Cammarano, D., Brisson, N., Basso, B., Martre, P., Aggarwal, P.K., Angulo, C., Bertuzzi, P., Biernath, C., Challinor, A.J., Doltra, J., Gayler, S., Goldberg, R., Grant, R., Heng, L., Hooker, J., Hunt, L.A., Ingwersen, J., Izaurralde, R.C., Kersebaum, K.C., Muller, C., Naresh Kumar, S., Nendel, C., O/'Leary, G., Olesen, J.E., Osborne, T.M., Palosuo, T., Priesack, E., Ripoche, D., Semenov, M.A., Shcherbak, I., Steduto, P., Stockle, C., Stratonovitch, P., Streck, T., Supit, I., Tao, F., Travasso, M., Waha, K., Wallach, D., White, J.W., Williams, J.R., Wolf, J., 2013. Uncertainty in simulating wheat yields under climate change. Nature Clim. Change 3, 827-832.
Hoogenboom, G., C.H. Porter, K.J. Boote, V. Shelia, P.W. Wilkens, U. Singh, J.W. White, S. Asseng, J.I. Lizaso, L.P. Moreno, W. Pavan, R. Ogoshi, L.A. Hunt, G.Y. Tsuji, and J.W. Jones. 2019. The DSSAT crop modeling ecosystem. In: p.173-216 [K.J. Boote, editor] Advances in Crop Modeling for a Sustainable Agriculture. Burleigh Dodds Science Publishing, Cambridge, United Kingdom (http://dx.doi.org/10.19103/AS.2019.0061.10)
Hoogenboom, G., C.H. Porter, V. Shelia, K.J. Boote, U. Singh, J.W. White, W. Pavan, F.A.A. Oliveira, L.P. Moreno-Cadena, J.I. Lizaso, S. Asseng, D.N.L. Pequeno, B.A. Kimball, P.D. Alderman, K.R. Thorp, M.R. Jones, S.V. Cuadra, M.S. Vianna, F.J. Villalobos, T.B. Ferreira, W.D. Batchelor, J. Koo, L.A. Hunt, and J.W. Jones. 2021. Decision Support System for Agrotechnology Transfer (DSSAT) Version 4.8 (DSSAT.net). DSSAT Foundation, Gainesville, Florida, USA.
Jones, J.W., G. Hoogenboom, C.H. Porter, K.J. Boote, W.D. Batchelor, L.A. Hunt, P.W. Wilkens, U. Singh, A.J. Gijsman, and J.T. Ritchie. 2003. DSSAT Cropping System Model. European Journal of Agronomy 18:235-265.
Ritchie, J.T., Godwin, D.C., Otter, S., 1984. CERES-Wheat: A user oriented wheat yield model. Preliminary documentation. AGRISTARS Publication No. YM-U3-04442-JSC-18892, East Lansing, Michigan, p. 252.

Area coverage: *field level (Ussana experimental farm)*	**Time coverage:** *(e.g. 1970-2100)*

Reference/calibration data: *model calibration requires observed climate, soil and crop and crop management data from experimental fields located in the case study area. In CS9, we will start from calibrations obtained in previous works (Dettori et al., 2011, 2017; Mereu et al., 2019) and we will update model calibrations for new durum wheat cultivars and considering new experimental data obtained during ARSINOE project to simulate durum wheat in rainfed and irrigated conditions.*

Model input parameter(s):	Source:	Resolution:

Daily data of maximum and minimum temperature, total precipitation, and global solar radiation	Observed data from weather stations Climate data from GCM/RCMs, CMIP6, CORDEX at the finest resolution available or downscaled for Ussana field	daily data Ussana field: 39° 24' 32'' N, 9° 5' 22'' E)
Soil data (texture, pH, soil organic carbon, etc..)	Field analysis	Ussana and Benatzu fields
Crop and management data	Field observations	Ussana and Benatzu fields

How are the input data bias corrected and/or pre-processed? *(or leave blank)*
Soil, climate, crop and crop management data will be carefully checked and pre-processed in the formats required by the DSSAT software.

Will the model be updated/improved during ARSINOE? *(if yes, please explain how)*
In the framework of ARSINOE project, we aim to perform calibrations for new durum wheat cultivars (in addition to the already available calibrated ones) and for wheat grown under irrigation.
Moreover, we aim to update the simulations obtained in previous studies using an ensemble of climate projections (3 climate models, possibly) and the new SSPs climate scenarios (as soon as they will be available). Moreover, different crop managements (changes in crop calendars, cultivars, crop management, etc.) will be modelled under climate change projections in order to explore the effects of potential adaptation strategies to reduce climate change impacts on durum wheat, with a specific focus on irrigation and crop water requirements. The option of extending the analysis to a larger area - or the whole Sardinia - will be evaluated according to the CS9 needs.

Modelling dependencies: *(does the model depend on other simulations or data collected?)*
We depend from WP3 for climate data.

Climate scenarios currently used[1]:	*CMIP5:* RCP2.6 ð - **RCP4.5 ð** - RCP6.0 ð - **RCP8.5 ð** - *other*: A set of simulations of climate change impacts for durum wheat in Sardinia are available and included in the Regional Adaptation Strategy to Climate Change (SRAC) (approved in 2019)(https://delibere.regione.sardegna.it/protected/45525/0/def/ref/DBR45368/), and obtained with RCM COSMO-CLM (8 km of resolution), RCP 4.5 and 8.5. In the framework of ARSINOE we aim to update these simulations using CMIP6 data and an ensemble of climate models. See below in bold our preferred choice: *CMIP6:* SSP1-1.9 ð - **SSP1-2.6 ð** - SSP4-3.4 ð - SSP5-3.4 ð - **SSP2-4.5 ð** - **SSP4-6.0** ð - SSP3-7.0 ð - **SSP5-8.5 ð** - *other*:			
Source (s) of future climate projections:	The available simulations for Sardinia region were performed using nationally provided data, a single RCM and 2 scenarios. For ARSINOE, we aim to perform simulations using an ensemble of regional climate models and the new SSPs scenarios (see in bold below our best options): Regional climate models: **CORDEX ð** – Nationally provided ð - *other:* Global climate models: CMIP5 ð – **CMIP6 ð** – *other*: Selected climate models ð – **Model ensembles ð** - *other*:			
Reference period:	1970-2010			
Future time periods:	2050 (2026-2075)	2080 (2076-2099)		
Extremes/ impacts considered by the model: *(if any)*	Droughts	Urban heat islands	Heatwaves	Wild fire
	Floods from rain	River floods	Coastal floods	Storm surges
	Groundwater	Land slides	Storms	Compound events

(please add)	Effects of persistent high temperatures and drought			
Output parameter(s):			**Resolution:**	
Crop phenology and crop yield			Field level (Ussana and Benatzu sites)	
Water and nutrient balances				
(please add additional lines if necessary)				
Analysis objectives:				
(please provide a short description of the planned analyses that will be carried out with this model within your case study and/or Living Lab) In the framework of CS9, we aim to update the available calibrations of CERES-Wheat model, including new durum wheat cultivars and experimental data in irrigated conditions. CERES-Wheat model will be used to simulate durum wheat performance under rainfed and irrigation both in current and future climate conditions in the experimental sites of Ussana and Benatzu to provide expected anomalies in terms of crop growth and crop production, as well as crop water requirement and nutrient balances. In addition, a selection of alternative options (changes in crop calendars, cultivars, crop management, etc.) will be modelled under climate change projections in order to explore the effects of potential adaptation strategies to reduce climate change impacts on durum wheat in Mediterranean areas. The option of extending the analysis to a larger area - or the whole Sardinia - will be evaluated according to the CS9 needs.				
Modelling time line:				
(please outline the expected time line for the planned modelling with "modelling milestones") Model calibration/validation for new cultivars and irrigated conditions (M30) Simulation of climate change impacts and effects of adaptation strategies on durum wheat productivity (M40)				
Could your model easily be adapted to another CS?			**YES** (if the minimum dataset for model calibration and operation is available)	

ANNEX B: Modelling tools across the Case Studies

(reproduced from MS22)

Name	**ARSINOE cascading impacts and permutable services modelling tool**
Description	Modelling tool aiming at the assessment of direct and cascading impacts of climate-change related hazards and the evaluation of mitigation and recovery strategies at regional level, that include the novel idea of permutation of service nodes
Timing	First version under development
Link to AST steps	UAST steps 2, (3), 4
Easiness to use or adapt	Can be adapted for different regions and hazards with a fair amount of effort
Materials available to support the use	ARSINOE Deliverable 3.1
Comparable existing tools and possible integration or synergies	Similar tools for evaluating cascading impacts of disruptions of various types to infrastructure and communities exist (albeit much to a lesser extent for the latter one), however as the idea of permutation has not been explored and the community impacts are not being taken into account in great detail, possible synergies could be explored.
Added value	The tool provides a fast resilience assessment method (in contrast to more rigorous frameworks) that explores the novel idea of permutation of service nodes.
Contact	ARSINOE (WP3) Mehdi Khoury, M.Khoury@exeter.ac.uk

Name	**ARSINOE-System Dynamics Modelling tool**
Description	System Dynamics is a computer-aided approach for strategy and policy design. The main goal is to help people make better decisions when confronted with complex, dynamic systems, based on analysis and understanding. The approach provides methods and tools to model and analyzes dynamic systems. Model results can be used to communicate essential findings to help everyone understand the system's behavior.
Timing	First SDM for one of the CSs is under development. Others will follow.
Link to AST steps	Step 2 & step 4
Easiness to use or adapt	It can be used by anyone, but needs effort to be customised to another CS's specifications
Materials available to support the use	The models are developed at the Stella Architect environment. There are also other commercial solutions.
Comparable existing tools and possible integration or synergies	Such efforts have been already done in the context of sustainability, resilience, WEF resources management, etc. Some examples can be found in [1], [2], and [3]
Added value	The SDMs will unveil hidden relationships within the complex systems that determine resilience against climate change, they will quantify

	interlinkages, stresses and effects, and will allow for scenario and interventions testing to facilitate decision making.
Contact	ARSINOE- WP3 Chrysi Laspidou, laspidou@gmail.com

Name	**ARSINOE-Traffic Impact Assessment Model**
Description	Flood model outputs will be coupled with the Open-Source Software "Simulation of Urban MObility" (SUMO) via the use of Python scripts developed at the University of Exeter. This will allow for the simulation of potential disruption/impacts to traffic flows within the transportation network.
Timing	The development of the model for Torbay CS is carried out in two primary stages: 1. Develop baseline dry weather traffic flows within the city using traffic count data (where available from local authority. 2. Develop and couple time-series flood model outputs into transportation network and analyse behaviours of vehicles in response to floods
Link to AST steps	
Easiness to use or adapt	The approach outline will be adaptable to other regions
Materials available to support the use	A collection of Python scripts will be developed along with a user guide detailing the steps required for building a model within a different region.
Comparable existing tools and possible integration or synergies	Previous works by Pyatkova et al., 2019 and Evans et al. 2020 have developed means of integrating flood model outputs into micro-scale traffic models. This work will be expanded upon for assessment in ARSINOE with the plan of linking it with other model outputs in relation to defining recovery time and use of permutable nodes.
Added value	Coupling a micro-scale traffic model with flood model data will allow for more comprehensive assessment of flood impacts whereby the disruption of traffic re-routing to avoid flooded areas can be captured. This will emphasise how localised flooding on the road network impact regions outside the flood extent
Contact	ARSINOE WP3 Barry Evans: b.evans@exeter.ac.uk

Name	**ARSINOE-Distributed Hybrid Modelling for Climate Resilience Analysis**
Description	A modelling framework and methodology aiming at integrating and operating multiple individual models synchronously so as to conduct the resilience analysis from the view of systems thinking. The distributed modelling framework and methodology allow effective and simultaneous communications amongst individual models. The core of the modelling is based on a hybrid simulation model that features the combination of system dynamics approach, discrete event simulation approach, and agent-based simulation approach.

Timing	The framework is under development in ARSINOE project (WP3)
Link to AST steps	steps 2, 4
Easiness to use or adapt	Can be adapted for different regions and hazards, featuring an interaction between human-based event simulation and nature-based event simulation
Materials available to support the use	The hybrid modelling is developed through AnyLogic platform
Comparable existing tools and possible integration or synergies	Similar examples of methodology for distributed modelling exist, whilst it is still lack of applications and further development. Moreover, the interaction between human-based event simulation and nature-based event simulation is still absent, which is the core demand of the climate resilience analysis
Added value	The methodology may be extended to the application of Digital Twin approach by integrating real-time data
Contact	ARSINOE (WP3) Prof Nav Mustafee, N.Mustafee@exeter.ac.uk Otto Chen, c.chen2@exeter.ac.uk

Name	**ARSINOE Data Catalogue**
Description	The ARSINOE Data Catalogue will act as the single place of collecting and hosting all datasets, together with their metadata, that will be produced, generated and/or used by the ARSINOE Case Studies. It will offer a User Interface where users can login and upload their datasets, while it will also be available to external users, providing access and filtering capabilities to the public datasets of the project.
Timing	The first release of the catalogue will be done in January 2024
Link to AST steps	
Easiness to use or adapt	The catalogue exploits open-source tools and can be adopted by other projects if needed in order to host their datasets
Materials available to support the use	The catalogue offers a web User Interface, together with a REST web service which support both user and machine to machine access to the information
Comparable existing tools and possible integration or synergies	Similar tools exist in general, but in ARSINOE Data Catalogue a specific metadata schema has been adopted to support the description of different types of datasets for all the different case studies and the option to efficiently filter and identify interesting datasets.
Added value	The Data Catalogue can be used as a guide for other similar projects and regions that develop tools for adaptation to climate change.
Contact	ARSINOE (WP4) Panagiota Koltsida (p.koltsida@athenarc.gr) - Athena Research Center

Name	**ARSINOE Knowledge Graph (SustainGraph)**

Description	SustainGraph is a Knowledge Graph (KG) that considers in a holistic way the tracking of the progress towards the SDG targets and the evolution of indicators at national and regional levels, along with their relationship with specified policies and the implementation of case studies across Europe. SustainGraph is considered as the basis for the systemic representation of knowledge related to the SDGs, enabling the collection and homogeneous representation of data along with their semantics and overcoming data management barriers. One of the main objectives of SustainGraph is to enable the development of participatory modeling and analysis processes (e.g., socio-environmental models), taking advantage of the semantic alignment of the represented terms and the knowledge produced through the analysis of the information that is made available.
Timing	A release of SustainGraph is available (see links in the material). The evolution of SustainGraph with new concepts and new data introduced is an ongoing process.
Link to AST steps	The main relevance is with the 6th step (monitoring and evaluating adaptation)
Easiness to use or adapt	A user-friendly visualisation kit is going to be made available for end users. Advanced usage of the tools requires some expertise on data science concepts.
Materials available to support the use	A detailed description of the SustainGraph is available at [1]. The SustainGraph is made openly available in a GitLab repository at [2].
Comparable existing tools and possible integration or synergies	Up to our knowledge, SustainGraph is the first KG that considers the tracking of the progress towards the achievement of SDGs in national, regional and local level. SustainGraph is going to be interoperable with the ARSINOE Data Catalogue. An integration with open-source modelling tools would be very beneficial.
Added value	Enable interdisciplinary scientists to do participatory socio-environmental systems modelling over qualitative and semantically-aligned data. Monitor and assess progress within the case studies to achieve posed targets based on the tracking of various indicators.
Contact	ARSINOE (WP4) Anastasios Zafeiropoulos (tzafeir@cn.ntua.gr) - Institute of Communication and Computer Systems / National Technical University of Athens

ANNEX C: Minutes of the weekly meetings (M5-M18)

This is an open document noting down the main points out of the weekly meetings (Thursdays) for WP6. The meetings are organised by KWR and Task 6.1. We are recording:

- Progress for each Case Study (CS).
- Any issues.
- Any changes.

FEBRUARY 3, 2022

Special agenda for this meeting

- Introduction 5 min
- Next steps about the conceptual model for each CS and method to work (10 min)-Deadline 15 March
- Next steps about indicators and what needs to be done/method to work (15 min)-Deadline 15 March (in parallel with #2)
- The questionnaire about Data sets (15 min)- Deadline 28 February (because this is necessary for a Deliverable due for March 2022)
- Discussion (15 min)

Purpose: To present in detail the steps and actions for Feb-March 2022 to all the CS.

Material prepared by UTH, ICCS, ATHENA

- No round updating from all the CS took place today.
- UTH (Dimitris Kofinas) presents the board with the conceptual) Explanations provided by Chrysi Laspidou (coordinator)
- SDG indicators- living Excel file. Presentation by Chrysi Laspidou (UTH)
- Questionnaire for Data sets by ATHENA (Panagiota Koltsida). Explanations also by Tasos Zafeiropoulos (ICCS)
- Contact details for the right persons to contact in case of questions are provided.
- Tabs added for the Questionnaire at the "General" folder and each CS folder for the indicators and the Miro board.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		
CS#2: Mediterranean ports	AUEB		
CS#3: Main River (Germany)	LMU	VKU	
CS#4: Prespa-Ohrid Lakes	IECE	NECCA, AKPT	
CS#5: Canary Islands	ULL		

CS#6: Black Sea	AUTH		
CS#7: Southern Denmark	EM	TUD	
CS#8: Torbay and Devon County	UNEXE	TC	
CS#9: Sardinia	AGRIS	UT, LMU	
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	Individual interviews with each CS about stakeholder mapping to be organised with each CS
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Reminder about the meeting in Tours (22-23 March)
WP3	TUD	LMU	Individual meetings with each CS organised by TUD with each CS for modelling needs. At present CS#2, CS#6 and CS#8 remain for an interview in the future.
WP4	UNEXE	ICCS	
WP5	BRC		
WP7	AUEB		
WP8	GAC		

Additional item discussed:

Information requested by REGILIENCE regarding **additional funding**.
Please fill in this table- **Deadline: May 15, 2022**

(the completed table is shown below).

Title	Additional funding related to Green Investments or Climate change adaptation investments Initial estimation (€Mio)	% Co-funding for bankable solutions (if any) (%)	% of increase to funding related to ARSINOE and CIW innovation packages (%)	Comments/additional info/explanations
CS#1: Athens Metropolitan Area	The municipality are in close collaboration with the new Metropolitan Attica Development Agency together with EYDAP (the Athens water company), the ministry of Culture and 7 "aqueduct" municipalities of the Attica region will be submitting to the new structural fund (cohesion fund) period for the fall of 2022 to obtain an ITI (integrated territorial investment). The amount of this investment will be around 60 to 70 million euros. Also, there is an MoU with the Arsht Rockefeller resilience centre and the new Metropolitan Region Development Agency (development agency of the Region). One part of the MoU is that the municipality will provide the data to them. There will be a budget allocated for a team to monitor and assess the project in years to come. The other part of the MoU is that			

	the municipality will provide expertise on heat resilience. A company has been identified (Alchemia Nova) that will develop guidelines for the public spaces, about what materials to use, etc. Arsht Rockefeller centre will provide the funding for Alchemia Nova (about 50,000 euros) and will also provide funding for an architect/urban planner to ensure expertise of climate adaptation and heat resilience (the main focus of the Athens Case Study in ARSINOE). **Please see also Excel File uploaded in the same folder on Teams.**			
CS#2: Mediterranean ports	unknown	unknown	unknown	The results from climatic projection models from the ECCLIPSE project, coordinated by FV (which total budget is 1,045,253€) will be used at ARSINOE in the case of Valencia port
CS#3: Main River (Germany)	unknown	unknown	unknown	Please provide us with some information on why we should disclose this information at a later stage. For the moment the partners wish to keep this information confidential.
CS#4: Prespa-Ohris Lakes	unknown	unknown	unknown	More information at a later stage
CS#5: Canary Islands	Approx. 1.500.000	30%	10%	Santander Green Investment, Bonos Verdes (Iberdrola)
CS#6: Black Sea	US$ 6.4 million	unknown	unknown	In support of the Common Maritime Agenda for the Black Sea (CMA), “Blueing the Black Sea” (BBSEA) GEF Regional Project supported by the World Bank would be aiming at catalysing blue economy investments for the Black Sea. The focus is on reducing pollution in the Black Sea. Within the scope of the project, national consultations took place in all Black Sea riparian countries, incl. the Republic of Moldova. The results from the webinars might be useful for the purposes of our Case Study and ARSINOE in general. (Website information: http://www.bsec-bsvkc.org/Forms/BlueingTheBlackSeaProject)
CS#7: Southern Denmark	Unknown yet	Unknown yet	Unknown yet	Additional funding may happen, but it is too early to define yet.
CS#8: Torbay and Devon County	Unknown	unknown	Unknown	Working in partnership with the Devon FCRIP scheme in Torbay for the assessment of impacts on critical infrastructure and provision of rainfall radar and early flood warning system. This work will feed into the ARSINOE project (funding through Devon FCRIP to Torbay scheme is £500,000).
CS#9: Sardinia	€ 600,000.00	Unknow	Unknown	The additional funding of € 600,000 has been provided for 2021 and 2022 by the Autonomous Region of Sardinia to finance the collaboration between AGRIS and “Lavoro Insieme”. The latter is a no-profit association aiming at developing social agriculture and increase resilience and sustainability of agricultural systems in climate change conditions.

FEBRUARY 10, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Progress on the conceptual model. Weekly meeting ok. Feedback from the City expected (new feedback) for the socio-economic data). Liaison with the Mayor established. Working also on the SDGs. 11 SDGs defined as relevant. Working also on the short list of stakeholders. Organising the “train the trainers” webinars (247 applications received ! 100 to be selected from secondary school teachers) Speakers booked. Handbook also to be prepared. (ELIAMEP working). There will be a 2nd call. Urban heat island as the hotspot for the region. 2 modules to be prepared (urban climatic indicators and heat island mapping) (NOA). First discussion on possible innovators held.
CS#2: Mediterranean ports	AUEB		Internal WP2 meeting took place, initiated the Miro board, working on it. Initialisation of the conceptual model to start next week. Perhaps one conceptual model for all ports, but maybe three separate ones, as long as they have a connection in the end. Probably also 3 LLs. WP2 also agree on letting them some flexibility to be defined later through the mapping.
CS#3: Main River (Germany)	LMU	VKU	Bi-weekly internal meeting took place. Developing the conceptual offline (for the moment). Started to discuss about the indicators. Identified 7 SGDs that are relevant for the CS. Working for the CS description, preparing for the WP2 workshop in March. Meeting next week with a company working on a benchmark survey on water security/water supply in the region (taking into account also CC).
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Meetings with 2 municipalities (Face to face) planned. Started with Miro, but meeting with the other partners needed. Meeting about data among the 3 partners started. Collected data sets. Suggestion for Task 3.1 in WP3/WP4 meeting.
CS#5: Canary Islands	ULL		Last meeting about sea-level rise and which cities will be involved. Miro board started (UTH also present). Also finished the indicators.
CS#6: Black Sea	AUTH		Bi-lateral meetings are being continued with the CS partners to define what each one will do. Meeting with UTH today about Miro. Meeting with WP3 pending.
CS#7: Southern Denmark	EM	TUD	Working with the 4 communities about the usefulness of the LLs. Physical meeting planned for early March. Bi-weekly meetings-next week holiday in Denmark. Discussion with CS#8 on synergies. To be continued. Case twinning discussed.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting also as interview with WP3 and also with CS#7. Synergies explored and agreed. Draft conceptual prepared and in the board (draft).
CS#9: Sardinia	AGRIS	UT, LMU	Meeting for modelling with WP3. Preparing description of the CS area for WP3 and the focus area. Field meetings for the irrigation trials took place-there are issues with drought (CC related). Sensors purchase procedures finalised. Meetings with stakeholders and local government being organised (for Feb 18)
Task 6.2	UT		

Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		1st update on hoe the innovators will be selected (Giannis-UTH updated)
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	Pending meetings with CS#6 and CS#2.
WP4	UNEXE	ICCS	
WP5	BRC		Gerardo Anzaldua (BRC) updated about the questionnaire from WP5 to be distributed to the CS (later today). After the questionnaire there will be individual interviews and a workshop in March. Deadline Feb 17
WP7	AUEB		
WP8	GAC	WE	Help will be needed for the content of the website (Giannis updated). Feedback needed. Update also by GAC. Poster and flyer are also being developed. WP8 activity in preparation for the CS.

Update on the Mykonos Conference (June 5-9). ARSINOE Special session Monday June 6, 2022, Activities to be organised.
Abstracts for end of February. Special session is being planned. Ideas exchanged, also about inviting the sister projects and about showing/paying a serious game. (Mehdi-UNEXE suggested the latter).

FEBRUARY 17, 2022

1. Data from the SDG Excel files from each CS to the GD goals, also for the other projects.
2. Gunnar: Businesses/companies stay with the SDGs, not the GDs

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Last meeting Phoebe (AUEB) discussed the SDGs. Does not translate well with the Green Deal. Additional work linking the SDGs with the GD Goals. This linkage to be mapped later by AUEB. To be developed for 1-2 cases experimentally. If it worked, then we will propose it to the other sister projects. UNSDN data available on city level.
CS#2: Mediterranean ports	AUEB		Meeting took place Working on the conceptual (energy pathways). Working on the SDG indicators ongoing. Scheduling meeting with WP3 for next week. Regular meetings to be turned to weekly (from 2-weeks)
CS#3: Main River (Germany)	LMU	VKU	Submitted survey WP5, data set sent, SDGs ongoing, Conceptual to be finalised. Local project has data, meeting to set synergies.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Completed the questionnaire, but option of downloading not possible, so they had to complete. They could not share the online questionnaire as .pdf. Answer (by ATHENA) : Share the link. NECCA to fill the data set.
CS#5: Canary Islands	ULL		Putting the sensors planned. Miro fixed. Video made for TV to be sent to WP8.
CS#6: Black Sea	AUTH		Finalised the bilateral meetings with each CS partner and the extension of this CS. Planning the meeting with WP3. Modification of CS to be sent to UTH for GA amendment
CS#7: Southern Denmark	EM	TUD	Meeting among the 4 municipalities on the LL. Shared workshop planned. Other municipalities need to be considered as partners (?) TBD with UTH
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting. Data set submitted. Review on the conceptual, Discussion on the indicators completed. Discussion with the NHS for flood info, Completed the questionnaire for WP5.
CS#9: Sardinia	AGRIS	UT, LMU	Description of CS prepared. Details of experimental area included. TBS to LMU. Issues with irrigation activities for the experimental fields. Meeting with WP2 on the mapping
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	
WP4	UNEXE	ICCS	ATHENA (Eleni Toli) provides more info and explanations for the data sets questionnaire required by the CS. Deadline for entry of 1 data set (at least by all the CS by **Feb22, 2022 (EOB)** CS#3, 4, 5, 8 have already entered at least 1 data set. The links sent by email need to be kept for re-access.

			Alex (KWR): Question about double entries. What happens? What happens by the same data set entered with double naming? Answer by ET: CS to discuss internally first, but this is intermediate Answer by ATHENA (Giota): The link is editable by anyone, but the CS teams need to collaborate first. CS#3 (Teresa): Please send the link to multiple emails. Where to send feedback for the questionnaire? Answer: Get emails from the manual. Only 1 person can receive the email with the link.
WP5	BRC		
WP7	AUEB		
WP8	GAC		Instagram account active (UTH). Send items to the account. Newsletter compilation started **(end of April deadline)**

FEBRUARY 24, 2022

9.0 **Workshop in Tours: 22/03 starting at 8.30, finishing at 13.00 on March 23.**

10.0 Update by Giannis (WP1) about monitoring the resources expenses, after the email sent yesterday

11.0 Very important to have the requirements for the GA amendment **by tomorrow Feb 25**

12.0 Update about the delay in MS8.

13.0 Update about the event in Mykonos (June 2022). Conference (5-9 June), Monday 6 June Special session for ARSINOE, possibly also a workshop for the 4 sister projects.

14.0 Abstract only for ARSINOE acceptable.

15.0 No project meeting, so no obligation to come.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		14 data sets submitted, internal meeting with WP2, working with the stakeholder mapping. 3-day seminar “train the Trainers” completed. Working on the conceptual. SDGs: working on it.
CS#2: Mediterranean ports	AUEB		Meeting with WP3 done, also regular meeting, working on the One Conceptual graph for all the ports. Scheduling meetings with all the ports. Draft with SDGs ready. 4 data sets provided. Three WGs to discuss later whether they can have a common LL.
CS#3: Main River (Germany)	LMU	VKU	Meeting with WP2 done helpful a lot because of the special stakeholders. Working on shortening the list of stakeholders. Working on the conceptual model, SDGs done.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Provided data sets, finished with SDGs, conceptual first draft done and sent for review to other partners. Internal meeting with WP2 also took place.
CS#5: Canary Islands	ULL		Meeting with WP2 done-helpful a lot with the matrix. Also regular meeting. Provided data sets and finished with SDGs.
CS#6: Black Sea	AUTH		Data sets are being prepared. By tomorrow they will be uploaded. Meeting with WP3 took place. Meeting also with WP2. Transboundary issues with WGs/LL discussed but not decided yet. Shortening the list of stakeholders.
CS#7: Southern Denmark	EM	TUD	Not decided yet about one or more LLs. Meeting with WP2 took place. Meeting with CS#8 –looking into similarities and interactions. Very useful. Data sets to be provided. Working on SDGs and conceptual. Workshop planned for Week 10.
CS#8: Torbay and Devon County	UNEXE	TC	Finished with the Conceptual, finished with the SDGs. Common meeting with CS#7. Internal presentations about transportation and other types of modelling . Meeting with WP2 took place. They will think again about the area of the LL and revise the list of the stakeholder accordingly. No one available for the meeting on March 22-23. To be discussed.
CS#9: Sardinia	AGRIS	UT, LMU	Nearly completed conceptual model, meeting with UTH about it. Filled the data set questionnaire. Agronomic data set submitted, which can expand and be used in other CS. Started with the stakeholder shortening list
Task 6.2	UT		

Task 6.3	UNEXE	ATHENA	Conceptual maps March 15. UTH to collect the conceptual maps and provide some sort of revision. Needed for horizontal activities in WP3
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	WGs will be in each country. LL could be one for the transboundary CS.
WP3	TUD	LMU	
WP4	UNEXE	ICCS	Data sets deadline 28 February. CS#6 to provide tomorrow. Every CS to keep an internal .xls file with info about submitted data sets. To include the link is important.
WP5	BRC		Update by Gerardo (BRC) Meeting scheduled for March 16 (9.30-13.30)-workshop with all the CS. Request to include also 2-3 stakeholders. Invitations will be sent to all. Stakeholders could also be outside the consortium. Responses from all the CS for the questionnaire. Representation from WP2, TBD tomorrow between WP2-WP5.
WP7	AUEB		
WP8	GAC		

MARCH 3, 2022
SDGs (update by Giannis-UTH): Inconsistencies corrected. Tab updated (except CS#8-see note).
Explanations about the conceptual. CS#5, CS#3, CS#7 cannot add the Miro app.
Action: All the CS need to send to Giannis to send the links for uploading the conceptuals.
For WP5: To ask how I is going with the interviews.
Mykonos: Discussion about the abstracts. All to be sent to Giannis.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Weekly meeting happened. Data sets submitted. Started working on the mapping of the stakeholders. SDGs working on it. Progress with conceptual.
CS#2: Mediterranean ports	AUEB		Regular meeting ok. Data sets submitted. Working on the conceptual. Finalised the SDG indicators. Working on the stakeholder mapping.
CS#3: Main River (Germany)	LMU	VKU	SDGs done. Conceptual model 1st version to be finalised. Sorting out also details for stakeholder mapping.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Data sets submitted, indicators ok. Conceptual submitted 1st draft. Working on mapping the stakeholders and the short list. Meeting with WP5 occurred.
CS#5: Canary Islands	ULL		No meeting this week (holiday). Finished 1st approach on stakeholder mapping. Working more on this for the LL. Conceptual ready.
CS#6: Black Sea	AUTH		Working on the Conceptual and the SDGs. Meeting with WP5 occurred. Working also on updating the stakeholder list.
CS#7: Southern Denmark	EM	TUD	Meeting yesterday with the 4 municipalities. Planned workshop for Monday for the conceptual and the short stakeholder list and the SDGs.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting occurred. Started work on stakeholder mapping. Meeting for March 16 planned. Meeting with WP5 occurred. Discussed the content for the CS on real time additions and linking with cascading effects. Started discussing the visualisation. Update needed for the SDG tab file at the common folder.
CS#9: Sardinia	AGRIS	UT, LMU	Working on the SDGs, included in the folder. Advanced draft for the conceptual. Final revision with Dimitris planned. Working on the stakeholder mapping. Meeting with Isabelle planned.
Task 6.2	UT		Isabelle confirmation of participation for the workshop in Tours. It is f2f, but there will be a laptop for CS#8 to connect. CS#8 to contact Isabelle (Kate and Sarah)
Task 6.3	UNEXE	ATHENA	In preparation for starting the task
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Update. Milestone end of March (stakeholder mapping) ongoing
WP3	TUD	LMU	Milestone for the end of March on track. Looking at the conceptuals necessary. @Giannis: access needed for WP2 and WP3 for the conceptuals.
WP4	UNEXE	ICCS	Data sets are going ok. Data Management Deliverable on track. Started discussing the visualisation for T6.1.

WP5	BRC		Meeting WP2-WP5 happened. During the workshop on March 16 the links will be presented. Invitation for March 16: Some missing people. Needs re-checking. (Action for Giannis) Also the CS leaders to check and contact Gerardo for any additional invitations.
WP7	AUEB		
WP8	GAC		Website to go online in 2 weeks, after an email for the last checks.

MARCH 10, 2022

WP5 meeting: The link in the chat for the meeting on March 16. Is empty. No link in it. Gerardo needs to provide a link.

@Giannis: Request for everyone to be able to see all the conceptuals. Privacy matter to be examined.

Action: All Conceptuals ready for March 15. To be sent to Giannis. CS#7, CS#2 have a conceptual in PPT and now is being transferred.

Mykonos: Reminder for registering with names. Abstracts submitted (so far): 10 (more expected).

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting happened. Educational activities being planned (1st Youth Assembly for May 2022), no citizen science for this year (too difficult yet). Finalised the conceptual model, discussion about the possibility to match stakeholders within the CS#1 conceptual. Seems complicated for the moment. So, conceptuals to be finalised without matching stakeholders with components of the conceptual. Redefined the sectors of stakeholders. Mapping to take place next Tuesday.
CS#2: Mediterranean ports	AUEB		LL meeting on Wednesday. Working on the conceptual and the SDGs. Both finalised. Final list of stakeholders in preparation. Interviews meeting with Phoebe and Chrysi with WP5 (CS#2 together CS#1). Valencia had a separate meeting with WP5. Action: CS#2 to organise better internal communication, so as not to organise separate meetings.
CS#3: Main River (Germany)	LMU	VKU	2nd meeting with WP2 happened, discussing the stakeholder mapping and the living lab. Meeting next week specifically for LL. Meeting also with WP5 occurred. Conceptual finishing. 3 people to attend Tours.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Conceptual finished and uploaded. Stakeholder mapping still ongoing on the short one. Meeting with WP2 planned for March 17. Meeting with Bureau of Statistics planned and with other stakeholders. Representative from GR and MK in Tours.
CS#5: Canary Islands	ULL		ON the island for a trip to put the sensors (XXX) next week to monitor the aquifer. Meeting with WP5 occurred, also regular meeting and meetings with stakeholders. Video for the regional TV channels. Video sent to WP8.
CS#6: Black Sea	AUTH		Meeting with Isabelle today about stakeholder mapping. Local working groups to be organised, focusing on specific topics (in local languages). One LL for the whole area. Conceptual model uploaded.
CS#7: Southern Denmark	EM	TUD	Workshop last Monday about conceptual (whole area), stakeholder, LL. LL to take place in 2 locations (XXX). Conceptual, SDGs to be uploaded on Tuesday. Matrix on mapping planned with WP2 for March 17 (? TBC)
CS#8: Torbay and Devon County	UNEXE	TC	Meeting with WP2 about not attending Tours, discussion on helping about the stakeholder mapping (planned for March 16). Normal CS meeting occurred. Modelling starting end April 2022. Brett (UNEXE) looking into it. Meetings on health impacts continued and about types of buildings for impact analysis. Strong interest about early warning aligned with CS#7
CS#9: Sardinia	AGRIS	UT, LMU	WP5 meeting occurred with CS#9. Focus on agriculture, crop choice and food security. The conceptual reviewed and

			completed and uploaded. Stakeholder mapping completed. Meeting with municipalities.
Task 6.2	UT		Preliminary plan for the meeting on March 22 confirmed.
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	Workshop on Resilience Framework on April 8, afternoon. To be added in the calendar.
WP4	UNEXE	ICCS	
WP5	BRC		
WP7	AUEB		
WP8	GAC		

MARCH 17, 2022

- Mykonos: Extension to the end of March.
- Meeting next Thursday to be cancelled because of the workshop.
- Isabelle: Info about the Conference in Tours in May/June 2022. All info to be sent BOTH to CAG and WE.
- CAG organising a workshop on communication for April 7. Invitation to all.
- Communication strategy to be enhanced for the CS. Comms strategy for the CS. Email by Giannis with details sent on March 11.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting took place. Focusing on the mapping and the SDGs. Follow-up with a meeting with WP2. Getting ready. Ready for the topic of the LL and mapping according to this goal. Finalised the draft for the conceptual
CS#2: Mediterranean ports	AUEB		Regular meeting occurred. Uploaded the Miro board. SDGs and links to the data sets identified. Delivered the 1st draft for the stakeholders (short list). Meeting with key persons with Piraeus and Limassol happened. Also started collecting the data. Next week meeting scheduled with Valencia.
CS#3: Main River (Germany)	LMU	VKU	Long meeting about the scope of the LL took place, also geographical focus and topics to focus on. Feedback for the website collected.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Finished with SDGs and the conceptual. 1st draft for the list of stakeholders took place. Discussion with WP2 about the short list and the issues with transboundary. March 5 meeting with WP5 took place. Meeting with Institute of statistics (MK). Meeting about the socio-economic modelling (internal-MK). Meeting with the other partners planned
CS#5: Canary Islands	ULL		They have field work. Absent today (excused). Meeting with WP2 took place on March 11.
CS#6: Black Sea	AUTH		Working on the stakeholder list to improve it, after the discussion with WP2. New list to the other CS partners to fill the gaps. Feedback expected. SDGs and conceptual uploaded. March 16 meeting took place (except Bulgaria).
CS#7: Southern Denmark	EM	TUD	Bi-weekly meeting held, follow-up on the conceptual model and the SDGs. Probably some update will be needed for the Conceptual. Working on scoping the LL. Meeting with WP2 took place.
CS#8: Torbay and Devon County	UNEXE	TC	Miro board for the conceptual for this CS is missing. Dave: CS#8 has no access to the Miro board now . Action: to sort this out between UTH and CS#8. Weekly meeting took place identifying the short list of stakeholders and the LLs. Questions about the LL discussed. (to be continued next week). More stakeholders identified.
CS#9: Sardinia	AGRIS	UT, LMU	WP2 meeting took place about the 1st draft stakeholder mapping (+influence and impact mapping). Reviewing the matrix. 2nd round of discussions tomorrow. Drought/irrigation and fertilising of the experimental farms (technical)
Task 6.2	UT		Everything ready for the workshop in Tours. Alternative to be provided for CS#8. Albania and Greece (CS#4) maybe will not be represented, because they have 3

			working groups and 1 LL. Material to be circulated by Alice and Ebun before the meeting in Tours. All CS to prepare 1 slide for the LL (or 5 min presentation of the CS)
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Need to focus on the LL stakeholders and scope for the mapping (=who to invite to the workshops).
WP3	TUD	LMU	UTH: Conceptuals have been downloaded for all the CS. Stored in the files for WP6. IN .pdf format. Not all of them in good quality. WP3: Conceptuals: feedback expected after the workshop on April 6. MS8 circulated to the CS, UNEXE, KWR for review.
WP4	UNEXE	ICCS	Useful to link the SDGs to data sets. To be added to the folder for each CS.
WP5	BRC		Workshop took place on March 16 with all the CS.
WP7	AUEB		
WP8	GAC		Update to all by Nina: News from the CS are needed for the website and the social media. Every 2 weeks: A piece of info to be shared every 2 weeks (on average). At least 1 piece of news for at least of 1 CS. Request by UNEXE to advertise future paying sessions for SG. Giannis: collecting feedback for the website. Deadline for feedback: **Monday 21 March**

MARCH 24, 2022

Meeting not held.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		
CS#2: Mediterranean ports	AUEB		
CS#3: Main River (Germany)	LMU	VKU	
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKT	
CS#5: Canary Islands	ULL		
CS#6: Black Sea	AUTH		
CS#7: Southern Denmark	EM	TUD	
CS#8: Torbay and Devon County	UNEXE	TC	
CS#9: Sardinia	AGRIS	UT, LMU	
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	
WP4	UNEXE	ICCS	
WP5	BRC		
WP7	AUEB		
WP8	GAC		

MARCH 31, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Finalized the Miro board regarding the shortlisting of stakeholders. Meeting with municipality in order to review the Miro board, Update on the datasets regarding SDGs and developed excel file regarding those. Internal Meeting to be held, with all partners of CS1 + site visits on 17 of May.
CS#2: Mediterranean ports	AUEB		Validated list of stakeholders, discussed about living labs form
CS#3: Main River (Germany)	LMU	VKU	Preparing the details within the CS on how to prepare the living lab, Miro board sent to WP2, ARSINOE presented in local conference,
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Miro board, SDG indicators finalized, Albania and North Macedonia to validate stakeholder matrix (validated already from Greece's side), Meeting to be planned between parties from the three countries on discussing the Tours workshop experiences
CS#5: Canary Islands	ULL		Placed sensors for monitoring the aquifers, finished Miro board for the stakeholder matrix and waiting for external validation
CS#6: Black Sea	AUTH		Submitted the stakeholder matrix to WP2, Decided on two types of living labs focal groups : 1. Local people 2. Participants of High interest and high impacts, Meeting with all partners of CS6 Tuesday 5 April to discuss about implementation of living labs
CS#7: Southern Denmark	EM	TUD	Working on updates on stakeholder mapping, Started making detailed time plan of CS modelling activities and living labs, Additional municipalities need to register
CS#8: Torbay and Devon County	UNEXE	TC	Initial draft of stakeholder mapping matrix, Kate and Sarah to speak to WP2 (Isabelle), meeting planned with Torbay council regarding stakeholder mapping next week,
CS#9: Sardinia	AGRIS	UT, LMU	Stakeholder matrix finalized and sent to WP2, ARSINOE will be presented in national television broadcast
Task 6.2	UT		Isabelle: 3 hours catch-up training, participation concerns CS8, Ralf & Martin (CS3), CS4, CS2, Black Sea Case Study, circulating doodle
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Finalize matrix by **14 April**, each case study to validate
WP3	TUD	LMU	Workshop on Resilience Assessment (for each case Study and WPs), kick-off workshop on **8th April**, case studies to present their conceptual models . WP3 started consolidating concepts and requirements from case studies, Case Studies will be approached to discuss the documents prepared by WP3. Questions to be sent to the case studies.
WP4	UNEXE	ICCS	
WP5	BRC		

WP7	AUEB		
WP8	GAC		

Chrysi : Each case study to report on works that the case study can fit in (Report to Guido)

APRIL 7, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting ok. No issues. Discussing stakeholder mapping. External reviewer discussed about r the mapping. Deadline April 14, maybe a couple of days late. Discussion about heat stress resilience. Developing the SDM from the SDM. 1st workshop planned for the end of May (possibly), so as not to have it in the summer. Mid May FtF meeting with the Greek partners.
CS#2: Mediterranean ports	AUEB		Discussion about stakeholder mapping. Valencia and Cyprus reviewed it with Externals. Piraeus waiting for the reviewer to get back. Simplification of the conceptual envisaged for the next 10 days.
CS#3: Main River (Germany)	LMU	VKU	Discussion about who to include to the LL and how to explain the concept (in German) for the workshop. Validation of the matrix planned next week. Article about ARSINOE published in VKU newsletter.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting GR,AL,MK, discussing about the validation of the stakeholder list. Question to WP2 about this. Internal meetings planned every Thursday. May 5 meeting in Athens FtF.
CS#5: Canary Islands	ULL		Regular meeting on Tuesday. Developing the sea-level rise concept. Decided on the scenarios. TBD tomorrow at the workshop. Stakeholder list already revised by an external. Absent next week Easter break.
CS#6: Black Sea	AUTH		Meeting last Monday with all the partners to explain about the Tours meeting. Focusing on specific topic and deciding about the stakeholders accordingly. Local working groups to be organised. Support to be provided by WP2. Date TBD.
CS#7: Southern Denmark	EM	TUD	Regular meeting done. Thematic meetings planned (e.g. danger, costs, policies etc.) so as to cover all the aspects of the CS. Meetings starting in May with the municipalities. PIC numbers for the municipalities to be provided to UTH for the amendment.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting on Wednesday. Meetings with the stakeholders discussed. Application on the permutables and the application. Alex presenting ARSINOE and this CS at the IWA, YWP conference on April 4-6.
CS#9: Sardinia	AGRIS	UT, LMU	Friday broadcast TV (local channel) with other local guests. General presentation of the project and the CS. Working on subtitles to upload the video at the ARSINOE website. Matrix submitted to main stakeholders to finalise the list of participants to the LLs. Meeting with trading unions (agriculture) presenting the ARSINOE project for them to participate as main stakeholders at the LLs.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		

WP2	UT	AUEB	Catch-up workshop is being planned. May 4th decided, because most of the CS Leaders will be present. (9.00-12.00). Decision to be finalised in 2 days. All to get back to the doodle for selecting options. All LL leaders need to be present. Weekly meetings for WP2 exist. If someone wants to have an exchange (Wednesday 2.30-3.30pm) during the meeting, they can do it then. Short text needed for the justification of the final stakeholders
WP3	TUD	LMU	Reminding about the workshop on Resilience Frameworks on April 8, 2022.
WP4	UNEXE	ICCS	Discussion on T4.1 on the setting of visualisation. All goes well
WP5	BRC		
WP7	AUEB		
WP8	GAC		Internal communication workshop took place today. Material on Teams for the people that were not present.

Chrysi: Regular meetings and links to be sent to Giannis for the calendar (if not there already). Meetings to be cancelled for the next 2 weeks (Easter holiday).

Deadline for April 14th for the stakeholder mapping

Discussion about the annual meeting will start soon (April 27) during the STC (October 2022).

The meetings on April 14 and April 21 were cancelled due to the Easter break.

APRIL 28, 2022

Update about the table with additional funding- Deadline 15 May (page 10)

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		12/04 SDM framework has been prepared and presented. 17 May F2F meeting for the preparation of the 1st LL (to be held at the end of May). **Stakeholder mapping completed. DONE**
CS#2: Mediterranean ports	AUEB		3 ports have finalised their lists and matrices, but further discussion needed on which stakeholders will be involved in the LL. Meeting with Piraeus for data needed-final meeting for data in 15-20. Valencia and Limassol have obtained the data. Scheduling LL and WGs will be discussed. **Stakeholder mapping DONE**. Date for LL pending
CS#3: Main River (Germany)	LMU	VKU	Progressing stakeholder mapping to be finalised. Meeting with WP2 planned for May. LL will be small but complex. Location TBD (upstream or downstream of a specific city). LL meeting for July 15. Connected MSc projects to WP3 (water temperature modelling- earth and geological info changes) with data from CS#3. **Stakeholder mapping DONE**
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Working (1 group) on preparation of LL (planned for June 15 or 17 June) and another group working on data (availability and needs). Short list prepared. Working groups in 3 countries. Working on harmonizing the activities of the WPs in the three countries for a common LL meeting in September 2022. Variety of data exists. Discussing also the barriers on modelling. Unified model for the 3 countries planned. MK and GR ok. **AL pending for stakeholder mapping**
CS#5: Canary Islands	ULL		1st session LL: June 21 fixed. Regular meeting on Tuesday working on the modelling of the aquifer. **Stakeholder mapping DONE**
CS#6: Black Sea	AUTH		Meeting with partners last week to identify the progress. Working on the calibration for the virtual watershed. Bulgaria working with local stakeholders and Romania too. Romania to start measuring in May. Also, Turkey planning field activities for the end of May. Stakeholder mapping: Update needed from WP2- Matrix filled for 3 countries No LL in Greece, because the LLs will focus only on the Black Sea area (not Greece). The concept of virtual watersheds is to benefit from work done in Greece. Working groups under the LL (Romania, Bulgaria, Turkey). The Greek team will support the international LL. **Stakeholder mapping to be finalised by next week**. Date for LL pending
CS#7: Southern Denmark	EM	TUD	Not present (excused due to personal matters)-to be updated online. **Stakeholder mapping pending validation – in progress (awaiting response from the validation).** Update: All CS7 partners meet Wed for a 3-hour online thematic workshop where the municipalities and technical partners presented and discussed the hazard dimension. The workshop was particularly related to those activities that are not part of our living lab but which are part of the overall CS7, will be modelled and the resilience framework applied. Knowledge and

			innovation gaps were discussed (will continue). Next thematic workshop/regular workshop on risk assessments and economics in two weeks.
CS#8: Torbay and Devon County	UNEXE	TC	Meetings took place. Looking into the stakeholder list. Meeting next week for the list again. Meeting with WP2 next week. Next week list for LLs finalised. Preparation of permutable assets (3.1) as spreadsheet to be finalised in the next days. Discussion on the dashboard has started (early stage). **Stakeholder mapping pending validation**. Date for LL pending
CS#9: Sardinia	AGRIS	UT, LMU	Before Easter: (11-15/04). Subtitles for the interview prepared-contacted WP8- Posted (Nina) 19-22/04: Field activities about fertilisation and hybrid irrigation. 21/04: Meeting with stakeholders. Meeting with WP2 about the mapping. 1st workshop: Early July. **Stakeholder mapping DONE**.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Updated. 3rd May catch-up session.
WP3	TUD	LMU	Internal meeting planned. 3.2 and 3.4 started. 3.1 progressing.
WP4	UNEXE	ICCS	Started discussion on the dashboard (T4.1).
WP5	BRC		Meeting WP5-WP2 took place about the open call for innovation (between LL1 and LL2) (Update by Isabelle-WP2)
WP7	AUEB		
WP8	GAC		Public website expected ????. WE to contact partners to contribute. Deadlines for contribution needed.

May 5, 2022

- **General question from CS#4 about the availability of RCP 7.0 (to be addressed by WP3_** Ask Ralf. **Martin: At the present, global data is available (CMIP6), regional climate models forced using RCP7.0 are not available in general.**
- **Is it possible to use the RCP8.5 data, which already exist? Question to Ralf. Martin: Yes, of course it is. So far, we expect most case studies will be building on the vast amount of RCP4.5 and RCP8.5, which is still considered state-of-the-art.**

MGT update.

- Vote for the GA annual meeting.
- Cooperation with WP8 to launch the website tomorrow or on Monday.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting-27 May 1st workshop (LL). 17/05 Preliminary meeting. Focus on preparation for the workshop. Working on the conceptual model. Main focus on urban heat islands (centred on the city only- specific municipalities), but the rest of the region needs also to be taken into account for other hazards.
CS#2: Mediterranean ports	AUEB		Laura (Valencia). Workshop Limassol 9/7, Valencia early June, Piraeus late June/early July. Climate data/projections for Valencia available (different variables). Check with the other ports. Discussion about compatibility with WP3-compatible scenarios needed. (for SSP and temperature increase). **Action:** Talk to WP3.
CS#3: Main River (Germany)	LMU	VKU	F2F meeting scheduled (today). Deciding on the LL options (boundaries). Workshop 15 July (LL). SIA workshop attended. Students working on modelling (see also previous week minutes). LL to be discussed with some stakeholders.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting (weekly) took place. 3 working groups in June/early July. September 1 joined LL. On May 6 and May 9. meetings planned with WP2. WGs F2F, but LL could also be virtual. Nikos Mellios (UTH) will develop the SDM for this CS. Decision about data ongoing. **Question about RCP 7.0 downloaded data for WP3.**
CS#5: Canary Islands	ULL		Regular meeting took place- presented satellite images. Sent to the administration for the aquifer model to get feedback. Contacting the participants of the LL (for June). Discussion on improving the models. Preparing contributions to Conferences (EGU and Mykonos). Two islands: La Palma – El Hierro (small islands- as Pilots representative for the whole region)
CS#6: Black Sea	AUTH		Stakeholder issues-extensive discussion with WP2 (see previous minutes). It's being sorted out. Workshop on Tuesday, with representatives from all the countries-all countries progressing with implementation. Dates to be finalised.
CS#7: Southern Denmark	EM	TUD	Yesterday, CS7 had an internal meeting on the Living Lab to "onboard" those colleagues from Fanø, who did not participate in the Tours meeting. Ways forward including a concrete time plan and deeper involvement of the partner organizations was discussed. **Stakeholder mapping is complete**. Validation will

			be done by the Danish Coastal Authority (DCA) and be ready early next week. All partners meet Wed for a 3-hour online thematic workshop where the municipalities and technical partners presented and discussed the hazard dimension. The workshop was particularly related to those activities that are not part of our living lab, but which are part of CS7, will be modelled and where the resilience framework is applied. Knowledge and innovation gaps were discussed. Next workshop in two weeks.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting UNEXE/TORBAY on Friday took place for the modelling. Another meeting about the LL with Torbay Council (communication officer). Invited to present ARSINOE in meetings on May 27. LL in September. Activities related 3.1 good progress.
CS#9: Sardinia	AGRIS	UT, LMU	Attended the online workshop (LL) with WP2. List of participants defined. Workshop planned for Early July. Contacting stakeholders.
Task 6.2	UT		See WP2 update also link with dates to be filled.
Task 6.3	UNEXE	ATHENA	Started discussions on the general . Generic workshop to be organised, once the internal phase finishes.
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Catch-up session (for Tours) delivered. Instructions to be sent by Alice about the workshops. Justification text CS#8. Meeting with CS#7 and CS#6 to be arranged. Travelling to Athens for the first meeting with CS#1.
WP3	TUD	LMU	Any questions about CC scenarios to be sent to LMU and DTU. Workshop planned for additional questions (doodle). About RCP7.0 (Martin): At the present, global data is available (CMIP6), regional climate models forced using RCP7.0 are not available in general. About RCP8.5 (Martin): Yes, it is perfectly acceptable to use the RCP8.5 data, which already exist (or other data if it makes sense to local decision-makers). So far, we expect most case studies will be building on the vast amount of RCP4.5 and RCP8.5, which is still considered state-of-the-art, and which most official sources refer to.
WP4	UNEXE	ICCS	Continuing the discussions on 4.1 and also on the data (4.2)
WP5	BRC		No update
WP7	AUEB		
WP8	GAC		In Mykonos short interviews.

May 12, 2022

- Dates and place for the GA in October (Canary Islands- October 4-6) defined
- Number of participants to be defined until July. Giannis to help with an Excel file. **Deadline July 25.** Airport suggested: Tenerife North. Info about venue next week.
- Additional funding info collected
- Website can be used: https://arsinoe-project.eu/

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Preparing for the LL workshop (May 27). Mock-up session May 17. Factsheet prepared in Greek and sent out to the stakeholders. Factsheet and letter shared (in Greek). Connection with Rockefeller centre (Municipality of Athens) re "Heat season". WP2 will also be there on Tuesday 17 May. EYDAP to provide a tour (aqueduct). SDM by UTH
CS#2: Mediterranean ports	AUEB		Meeting on Monday. WP2 attended for the finalisation of the list. Valencia and Limassol provided comments. Piraeus to provide comments in the following days. LL Valencia (late weeks of June), LL Limassol (July 8), LL Piraeus (first 10 days of July). SDM or ABM by UTH
CS#3: Main River (Germany)	LMU	VKU	Internal meeting today. More frequent internal meetings decided. Initiated interviews with crucial people about the LLs, also discussions with individuals. Improved in depth picture for the LLs created. Meeting with WP2 on May 24 to restructure the workshops, according to the latest insights.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Preparing for the LLs. Separate meetings with WP2 took place for each country. Common presentation prepared to be translated. 17 June: North Macedonia, 8 July: Greece, Early July or early September: Albania (all FtF). Common LL : End of September (most likely remotely). Data collected by all, sent to IECE. SDM being set up (UTH)
CS#5: Canary Islands	ULL		Started with the preparation of the GA. Meetings every 2 weeks. SDM work also by Nikos (also preparing-UTH).
CS#6: Black Sea	AUTH		Meeting last Tuesday for the CS and with WP2 to finalise the stakeholder mapping. All the partners responded to the remarks. Info to be processed in the coming days. Validators to be identified, after the summer. Time need to convince them to participate (LLs), WP2 has been notified.
CS#7: Southern Denmark	EM	TUD	2nd workshop took place yesterday, discussing about damage costs and vulnerability analysis, to be continued in 2 weeks. Next week meeting with organisations to discuss the LL (political level). PIC numbers need to be sorted out with the EC officer (not replied yet).
CS#8: Torbay and Devon County	UNEXE	TC	Yesterday internal meeting: Miro board and stakeholder mapping, separate meeting with Torbay Council Comms Officer. LL planned for the end of September. 11 key stakeholders identified for the 1st workshop. Interaction will be sought for transferring ideas for the 2nd workshop.
CS#9: Sardinia	AGRIS	UT, LMU	SDM for Sardinia by UTH. Formalised the participation for the Mykonos meeting. Meeting organised about durum week short chain, next Monday. Date of the 1st workshop TBD (Early July).

Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Guidelines for the preparation of the workshop, and separate guidelines on how to report on the workshop. Event assessing evaluation form to be adapted (D1.2)
WP3	TUD	LMU	Meeting next Thursday WP3 status update and decide about the next steps and the new Tasks. Update next week.
WP4	UNEXE	ICCS	All Tasks ongoing. Discussing about the dashboard (also maintenance and existence after the end of the project). Also discussion about model integration to the knowledge graph. Further requests to be sent to the CS about the type of end-users and the information they want to see. First discussions about the resilience framework (people from EU-CIRCLE and RESCCUE and UTH)
WP5	BRC		N/A
WP7	AUEB		
WP8	GAC		1st version promo-pack available in Teams. Website: ready to launch it. https://arsinoe-project.eu/. Communication guidelines have also been prepared and are available. UTH asks to promote the project through social media.

MAY 19, 2022

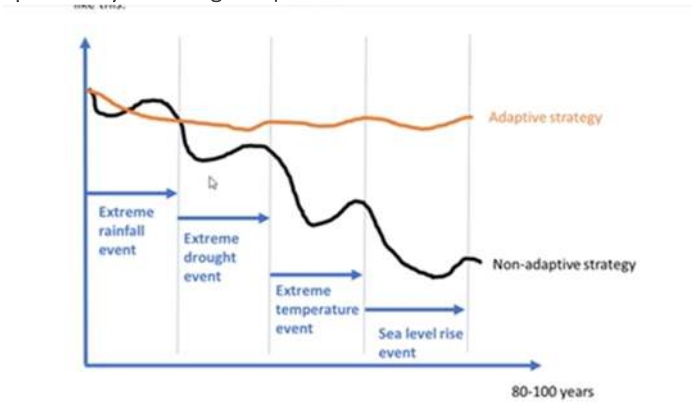
- Final program of CEMEPE uploaded. Events folder. Feedback on the Resilience event (Monday 6 June) needed. Discussion about indicators, similar CS in the 3 projects

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		F2F meeting on Tuesday in Athens, site visit, EYDAP also participating. Interaction with stakeholders promoted. WR2 also attended (Tours and ATHENA) as observers to the mock-up.
CS#2: Mediterranean ports	AUEB		Meeting on Monday-common vulnerabilities discussed. WP2 invited for the regular meeting next Monday to discuss details about the LL.
CS#3: Main River (Germany)	LMU	VKU	Extending the LL, approaching stakeholders to invite them for the workshop for July, discussing with key stakeholders. Meeting with WP2 planned for next week.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Preparation for Workshop at National Level ongoing. Also preparing for additional modelling activities (collecting data) meeting today (earlier) to improve the common parts of the presentation for SIA approach. Suggestion by GR partner for a common repository for data to be transferred later to WP4. Water balance model: MK partner running the model from the common repository.
CS#5: Canary Islands	ULL		Finishing the modelling of the aquifer of La Palma, preparing for the GA meeting in October with the hotel to block rooms. 75/88 Euros price. **Deadline for knowing the number of people: June 1**
CS#6: Black Sea	AUTH		Justifying the selection of stakeholders. Discussion about validators ongoing (3 + 1 groups of validators at national and international level). Romania experimenting on planting/growing (field experiment). SDM discussion ongoing.
CS#7: Southern Denmark	EM	TUD	Meeting yesterday about the LL (high level) to prepare for acceptance at higher level. Energy infrastructure more important/ EC interest. Approval of the goals of the LL. No SDM needed.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting with NHS and ECEHH/UNEXE-climate adaptation and health (demo of an app LCAT). Looking into possible synergies (App for Cornwall to be extended to flooding from heatwave and expand to Devon). ECEHH invited to participate to the LL meeting in September as additional academic partner. Discussion on modelling EU Flood mapping+ CAFLOOD+Transport model. Discussion on assets and type of modelling.
CS#9: Sardinia	AGRIS	UT, LMU	Discussion about the Mykonos conference (data and more+poster being prepared). F2F meeting and presentation of ARSINOE for Unions of farmers, who will participate to the 1st workshop (July).
Task 6.2	UT		See WP2
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Alice: need to re-affirm the methodology for each CS. Need to implement what is in the guidelines. Free to add activities, but

			the basics need to be followed. Guidelines for the 1st workshop posted on Teams. 1-1 Meetings to be held with all the CS. Template for the reporting to be uploaded at Teams.
WP3	TUD	LMU	Discussion about the Deliverable due in September. Next week template to be sent. Input (1 page) needed about the modelling activities. **To be filled before July 1st.** Deliverables in WP3 need 2nd round of discussions, especially with CS#2. CS#6, CS#5 and CS#9. Bringing together some CS with close content. Possibly at the GA meeting. 1st version of Resilience Framework being discussed.
WP4	UNEXE	ICCS	Discussion about the knowledge graph (T4.2). Further discussions needed. T4.1 little progress (people working on finishing another project)
WP5	BRC		N/A
WP7	AUEB		
WP8	GAC		Comments on the website to WE (Ana de Leon and Maria Mirachtsi)

MAY 26, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		LL Workshop prepared for tomorrow (25-27 stakeholders to participate). 4 hours duration. Next week to report back (WP2), including the mental map. Limited number of observers to be efficient.
CS#2: Mediterranean ports	AUEB		Meeting on Monday (including WP2). Working on the preparation of the LLs to be homogeneous and comparable.
CS#3: Main River (Germany)	LMU	VKU	N/A
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Work for the workshops preparation and also providing data for modelling (all 3 partners). Common presentation for the workshops. Virtual (common) workshop planned for September. Sharing also data. WP4 sets to be updated after data are collected. Giota provides the link to the survey. https://docs.google.com/forms/d/e/1FAIpQLSej0z_2GtQfAfIgVY3TTxReYpK30-Z8PKG94uoricJCH_qI0g/viewform
CS#5: Canary Islands	ULL		Participation at a Congress in Vienna (Vulnerability of aquifers on volcanic islands: the case of La Palma and El Hierro (Canary Islands, Spain). EGU General Assembly 2022 (EGU22). Vienna (Austria). Preparation of workshop continues (30 participants so far). Details about the hotel (GA) to Giannis.
CS#6: Black Sea	AUTH		Meetings with Dimitris-UTH (bilateral and during the plenary meeting), about whether the SDM is suitable. Decision: They will try to implement it. Stakeholder mapping and validation to be finalised next Tuesday.
CS#7: Southern Denmark	EM	TUD	N/A
CS#8: Torbay and Devon County	UNEXE	TC	Meeting about the resilience re the LLs. Plans for future growth discussed (tourism etc). Cascading effects discussed, especially with regards to multiple sectors. Kate presenting at a NBS seminar in Torbay (40-50 people attending), where some people will also be involved in the LLs. Resilience Framework: Mehdi updates about general features that will be useful for others: Human-physical assets interactions, critical services, time scale longer with multiple events (figure), estimating also the impact on communities for the RF (see the figure under WP3).
CS#9: Sardinia	AGRIS	UT, LMU	Monday meeting with the other partners (CRS4 to manage the data sets re crops and fertilisation, land variables and historical data sets from satellite data). Discussion about how to include photovoltaic energy estimations in the modelling. Activities with stakeholders presented in preparation for the LL.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	No need to further address the CS about the LLs and the methodology.

WP3	TUD	LMU	Discussing the resilience framework (see explanations under CS#8-specifically referring to it) 
WP4	UNEXE	ICCS	Giota: Progress on the knowledge graph and the data hub. CS#1 the first model.
WP5	BRC		N/A
WP7	AUEB		
WP8	GAC		N/A

June 2, 2022

- UN presenting the 2022 Global Sustainable Report today (update by CS#6). https://www.google.com/url?q=https://us02web.zoom.us/u/keJilkVmM1&sa=D&source=calendar&ust=1654603161960560&usg=AOvVaw3Tb2yWIQSzR886pbNCQHmR
- Presentations of CS#1 and CS#8 to the sister projects done (25/05/22). Need to plan what we are going to do.
- Suggestion to all the CS to keep a separate file with their activities.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Workshop took place on Friday 27 May 2022, 22 stakeholders, mental map. Feedback discussed. Bilateral meeting organised for the conceptual. CSIC finalised the MINKA app, also translated in Greek. Working on tree monitoring to collect inf and data. Activities with students and for awareness on track.
CS#2: Mediterranean ports	AUEB		Meeting on Monday, discussion about the CS#1 workshop and about details for the upcoming workshops for this CS. Invitations to be sent by next Monday.
CS#3: Main River (Germany)	LMU	VKU	CS3 is working on an inventory of assets (maps, figures, socio-economic statistics, etc.) for the workshop. We are currently in the process of inviting stakeholders; some have already indicated that they are willing to participate. Planning for a venue and assigning roles to CS3 partners is ongoing. This week parts of the team were taking part in the conference in Tours.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting Thursday with CS partners + CS1 present with update for the workshop. 8 July workshops in MK and GR. AL workshop in July. Sending invitations. Meeting planned with WP2. Collecting data too.
CS#5: Canary Islands	ULL		Participants for the GA (list) obtained. Weekly meeting on Tuesday. Working on the quality index of the crops. Paper published about the Aquifer in La Palma. Shared with WP8. https://doi.org/10.1016/j.jhydrol.2022.127975
CS#6: Black Sea	AUTH		Meeting last Tuesday, with CS#2 and CS#1 also participating. LL workshops after summer. Intention to work on the focus from the Working Groups. Working also on implementation about the watersheds.
CS#7: Southern Denmark	EM	TUD	No meeting since last week (holiday). Meeting postponed for next week. Work progressing. No dates yet for the LLs.
CS#8: Torbay and Devon County	UNEXE	TC	Kate presented the project to an audience in Torquay. Interest. Organising the LL meeting for September. LVL presented the CS to the sister projects. Discussion about the expansion of the CS to Teignmouth and Devon. Waiting for the EA database (next week). Also discussion about the modelling (different approaches for the urban and rural areas). Climate change guidance received.
CS#9: Sardinia	AGRIS	UT, LMU	Holiday in Sardinia.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		

Task 6.5	KWR		
WP2	UT	AUEB	Conference in Tours.
WP3	TUD	LMU	Links with CSIC needed (UTH alerted). Next week WP3/WP4 postponed. WP3 workshop needed during the GA.
WP4	UNEXE	ICCS	4.1 had little progress recently. 4.2 is implementing data fusion with knowledge graph, and 4.3 is working on the data catalogue and interface.
WP5	BRC		
WP7	AUEB		
WP8	GAC		GAC in Mykonos to conduct interviews. Questions to be sent this afternoon to the interviewees.

June 8, 2022

Few people in the meeting because of the project meeting in Mykonos. Mehdi gives a short summary of the conference. New concept introduced 'climate exposome'. Deals with exposure of people to certain issues/effects. This concept is relevant for ARSINOE, and we should take stock how this relates to the vulnerable communities in our case studies.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Not present today.
CS#2: Mediterranean ports	AUEB		Not present today.
CS#3: Main River (Germany)	LMU	VKU	Continuing to prepare first LL workshop. Stakeholders being invited and mapping of assets ongoing. First stakeholders have indicated that they will join the meeting. Presentation at the Bavarian Research Alliance.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	No weekly meeting this week (cancelled) - all proceeding with data collection and identifying gaps for model. Preparations for LLs ongoing. Greece LL has sent invitations to stakeholders (all stakeholders have been contacted by telephone before, so interest is guaranteed, official responses now being awaited), NM has also sent invitations.
CS#5: Canary Islands	ULL		Not present today.
CS#6: Black Sea	AUTH		Tuesday bi-weekly meeting took place with the participation of WP2. During the meeting challenges and issues of each Case Study were identified. Regarding Turkey, more time is needed to find a focus challenge for the Working Groups. Thus, in the next meeting we will reach to an agreement regarding the focus challenge of the whole Case Study to address in the Living Lab.
CS#7: Southern Denmark	EM	TUD	Tuesday – 3rd workshop took place with Danish partners. No conclusion yet on which activities to take on the case study. All relevant partners will produce papers with suggestions for specific actions. To be decided on after holiday period – August. Coming weeks focus on LL activities – before the holidays this will receive attention. Expected there will be 2 living labs, as the two involved municipalities are quite different in size and nature. To be decided. First LL workshop will take place in September. Support meeting with WP2 to help with preparations to be planned.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting cancelled this week. Meeting arranged with neighbouring authority to go through data. To take place next week. LL – names of people to be invited are being compiled. At Mykonos meeting the 5 pillars for the resilience modelling have been presented by Mehdi.
CS#9: Sardinia	AGRIS	UT, LMU	Took part in Mykonos meeting. Discussed contacts between projects (ARSINOE and sister projects) and strengthening

			collaboration and prevent duplication (I.e. concerted action in contacting stakeholders). Use files circulated by Giannis and prepared Italian version to share with the members of the LL to formalise participation. Workshop to be scheduled for first half of July. Issue might be that July is very busy with durum harvest and many stakeholders are involved in this. Still confident sufficient number of stakeholders will participate.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	LL preparation progress of all CS is being monitored. Last week's focus on CS4 LL – some issues with administration. Possibly the Albanian case will not manage before the summer. Reporting template – a meeting with each LL meeting to be planned with WP2. These meeting will be used to review the whole preparation, the 'script' for the meeting, and the reporting template. The reporting templates are needed for D2.2 - to be sent in in September. WP2 is there to assist in organising the LLs. Confident that all first workshops can be held before the end of September (This is the aim). Deadline for reports is September 9 (for those with workshop before summer). Deadline is later (ASAP, at the latest October 14) for those with workshops after summer.
WP3	TUD	LMU	No news this week.
WP4	UNEXE	ICCS	No news this week.
WP5	BRC		
WP7	AUEB		
WP8	GAC		At Mykonos – many people present were interviewed – will be used to create some short videos. Also case study presentations will be made using interview with case study leaders. Those not at Mykonos will be interviewed (hopefully) during the annual meeting. Note – it any adaptation of the standard materials for local use (e.g. different language) please let this know.

Question about the meeting in October – are all partners are expected. It is the annual project meeting, and also the meeting of the project steering board. Ideally all partners are represented by at least one person with authority to participate in the PSB. There will be a technical part in the programme that concerns the case studies.

June 16, 2022

- Meeting in October: **Deadline June 17 for registration**
- Tenerife update to all.
- Material from Mykonos to be prepared. Material from BRC to be further prepared.
- Teams is the general communication channel for the project.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting took place. Meeting scheduled with WP2 for the next steps. Preparing also the evaluation report. Working on identification of trees in Athens and connecting with CSIC about it.
CS#2: Mediterranean ports	AUEB		Discussing about the material for the LL. LL Valencia 30/6, Cyprus 4/7, Piraeus 10/7. Preparing for the LLs.
CS#3: Main River (Germany)	LMU	VKU	Not at the meeting due to a public holiday; Workshop planned for the LL 15/07, preparation meeting on July 7, in touch with WP2.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Meeting on June7 with WP2, LL preparation. Today regular meeting for the CS about the preparation for the LLs. Data being collected. Related to 3.1: Permutable assets discussion with Mehdi.
CS#5: Canary Islands	ULL		First session LL next week. In touch with WP2 for the preparations. Went in situ this week for checking the sensors. Preparing internal report.
CS#6: Black Sea	AUTH		Nicos elected for the Council of Engineers (UN) for Energy Transition. Participation in the Global Baku Forum. Last week meeting with WP2-challenges to be identified for the LLs.
CS#7: Southern Denmark	EM	TUD	Meeting on Monday with WP2 about the LL (separate or together for the 3 municipalities) Workshop #1 in separate tracks. Next meeting on June20, involving also the police as stakeholders.
CS#8: Torbay and Devon County	UNEXE	TC	No weekly meeting, because of another webinar. Meeting with the Teignbridge Council today for expansion issues and challenged. Also contacting Devon County Council for data.
CS#9: Sardinia	AGRIS	UT, LMU	Location for the LL workshop defined. Contacting stakeholders for a date in July. Poster on ARSINOE at the Annual Conference locally. Working on calibration (field).
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Date for the 1st workshop by ALL the CS needs to be defined by the end of June.
WP3	TUD	LMU	Discussion on the Resilience Framework during the weekly meetings. All invited to participate. Looking into the exposome concept to be included for ARSINOE.
WP4	UNEXE	ICCS	ICCS are working on linking climate change hazards as published EEA.
WP5	BRC		BRC update: Preparation for the 1st tender ongoing for October/November. Reaching out to all in the coming weeks

			for separate discussions with each CS to find out which CS will participate more actively for the tenders (selection committee). BRC present at Mykonos and presented the work on CIW, also to the sister projects. Discussion with CS#3 about the definition of the SMEs to be used for the tenders.
WP7	AUEB		
WP8	GAC		Some interviews conducted in Mykonos for the video presentation. CS#1,2,5,9. Other interviews in Tenerife. WE are working on the video presentation.

June 23, 2022

- Please let Noelia know if there are any issues with the reservations for the hotel.
- Use the North Tenerife airport for the meeting. Infor about the flights to be sent by Noelia.
- Discussion needed about the GA schedule/shaping. Document to be shared soon.
- D8.3 (30/6) Sent to GAC. Then review by LVL.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting took place. Working on the evaluation report (mental map), working also the data and their presentation. In line with the request from WP5 regarding the innovators. Working also on the tree mapping for the Citizen Science approach. Working with NOA for the heat waves (collecting data this summer) +satellite data
CS#2: Mediterranean ports	AUEB		Regular meeting on Monday. Discussion on the LLs. Finalised the material. Workshop in Valencia on July 6. Final date for Piraeus not fixed yet (between 10-15 July).
CS#3: Main River (Germany)	LMU	VKU	Internal meeting today, finalising the preparations for the LLs, invitations sent out. For questions they will contact Isabelle.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Preparing the WGs, sent invitations, meetings with stakeholders. WG dates fixed for North Macedonia and Greece. Not yet defined for Albania. September for the common LL. Next week meeting with WP2.
CS#5: Canary Islands	ULL		First session of the LLs last Tuesday. Went well. Water, agriculture, urban planning, NGOs (citizen participation) participated. Working on the modelling, working on sea-level rise.
CS#6: Black Sea	AUTH		Last Tuesday meeting with all the partners, defined the challenges. Reviewing the stakeholder list accordingly (urgent action to be ready for the LL). Date of the LL (September) after the WGs. Arrange for all to be done before the end of September.
CS#7: Southern Denmark	EM	TUD	Earlier this meeting we had meeting with Police as well as Emergency Preparedness Agency and they are positive towards the Living Lab. Next week we will continue the preparation of the workshop for the Living Lab. (update by email)
CS#8: Torbay and Devon County	UNEXE	TC	Regular meeting on Wednesday. LL week starting on Sep. 18. Venue defined, invites to be sent. Possible use of the SG for Millbrook to engage stakeholders. Discussion also cascading effects for the project (perhaps speaking to some stakeholders after the LLs)
CS#9: Sardinia	AGRIS	UT, LMU	Meetings with several stakeholders. 15-20 stakeholders invited for the first workshop (LL). Factsheets prepared to circulate. Formal letter of invitation to be sent. Most probable date July 12.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		

WP2	UT	AUEB	Next week (**30/6/2022**) deadline for providing the date for the first workshop (LL).
WP3	TUD	LMU	CSIC present here. Update about the platform. Working on the data from Athens. Sonia did not receive the notice. GA: Discussion on shaping the workshop for the GA-decision pending from the coordination-other workshop. August meeting with DTU to organise elements of WG3 in Germany.
WP4	UNEXE	ICCS	ICCS are trying to get a licence for free for the knowledge graph (NEO4J- software_ to be used for all the CS.
WP5	BRC		Presentation by Gerardo. SME definition. The partners to go through the recommendations (possibly to involve also the legal department) Deadline 3 weeks. Message left on Teams.
WP7	AUEB		
WP8	GAC		Meeting with WE, templates for factsheets to be shared and general presentations ready. Newsletter coming +video. Event with REGILIENCE. Seminar with WE on July 6. Next seminars also planned for September

30 June 2022

Deliverables: D8.3 ready, MS4 to be submitted today, with an addition for moving it for a month. End of July: D8.4 to be prepared.

- Tips about LLs provided by CS#1 (Giannis) and CS#5 (Noelia) (informal chat).

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		No regular meeting this week, because of the REGILIENCE workshop. Meeting tomorrow about data (overall). Data to be collected for the next 2 months.
CS#2: Mediterranean ports	AUEB		WP2 needs the date of the LL. (CS#2 not present today).
CS#3: Main River (Germany)	LMU	VKU	Working on the LL workshop (15/7). Ideas being collected from the stakeholders. Meeting with Carole next Thursday. Request for tips by the CS that had the LL meeting already. Suggested to contact WP2 (by Isabelle).
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Completing preparation for WS1 (MK and GR). AL advised by Dijana to organise their WS earlier than September. Support by WP2 provided. Consultation scheduled for next week.
CS#5: Canary Islands	ULL		Team in La Palma for the aquifer campaign, testing also the sensors. Report for the LL provided to WP2. Juan-Carlos interview for local TV. Preparing the GA meeting in Tenerife.
CS#6: Black Sea	AUTH		Discussions with the CS partners about the dates of the WS to move them before the end of September, to send in time for WP2 for the Deliverable. Nest meeting specific dates. Difficult to have the stakeholders in September (touristic season). Missing the stakeholder mapping (WP2)
CS#7: Southern Denmark	EM	TUD	LL preparation meeting yesterday. 22/09 1 WS, the week after for the other 27or 29/9. Early report at the end of September, final report by mid-October. Isabelle said it was ok. Meeting to be scheduled with UTH about the recent PIC validation for the Communities, which happened recently.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting took place. LL for 22/09 in Torquay. Discussion about invitations, plan to send invitations next week. Also discussed the agenda.
CS#9: Sardinia	AGRIS	UT, LMU	Prepare the monitoring for water consumption and the irrigation flows for the durum fields for the next season. 1st WS (LL): 14/7.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Update by Isabelle for each CS
WP3	TUD	LMU	Preparation for the workshop in Tenerife. Internal meeting in August. T3.6 (CSIC) made contact last Wednesday, Jaume explained what he was doing. Also explanations about T3.5 (Assets model by UNEXE).
WP4	UNEXE	ICCS	Meeting on meeting (UNEXE) internal about the dashboard, to try to find the commonalities among the CS for the visualisation perspective. CS#1 and CS#8 to be contacted first with mock-ups.

WP5	BRC		Gloria: WP5 needs to meet with each CS leader after the LL to discuss the outcomes. To be contacted by WP5. Updating the CIW, meeting with REGILIENCE project. CIW to be supported by them (looking of types/way of support). Working on the open tender. In touch with WP8 for the development of the exploitation plan.
WP7	AUEB		
WP8	GAC		No one present.

7th July 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting on Tuesday, Discussed 1. Data for the green area in Athens will be collected (.shp files) 2. Monitor/ map blue areas such as fountains and streams (working on that) 3. The Nature Restoration Law (expected to be published) discussed due to relation with case study. 4. Discussion with Jaume regarding Citizen Science, plans to additionally ask people to record temperatures 5. Bilateral meetings (e.g. with data providers) being held
CS#2: Mediterranean ports	AUEB		Cancelled regular meeting due to living labs being held, Monday 4/7 living lab on Limassol and yesterday in Valencia, 12/7 in Piraeus. The living labs were well-attended. Sent pictures to WP2. Details about Limassol living lab: Maritime and shipping sector challenging to deal with, strong absence from the port authority observed, in general fruitful workshop. Main aspect/ challenge that came up was energy. They were insisting on mitigation vs adaptation. Willingness to participate again observed. Valencia living lab: Very active participation, willing to participate in next workshop, input given was useful
CS#3: Main River (Germany)	LMU	VKU	Weekly meeting held, living lab organized for 15/7. Meeting with WP2 to finish up organization of living lab.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Greece and North Macedonia holding living labs tomorrow. Meetings held for organization of living lab, with WP2. Albania to hold living lab in August (1st or 2nd week). Common living lab in first 2 weeks of September
CS#5: Canary Islands	ULL		Meeting with Carola to finalize living lab details. Certification of training for the participants of the living labs provided through university.
CS#6: Black Sea	AUTH		Meeting held, living labs to be held in September. Finalized all details regarding stakeholder lists etc., to be sent to Carola for WP2 deliverable.
CS#7: Southern Denmark	EM	TUD	On Holidays.
CS#8: Torbay and Devon County	UNEXE	TC	Invites sent out for living labs in September.
CS#9: Sardinia	AGRIS	UT, LMU	Technical and living labs split: Harvest period, harvested ARSINOE related durum fields, comparing two different irrigation techniques (irrigated vs rainfed). Living lab workshop to be held in 14/7 . prepared agenda, material to be sent today. All stakeholders previously contacted. Increasing trend of COVID and workshop might need to be postponed.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	
WP4	UNEXE	ICCS	

WP5	BRC		
WP7	AUEB		
WP8	GAC		

Living Labs discussion, with Giannis and Carola regarding data protection, and other questions. Concern regarding missing seasonal data by stakeholders of CS6, regarding the innovation bazaar, to be discussed with WP5. WP2 will be on holiday for August, so urgent things should need to be discussed before that.

14 July 2022

- Giannis: Everyone to subscribe through the website to receive the newsletter.
- First meeting with BRIGAID for WP5 by CS#1, relevant for the call in October. Probably relevant also for the other CS.
- Follow the instructions for data, according to the DMP (Giota).

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting took place. Bilateral meetings are taking place. Looking into the use of data. Synergies with EYDAP. Athens Municipality report about the Urban task Force, relevant about innovation and refugees to be used as data. To be uploaded to the project repository (ATHENA). Finalised the matrix with stakeholders. Finalised the LL meeting report. Looking for the (surface and underground) water streams in Attica for the blue areas.
CS#2: Mediterranean ports	AUEB		LL for Valencia and Limassol took place. Working on the conclusions. Cancelled LL for Piraeus for July 12, final date Sept. 6.
CS#3: Main River (Germany)	LMU	VKU	Tomorrow 1st workshop (LL). Working on the inventory of assets using info/outcomes from other projects also. CIW: interest before the workshop.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	8 July 1st LL (North Macedonia and Greece)- Albania in August. Working on conclusions/report. 2nd workshop 2nd week of September. WP2 comm with week. Meeting (internal-all countries) next week to discuss the LLs.
CS#5: Canary Islands	ULL		Meeting with WP2 (w meetings for the report and the mental map). Working on the mental map. WP5 meeting with Gloria scheduled for Monday. Meeting issues ready before the summer.
CS#6: Black Sea	AUTH		Finalising the details for stakeholder mapping for tomorrow. Possible to have a few more days for the report in September from WP2. Working on implementation (field work/measurements etc) for data collection.
CS#7: Southern Denmark	EM	TUD	Not present
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting took place. Collecting data, starting place Paignton. Details about the hybrid modelling discussed. Discussed LL. Invites sent. Exposome hackathon participation (Mehdi and Alex).
CS#9: Sardinia	AGRIS	UT, LMU	1st workshop LL-increasing trend for COVID in Sardinia, LL may be postponed by a few days (due to COVID).
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Stakeholder mapping expected by all. Working on a template for the follow-up of the workshops.
WP3	TUD	LMU	Meeting WP3-WP4 yesterday. See below.

WP4	UNEXE	ICCS	Discussion about the dashboard and the indicators related to the knowledge graph. Data transform service (tool) prepared (4.2) to be able to share data.
WP5	BRC		CS#3 (and other CS) require info about CIW from WP5 about ready solutions. (Gerardo present) All solutions are available from the website. 1st call October-November. SME definition deadline for tomorrow (comments). Contact Gerardo in case there are issues.
WP7	AUEB		Starting on M12. Regular meetings starting from September (Conrad)
WP8	GAC		

21 July 2022

Innovators discussion -

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular weekly meeting held. Started with bilateral meeting with data providers/people, incl. EYDAP. Identifying what data is available (nature, type). Also involved prof from UTH who is expert on time series analysis. Clear concept of geographical boundaries of the area to be investigated has been developed. Meetings will be restarted beginning September.
CS#2: Mediterranean ports	AUEB		Regular meeting held on Monday. Currently processing results from the living labs (Limassol and Valencia). Piraeus living lab scheduled for September 6th. Results to be compiled into one story valid for all three ports. Maybe summer break, but not clear yet.
CS#3: Main River (Germany)	LMU	VKU	Friday last week – first workshop held. Interaction of participant with map (to point out locations and issues) was very successful. All participants very involved. Mind map complex – post-workshop meeting tomorrow to discuss outcomes. Next week meeting with VKU on how to proceed. Availability for meeting in coming weeks impacted by holidays.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Finished with LL in North Macedonia and Greece. Results presented to WP2. Albanian partner was present and will have meeting tomorrow with WP2 for preparing their LL to be held on August 10. Common living lab in September (most likely 12th). Results from first two LLs being processed. Data being collected, to be stored in one location (google) for all 3 cases. Available in August.
CS#5: Canary Islands	ULL		Monday meeting held with WP5 to discuss follow up on LL from June. ULL will be closed whole month of August – meetings will be resumed in September.
CS#6: Black Sea	AUTH		Weekly meeting with partners held – in process of validation of stakeholder mapping. Validators are being invited (validators are independent experts). Working groups to be hosted in mid-September. Meeting with WP2 held on organising the LL (3rd or 10th of October as provisional dates). Bulgarian partners met with Bulgarian ministry deputy prime minister for climate policy and minister of environment and water. Support the working groups and LLs has been promised. Important e.g. for working in protected areas. Next meetings – after holidays but work will continue through to August (especially data collection).
CS#7: Southern Denmark	EM	TUD	Absent due to summer holiday.
CS#8: Torbay and Devon County	UNEXE	TC	All LL invites have been sent out; first confirmations have been received. Kate met with WP2 yesterday to discuss preparations for workshop. Agenda and other details to be finalised shortly. Separate meetings with stakeholders concerning permutable

			assets to be organised. Discussions with South West Water on this already ongoing. Weekly meetings to continue through the holiday season. Contact for local resilience forum – meeting to be set up.
CS#9: Sardinia	AGRIS	UT, LMU	First LL workshop has been cancelled (14th July). New date could be July 24 or post-pone until mid-September. Against July 24 is holiday which might mean many stakeholders will not join (loss of information). Meeting with WP2 today to decide. Nearly done with technical ARSINOE activities. Harvests being completed. Chemical and technological analysis of crops being done. Preliminary results – happy with information that is being collected. Summer holidays until September, but some activities will continue.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Very busy with pre- and post-workshop meetings. Good result – discussions are shedding light on how the teams from the varies CSs perceive the issues and work.
WP3	TUD	LMU	Meeting in August (16-19) planned in CS3 region. Being organised. Feedback from this meeting expected for further activities.
WP4	UNEXE	ICCS	Working towards MS12 – user interface design. First prototype shown, no input needed the coming weeks from CSs.
WP5	BRC		Meetings held with CS1 and CS5 to discuss follow up of LLs. Request to other Cases that have already held LLs to also plan meetings. Gloria to email contact persons individually. Request to proceed as soon as possible with the tenders for innovations – so there is time to collect data from the implementation of the innovations. Common topic of innovations / needs for innovations across the CSs to be identified. For first call to be determined what are the common topics (call to be out between first and second LL). Suggestion – to have a round of discussions between WP5 and the case studies on the innovation and tender procedures. First step is meeting with individual case studies after the LL, once topics identified -> organise a meeting with all CSs. Earliest beginning of September. Ioannis to schedule meeting first half of September – goal is mainly informative about what calls are possible. Results from the LLs to be compiled for the meeting in Tenerife (annual meeting), timeslot to be scheduled.
WP7	AUEB		Regular meetings to start in September.
WP8	GAC		Working on Deliverable on comm and dissemination tools. Currently going though QA. Deliverable on dissemination

			strategy being prepared for September. Newsletter being finalised and to be shared soon. Scientific publications to be disseminated soon -> important everyone fills out Excel with contributions that can be shared. Working with sister projects on interactive map that shows the case studies, and working on common newsletter. Images etc for social media – to be sent to GAC (lpourcher@group-gac.com nolivier@group-gac.com)

28 July 2022

- Deliverable 8.4 ready-No other deliverable for July/August

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		No meeting this week. No meetings during August. Collecting data and working on them. Extension of the study period from April to October (not just the summer).
CS#2: Mediterranean ports	AUEB		Just in case i will not be able to attend, please find below few lines for the progress of CS2 this week (I can add in the online document later). - We are working on identifying common stories for Mediterranean Ports based on the outputs from the 1rs Workshops of the LL's for Limassol and Valencia. - Piraeus Workshop scheduled for 6th of September. - We have scheduled a meeting with WP2 next Monday 1/8 (LL follow up meeting with WP2 for Limassol and Valencia). - CS2 meetings will pause during August (1/8 to 22/8). Regular meetings to re-start by Monday 29/8.
CS#3: Main River (Germany)	LMU	VKU	Meeting took place. Evaluating results from the workshop. Meeting with WP2 about next activities. Communication/Dissemination activities took place. Info added to the Excel sheet. Date for 2nd workshop in November (18/11)
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	No new activities. Working on the results of the LL workshop (MK and GR). AL planning meeting July 22, preparing for the LL (August 10). Meetings with stakeholders in August for the common LL (on Sept. 12 most probably). Modelling: Collecting data (water and social economy aspects). End of August expected to finish.
CS#5: Canary Islands	ULL		On holiday
CS#6: Black Sea	AUTH		Names of validators for the stakeholders defined. Now on holiday
CS#7: Southern Denmark	EM	TUD	On holiday
CS#8: Torbay and Devon County	UNEXE	TC	Meeting took place. New member of staff (UNEXE) for the modelling, starting in December. Modelling cascading effects for Torbay starting. Meeting with WP2 took place. Meeting with them on Sept. 7 to discuss the LLs. Discussion about the attendees (confirmed) to the LL.
CS#9: Sardinia	AGRIS	UT, LMU	Meeting with WP2 to discuss the LL. Postponed for mid-September (due to the high rate of COVID infections and the touristic season). Selecting new genotypes, comparing results on agronomic practices (innovative and existing).
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		

Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	Documents from the Venice summer school on Resilience. On Teams under WP3. Hackathon win (Mehdi and Alex). Linking simulation in WP3 with Knowledge Graphs (WP4) (by Nav-UNEXE)
WP4	UNEXE	ICCS	T 4.1 Dashboard first presentation at the WP3/WP4 based on a previous project for the IT structure. TBD during the GA.
WP5	BRC		Artemis Stratopoulou (new member BRIGAID). Schedule meetings WP5/WP6 in September. Open tender early December. Suggestion to use this timeslot for the WP5/WP6 meeting, to prepare for the open tenders.
WP7	AUEB		Meetings to start in September
WP8	GAC		Deliverable 8.4

4th of August 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Not present
CS#2: Mediterranean ports	AUEB		Not present
CS#3: Main River (Germany)	LMU	VKU	Contact details of workshop participants has been shared with participants. Additional stakeholders proposed – interviews being planned. Also interviews with stakeholders that could not join the workshop. Scheduling meeting with WP5 for end of August.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Albanian partner is preparing for workshop on August 10. Greek and north Macedonian cases working on mental maps. Contacting stakeholders that could not be present at workshop. On August 12 meeting between partners to discuss transboundary workshop, date to be set in mid-September. (will be a virtual meeting)
CS#5: Canary Islands	ULL		Not present
CS#6: Black Sea	AUTH		Identified validators for LLs – materials sent; validations expected before end of August. Working groups to take place first half of September. Monday 10th of October – virtual LL planned. Partners busy with field work/data collection.
CS#7: Southern Denmark	EM	TUD	Not present
CS#8: Torbay and Devon County	UNEXE	TC	Meeting yesterday, cascading effects discussed. Alex following up with other groups/researchers who have looked at this in past and its relevance for ARSINOE. Investing how to get data from substations electricity (and power users such as telecom, pumping stations) in catchment. Not all organisations keen to share this level of detail. LL planned for 22nd September, confirmation of participants being received (including South West Water, Western Power). Mehdi – considering alternative approaches in case date from substations is not forthcoming.
CS#9: Sardinia	AGRIS	UT, LMU	Not present
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Not present
WP3	TUD	LMU	Meeting on August 17-19 between WP3 partners TUD and LMU scheduled. Meeting to discuss knowledge graphs on 9th of August (Exeter and Tasos/ICCS)
WP4	UNEXE	ICCS	Currently on summer break – nothing to report

WP5	BRC		Ioannis planning joint discussion between WP5 and all CSs in first two weeks of September to discuss the open tenders. Also timeslot in Tenerife meeting scheduled to discuss and present open tenders based on outcomes of LLs.
WP7	AUEB		
WP8	GAC		Working on D8.5. Nothing to report concerning WP6.

11th pf August 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Not present
CS#2: Mediterranean ports	AUEB		Not present
CS#3: Main River (Germany)	LMU	VKU	Next week meeting scheduled with WP3, and meeting on structuring work for next tasks. Start preparation the LL report in September. Regular project team meetings are starting again next week.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	August 12 – Albanian workshop will take place. August 17 international meeting with all 3 countries, to discuss outcomes from all 3 workshops, start to prepare LL in September. Date in week 12-16 Sept still needs to be confirmed. Meeting with Brigaid planned in August. Data collection ongoing in all 3 countries, software modelling to start in September.
CS#5: Canary Islands	ULL		Not present
CS#6: Black Sea	AUTH		Not present
CS#7: Southern Denmark	EM	TUD	Regular meetings restarting next week. Meeting scheduled on 13 September Carola.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting on 10th of August. 18 attendees for LL confirmed. Work on list of question for participants on what resources are relevant. What is required for services to continue functioning. Meeting with UK Met office to discuss ARSINOE and sister project – agreed to share details about activities and check which data can be shared / made available for ARSINOE. Meeting with ECEHH (European Center for Environment and Human Health) set by Exeter to discuss how they can contribute to the LL in September
CS#9: Sardinia	AGRIS	UT, LMU	Not present
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Nobody presents
WP3	TUD	LMU	Link between knowledge graph and modelling people has been established. Concerted effort to extract information on assets from the knowledge graph database and see whether there are (known) interconnections. To check whether cascading failures can be identified. Checking whether this linking is technically possible. Also links to WP4 – concerning how this type of data should be presented in the dashboard. Discussions concerning this took place this week.

WP4	UNEXE	ICCS	See WP3
WP5	BRC		Nobody present
WP7	AUEB		Nobody present
WP8	GAC		Nobody present

August 18, 2022

- Discussion the GA agenda. Meeting of the WP leaders needed for preparation

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Not present
CS#2: Mediterranean ports	AUEB		Not present
CS#3: Main River (Germany)	LMU	VKU	Processing the info from the LL. Drought issues important-trying to connect with local forest stakeholders.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	12 August LL in Albania, also internal meeting three countries to discuss the results and prepare for the transboundary LL. Reports discussed and how to combine and present the result. Each Thursday internal meetings planned to plan the transboundary LL. Date in September to be confirmed. 23 August meeting with WP5 about solutions. Modelling: Collecting data.
CS#5: Canary Islands	ULL		Not present
CS#6: Black Sea	AUTH		Dates for WGs in Bulgaria (8/09) and Turkey (16/09). Romania TRC. October 10 the LL to take place. Collecting data (fieldwork).
CS#7: Southern Denmark	EM	TUD	Meeting on Tuesday, preparing for the workshops. Final decisions about the participants next week. Workshops to take place in September. 07/09 Physical meeting planned for all the DK partners to plan the activities in general. Practical exercises on land use planning with the software tool (Damage-cost assessment model for flooding developed by LNH), as capacity building, probably also helpful for the LL.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting yesterday, discussing the electricity transformers and technical details on how they are going to be implemented. Also about dependencies. Data found about boundaries (railway and road)
CS#9: Sardinia	AGRIS	UT, LMU	Not present
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Not present
WP3	TUD	LMU	T3.1 and D3.1. Discussion WP3/WP4. Deadline in January. To be ready by Jan 10. Information earlier needed (around October). TOC next week. 2 types of models to be included (Mehdi-linked to T3.1 and Otto-linked to T3.5) Generic example from CS#8 but more CS can be added. T3.3 D3.2 M12: Working on it. All the CS will receive requests on Monday to provide info for this Deliverable. (Scenarios and Guidelines). Deadline TBC on Monday. WP3 side meeting planned for the GA in Tenerife.

WP4	UNEXE	ICCS	From WP3: Working on linking the distributed simulation (T3.5) with the knowledge graph.
WP5	BRC		Next week meeting with CS#3 and CS#4. Special sessions during this time slot about open tenders from September
WP7	AUEB		
WP8	GAC		Working on D 8.5 (first draft)

August 25, 2022

- Agenda for the GA to go public on August 26
- Discussion about 5 reviewers for the end of September with Giannis.
- Deliverables for end of September
- D2.1 (ATH)
- D3.4 (DTU)- Reviewer identified by Ralf
- D4.6 (ICCS)- Knowledge Graph (ICCS)
- D8.5 (GAC)-Exploitation
- D8.6 (WE)- Policy brief.

Milestones

1. MS21- Co-creation activities with stakeholders (WP2)

2 MS5- (WP2) stakeholder material (ATH)

3. MS9- DTU- common climatic baseline

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		No meetings, working on data analysis. Collaboration with EYDAP being investigated. Demonstration around Dexameni tree-tank project (planting/greening). Perhaps inclusion of EYDAP through the tenders (to be examined).
CS#2: Mediterranean ports	AUEB		No meetings in August. Starting again on Aug 29. LLs in Limassol and Valencia concluded and currently analysing the results.
CS#3: Main River (Germany)	LMU	VKU	Internal meeting, also with VKU about the summary of the LL to be sent to the participants. Revising the list of invitees for the future (especially about forestry stakeholders). Meeting with WP5 took place.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Today internal meeting with all the partners about the results of the LLs, next steps and activities and the related logistics. 23/09 date fixed for the transnational LL. Also meeting with WP took place this week (23/08). Analysing the similarities and differences of the 3 national workshops with WP5. CS data files and folders being arranged. Data are being collected.
CS#5: Canary Islands	ULL		Not present
CS#6: Black Sea	AUTH		Preparing the working groups and LLs. WG Bulgaria 9/9, Romania 14/9, Turkey 16/9. LL scheduled for 8/10. Evaluation of for the LL received and working on it. Preparatory meeting planned for next Tuesday. Working on field work, interesting material from Romania.
CS#7: Southern Denmark	EM	TUD	Meeting planned for tomorrow. Preparing the LLs for the end of September. Danish partners' meeting on 07/09 (brainstorming)
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting yesterday. Discussion about electricity substations and cascading effects. Speaking to SWW about data and approval (docs). Preparing for the LL (planned for September 22), e.g. agenda details.
CS#9: Sardinia	AGRIS	UT, LMU	Not present
Task 6.2	UT		

Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Not present
WP3	TUD	LMU	Preparation for D3.1 and D3.2 (special presentation by Martin) about the information we need from the CS. Together with WP4, WP6, WP7 we discussed the agenda of the GA.
WP4	UNEXE	ICCS	See WP3
WP5	BRC		Meetings with CS about the LLs (see details above), also discussing the open tenders. Preparing document with questions from the CS. The document will be on the common folder for 2 weeks and final presentation (online during this timeslot) after that (around mid-September).
WP7	AUEB		
WP8	GAC		Deliverable 8.5 being prepared (end of September), collaboration with WP5 for this. To be ready by mid-September. Expecting responses by WP5 (Gloria) and Giannis, probably also from CS leaders.

September 1st, 2022

- Clarifications about the template (models) for WP3 provided by Martin (DTU)
- Event in Thessaloniki (Thessaloniki Sustainability Summit) about sustainable energy. Nikos (AUTH) to send invitations for project people to join. Synergies with UN network. September 14. Dimitris to update Chrysi.
- Fill in the 1st workshop reports by Sep 9 (WP2).

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Exploring models to be used for the SDM (sub-models), mostly on the social sciences content. Collecting data (e.g., exposure etc.), exploring synergies with other projects.
CS#2: Mediterranean ports	AUEB		Meeting on Monday, discussing about the workshop (Piraeus-06/09). Discussion about the WP3 template too.
CS#3: Main River (Germany)	LMU	VKU	Finalising the report about the 1st workshop. Approaching new/other stakeholders that did not participate in the 1st workshop. Meeting (for graduate students) about innovation for the region (about the 2nd workshop or after). Linked also to the open call. To be reported also as a Diss activity (WP8). Participation in a workshop on Energy (Local level) (DECIDE project). ARSINOE to be included and explore synergies.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting today (CS#4). Preparation of the transboundary LL (Sept 20). Preparing the report from the workshops. Sep 7 meeting with WP2 about the LL. Working on the template for WP3. Collecting data and working on modelling.
CS#5: Canary Islands	ULL		Not present.
CS#6: Black Sea	AUTH		Meeting last Tuesday. Organising the WGs for next month. Participation of WP2 in the meetings. F2F meetings offered by WP2. Filling the template for WP3, one uploaded.
CS#7: Southern Denmark	EM	TUD	Meeting yesterday, focusing on the LLs (draft programme and teams-22/09). 2nd workshop invitations to be sent next week. Meeting with WP2 on 13/09. 07/09 physical meeting planned, also for modelling components (all Danish partners)
CS#8: Torbay and Devon County	UNEXE	TC	Meeting yesterday. LL reminders to be sent to the participants. Next weekly meeting joined by Torbay Council for details. Working on filling the templates for WP3. Starting working on restoration curves (Alex), gathering also info from past events. Looking into the possibility to collect info from the Pakistan floods that could be relevant for us.
CS#9: Sardinia	AGRIS	UT, LMU	Working on the date for the 1st workshop (with WP2).
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Working on the post-workshop and pre-workshop preparation with the CS.
WP3	TUD	LMU	**Fill –in the template-Deadline September 9.** Finalised the agenda for the GA.

WP4	UNEXE	ICCS	Finalised the agenda for the GA- with WP3-Order of presentations.
WP5	BRC		Working on FAQs for the open tenders Link: https://uthnoc.sharepoint.com/:w:/r/sites/ARSINOE-WP5/Shared%20Documents/WP5/Task%205.2.%20Open%20Tenders%20for%20Innovations/ARSINOE_FAQs%20on%20Open%20Tenders.docx?d=w9bdcb911f32342109729bc26ac9c38b4&csf=1&web=1&e=zBTdR9 To be kept open for the next 2 weeks. It is also under WP5 Files folder on Teams.
WP7	AUEB		Regular meetings to start in September. Initially bi-monthly. Define the profile of the participants for these meetings.
WP8	GAC		Request by Lisa (on Teams-General) Technologies for the Case Studies to tick the types of technologies to be used at each CS. **CS leaders to respond by next week.**

08/09/ 2022
Announcements by CS#6 (AUTH):
Announcements (we will upload the announcements on Teams):

September 14th, 2022

"Thessaloniki Sustainability Summit – Sustainable Energy", organized by UN SDSN Black Sea

The 2022 "Thessaloniki Sustainability Summit" aims to bring together scientists, local authorities, politicians, entrepreneurs, and other stakeholders to discuss a topic of global interest, sustainable energy. The international character of the annual Thessaloniki Fair provides an excellent opportunity for bringing together experts from all over the world. The topic of the summit "Sustainable Energy" is in accordance with the Agenda 2030 and the United Nations' Sustainable Development Goals (UN SDGs) as well as the European Green Deal. The 2022 "Thessaloniki Sustainability Summit" will comprise a series of round-table discussions focusing on subjects of interest. The participation of scientists, government officials and other stakeholders from various countries, promises high-level panels expected to lead to interesting conclusions and outcomes.

(http://sdsn-blacksea.auth.gr/projects/thessaloniki-sustainability-summit-2022 and https://www.thessaloniki-helexpo-forum.gr/el/schedule)

September 27th-28th, 2022

"BRIDGE-BS: Black Sea High-Tech Summit (Varna, Bulgaria)", organized by Middle East Technical University

The High-Tech Summit for the Black Sea is organized to create a supportive environment for companies, start-ups, organizations and universities to exchange, present and discuss their latest technological developments, debate the most recent discoveries, participate in matchmaking events, and generate business ideas in blue economy sectors. The Summit will also be instrumental in launching the new initiative aimed at accelerating the uptake of sustainable technologies across the Black Sea.

(https://bridgeblacksea.org/)

-No central decision for these 2 events. Up to the partners if they want to present .
-AUTH in Teams (announcement), GAC for the website (announcement)
- ULL: All arranged for the GA (Tenerife). Minor changes in the programme announced.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Internal meeting about models (WP3). Question about timeline: clarifications under WP3.
CS#2: Mediterranean ports	AUEB		All LLs have taken place (national level), according to plan. International WG to be planned. Templates for Valencia and Cyprus sent to WP2. WP3 model templates to be finished by tomorrow.
CS#3: Main River (Germany)	LMU	VKU	Internal meeting took place WP2 report almost finished. Diss channels also discussed with WP5. Working also on data collection.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Preparing the LL (23/9) transboundary. Meeting with WP2 took place for the LL. 2nd meeting planned. Models finished for WP3. Working also on data collection.
CS#5: Canary Islands	ULL		Meeting on Tuesday. Preparing the models for WP3. Meeting with WP2. Finished the mental map and the report from the LL.

CS#6: Black Sea	AUTH		Update by email on the progress. Workshops planned and organised for the 3 countries. 9,14 and 15 September (Bulgaria, Romania, Turkey respectively).
CS#7: Southern Denmark	EM	TUD	All day workshops took place with all the CS people. Focus on the damage cost assessment with the municipalities, using a tool prepared by TUD. Meeting with WP2 on Tuesday to finalise the agenda for the workshops (22-29 September).
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting with WP2, discussing the workshop on September 22 for CS#8. Preparations ok. Models uploaded to the Teams files. Further discussions about data for CS#8 and past extreme events (restoration times etc.)
CS#9: Sardinia	AGRIS	UT, LMU	Field experiments progressing. 1st workshop LL between 20-25 October, Date TBC tomorrow. Models –deadline tomorrow LMU in contact.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	No further additions (details under each CS). Finalising D2.1 to be submitted for review on September 23. Reviewer: Charis Stavridis (AUTH)
WP3	TUD	LMU	Question about timeline (for the model templates): To fit into the Resilience Framework. For now it is informal to be updated later. Discussion about the interactions among different tools/models
WP4	UNEXE	ICCS	No updates
WP5	BRC		Not present
WP7	AUEB		
WP8	GAC		WP meeting took place today. Finalising D8.5

15 September 2022

- WE Announcement (Loic) about the Policy Brief: Share the name of the "right" person for each CS for the Policy Brief. Under WP6. Deadline 19/09/22
- WP5: Introductory presentation for the open tenders (22/09/22)-Presentation to be recorded and uploaded.

Tenerife: Bring warm clothes at the meeting (La Laguna)

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Finalised the model list for WP3. Working with collected data, using DB for trees, temperature etc. to link with maps. Progress in the Citizen Science feature. MINCA ready in Greek in October, then citizens to be involved.
CS#2: Mediterranean ports	AUEB		LLs completed for all the ports. Model list uploaded (WP3). Discussion about mental mapping for Valencia and Cyprus. Mental mapping for Piraeus next week.
CS#3: Main River (Germany)	LMU	VKU	Regular meetings with MSc students. Finished report for WP2. Additional meeting with stakeholder who was not present in the LL.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting GR-AL-MK (9/9) for the transboundary LL. Another meeting today. On Monday final rehearsal for the transnational LL. (4 languages to be used-Agency hired). Model list finalised. Collecting also the data for the modelling.
CS#5: Canary Islands	ULL		Model list for WP3 finalised. Meeting with a company about an innovation they are developing for the call tenders. Communicated with WP5 this info.
CS#6: Black Sea	AUTH		On Tuesday (13/9) we had our CS6 meeting, where we discussed, amongst others, the procedures that need to be followed during the national Working Groups. The Bulgarian Working Group took place last Friday (9/9), the Romanian one today (14/9), while the Turkish one is scheduled for tomorrow (15/9). We asked our colleagues to gather the results of the Working Groups as soon as possible, to that we can introduce them in the Living Lab which is scheduled for October 10th.
CS#7: Southern Denmark	EM	TUD	No meetings. The two LLs have to be postponed, new dates 11-12 October. Meeting about the preparation planned with WP2.
CS#8: Torbay and Devon County	UNEXE	TC	Internal meeting, sorting the logistics for the LL for 22/09. Meeting after the LL on 28/09 with WP2 to discuss the LL. Transportation data to be collected. Looking also at the restoration data (historical data).
CS#9: Sardinia	AGRIS	UT, LMU	List of models finalised and uploaded. Internal meeting about the technical characteristics of new sensors for the next season (irrigation). Genotypes analysed (durum wheat). New date for the LL: September 27, preparing documents and invitations.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		

Task 6.5	KWR		
WP2	UT	AUEB	Overview about the workshops: reports obtained from all the workshops that took place before the summer: Issues: Mental maps- refinement needed to avoid repetitions, but do not change the structure. As Example: CS#1,CS #3 and CS#5 please look at them. Working on the deliverable (2.1). Overlapping is happening between 1st and 2nd workshops in some cases. Please all follow the procedure outlined by WP2.
WP3	TUD	LMU	All CS have uploaded the models (😉) final processing taking place.
WP4	UNEXE	ICCS	Discussions about the dashboard, in preparation for Tenerife. D4.6 is being prepared (UNEXE-Gareth, to review)
WP5	BRC		See announcement. Separate contacts as needed in preparation for Tenerife.
WP7	AUEB		
WP8	GAC		See announcement. Working on D8.5. Answer missing from LMU/UNEXE: Cascading effects for CS#8, CS#7 and perhaps for CS#3. Interviews to be released shortly. 2nd workshop with sister projects at the end of the month.

22 September 2022

General issues:

WP5: Introductory presentation for the open tenders WP5. Presentation is recorded and available for all partners from the WP6 directory in Teams:

https://uthnoc.sharepoint.com/:v:/r/sites/ARSINOE/Shared%20Documents/General/WP%206/WP6%20-%20Meetings/recordings/ARSINOE-WP6-Teleconference%20with%20all%20the%20Case%20Studies-Regular%20weekly%20event-20220922_140221-Meeting%20Recording.mp4?csf=1&web=1&e=LLUVo3

Link to PPT:

https://uthnoc.sharepoint.com/:b:/r/sites/ARSINOE/Shared%20Documents/General/WP%205/ARSINOE%20PPT%20Template%20Open%20Tender%20for%20Innovation%20-%20WP6%20call%2022.09.2022.pdf?csf=1&web=1&e=rAfjVg

FAQ is online in Teams – link:

https://uthnoc.sharepoint.com/:w:/r/sites/ARSINOE/Shared%20Documents/General/ARSINOE_FAQs%20on%20Open%20Tenders.docx?d=w227adcd48eb847d0ad035e1e7c1a697b&csf=1&web=1&e=33Wfzb

Questions: call after the third workshop -> output from LL will be much clearer after the third workshop. It makes sense to apply for the open call after the third workshop (third workshop will focus on backcasting). For CS3 – it makes most sense to follow the above as this will be needed to understand what the stakeholders need.

Answ: Geraldo – WP5 is a service work package, so we can accommodate this approach.

Carola – do all CS have to participate at the same time? Workshops are being rescheduled, and some CS will have their 2nd LL at the same time other CS are still organising their first LL.

Answ: of all are synchronised it would be easier, but unfortunately this seems to be impossible. Do we want to open a call for those that are ready or do we offer them room to connect to the calls when they are ready. Gerardo – the reason for going for two calls we partly this eventuality and being able to deal with it.

Teresa: how is the clustering of topics planned, or is it possible that one CS has their own specific individual call?

Answ: from work done so far, it is apparent that clustering will be possible. All CS will be able to review the text for the open tender, and specific items can be added at that stage.

Teresa: how do we deal with local issues, such as languages. These can/will be case study specific.

Answ: calls are European, will go out in English. Translation can be organised if CS think it is necessary. The solutions to be piloted will have to be localised. This is however fully in the power of the CS to organise this in the selection process and the contract set up with the contractor. Each CS has its own funds allocated, and they are to be used by the individual CS. Each therefore can set up their own contract with a tech supplier/innovator.

Teresa – is it possible to provide an example for a call.

Answ: will be provided from a previous call process. More detailed to be provided during the meeting in Tenerife.

Joep: do you expect responses from innovators that submit ideas specific for individual cases? What information do we provide concerning the cases in the call text.

Answ: case studies to point out the relevant information to be used/referred to.

Manon: approach seems tailored towards technical innovation. Is social innovation also possible?

Answ: we need to discuss how to further develop the materials, incl. Selection criteria, to facilitate this.

Isabelle: already noticed that for several CS the governance aspect could be the issue that requires innovation.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH	ICCS	Weekly conf call held on Tuesday. Focus on modelling spec with inputs and outputs coming from the Athens case study, and how to describe climate hazards. Discussion on best way to represent hazards and indicators. Will make an attempt and then intend to share approach with other case studies.
CS#2: Mediterranean ports	AUEB		Not present – update provided by email: During our meeting on Monday we discussed for the corrections in mental mappings requested by WP2. The final version of the mappings for Valencia and Limassol were uploaded. During the next week we expect the mental mapping of Piraeus will also be delivered to WP2.
CS#3: Main River (Germany)	LMU	VKU	Regular meeting held. 2nd LL being planned – to be held 18 November. New stakeholders are being approached for this meeting. Drafting comments on policy. Last documents for LL (WP2) have been submitted. And working on WP6 presentations for the annual meeting. Template still to be circulated.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Final preparations for first transboundary LL. To be held on sept 23. Last meetings to prepare 16th and 22nd of September.
CS#5: Canary Islands	ULL		Not present

CS#6: Black Sea	AUTH		Finished all 3 working group in the separate countries. In discussion with WP2 on feedback and how to prepare the reports. LL scheduled after the annual meeting, invitations to be sent in the coming days.
CS#7: Southern Denmark	EM	TUD	First workshop was planned for today, but postponed as one of key participants could not make it. Esbjerg meeting postponed also. Now to take place on 11-12 October. Feedback from WP2 for mindmap process has been received.
CS#8: Torbay and Devon County	UNEXE	TC	Workshop LL is taking place today. Discussed about LL details and preparations. Working on annual meeting presentations. Discussed about data requirements and collection for modelling (information that is needed from stakeholders-expected input after living labs).
CS#9: Sardinia	AGRIS	UT, LMU	Preparation with first LL for September 27. Inspected location for the physical meeting, materials prepared. Ensuring presence of all stakeholders. Much effort being put into getting representation with good gender balance.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Finishing D2.1 - waiting for internal (WP2) feedback. To be shared with reviewers tomorrow. Date for training for 2nd workshop still lneeds to be set. Currently being discussed.
WP3	TUD	LMU	Feedback from reviewer D3.4 has been received. Final version expected next week. Planning workshop for annual meeting.
WP4	UNEXE	ICCS	Feedback for D4.6 has been received, final version expected next week ready for submission. Session on knowledge graphs to be prepared for Tenerife. Would be helpful if the CS look at the deliverable before the meeting. Link to be provided to all CS participants.
WP5	BRC		See comments above on presentation.
WP7	AUEB		
WP8	GAC		Link to subscribe to newsletter has been shared through teams – but many have not registered yet. Please to all – subscribe.

DATE 29/09, 2022

- Final update about the WP6 session preparation for Tenerife
- Last info about Tenerife: 4/10 Dinner at the hotel (roof garden). 5/10 dinner by bus to dinner, 6/10 visit to the Observatory and El Teide. From the South: There are buses to La Laguna (Line 20).

Deliverables/Milestones:

- D2.1: Ready
- D3.4: Ready
- D4.6: Ready
- D8.5: Ready
- D8.6: Ready- Lydia to have a look.
- MS5: not to be submitted now-it will be moved, because the date is not correct. To be explained in the portal. It will be moved 2 months later. Giannis to explain at the portal
- MS9: Ready
- MS21: Linked to WP6 (T6.2) Ebun to send the text to Giannis.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Each team worked separately. Feedback from each team (7 teams). Preparation for Tenerife. Effort to link hazards/damages to indicators (TBD in Tenerife). Linked also to the Resilience Assessment.
CS#2: Mediterranean ports	AUEB		Working on LLs, Finalising mirror maps, no meeting this week. Meeting WP3/Phoebe discussing connections between WP3 and CS#2.
CS#3: Main River (Germany)	LMU	VKU	Working on the 2nd LL, contacting stakeholders who did not attend. Planned for November. People from forestry and from vineyards to be included.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	23/09 LL took place. 22/09 Internal meeting with the CS partners. Preparing the Miro. AL meeting with WP2 about their national LL. 30/9 MK meeting with WP2. Modelling team working. Team for social analysis to start working from October.
CS#5: Canary Islands	ULL		Meeting about policies. Final info about Tenerife.
CS#6: Black Sea	AUTH		WGs/LLs finished at country level. Working on feedback. In contact with WP2 about the processing of the material. Preparing for the international LL.
CS#7: Southern Denmark	EM	TUD	Not present, but excused.
CS#8: Torbay and Devon County	UNEXE	TC	LL took place on September 22 with success. Meeting yesterday, WP2 (Carola)attended too. Working on the mental mapping. Additional stakeholders have been identified. Identified importance on community engagement. Working on the report. Preparing for Tenerife
CS#9: Sardinia	AGRIS	UT, LMU	1st Workshop /LL on 27/09, successful. Working on the mental mapping. Online meeting with Carola (WP2) and Gloria (WP5) about the LL and the next steps (I.e., the 2nd LL- February-March 2023). Field activities also took place. Processing

			technical seed. Selecting wheat genotypes as ARSINOE innovations.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Reported above for each CS
WP3	TUD	LMU	NOTE: All the CS to examine the implications of the current situation (energy and climate crises) to be included in the CS. TBD in Tenerife. Perhaps beyond the regular meetings (e.g. increased CO2 emissions) -Questionnaire to be circulated after Tenerife. Task 3.5 discussion needed in Tenerife.
WP4	UNEXE	ICCS	
WP5	BRC		Ready for Tenerife, where they will present the open tenders. TBD in Tenerife. Video received by 1 innovator. Template for innovators prepared.
WP7	AUEB		
WP8	GAC		

DATE 13/10/2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting held. 2 main points discussed: 1. Started organizing 2nd LL workshop (planned for 6 December), additional stakeholders to be considered, working on 1st LL follow-up document 2. Joint activities with Cost for Cloud project being pursued, ARSINOE to be presented at the 22/10 project activity
CS#2: Mediterranean ports	AUEB		Regular meeting held, AUEB meeting with PPA to finalize report for WP2, working on creating mental map for international working group
CS#3: Main River (Germany)	LMU	VKU	Preparation for 2nd LL , 18/11, invitations sent out, additional stakeholders to be invited, summary of 1st LL sent to 1st LL stakeholder participants
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Working on 1st LL report and results, post-LL communication with stakeholders who participated on 1st LL, modelling activities continuing
CS#5: Canary Islands	ULL		Invitation for activity/event organized by the university sent out to 1st LL participants,
CS#6: Black Sea	AUTH		
CS#7: Southern Denmark	EM	TUD	1st LL held on Tuesday (11/10), 11 different stakeholders participated (missing 4), working on reporting, preparations for next workshop (to be held probably in December), remarks to add more participants, LL focuses on Esbjerg municipality
CS#8: Torbay and Devon County	UNEXE	TC	Regular meeting held, discussion about modelling details
CS#9: Sardinia	AGRIS	UT, LMU	Reviewing the information collected during the 1st workshop, digitalized mental map, reformulation of CS problem and objectives statements, to be shared with stakeholders before final report
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	7/11 at the morning : Training for 2nd LL workshop organized by WP2 for the Case studies. Case studies that cannot attend please report timely
WP3	TUD	LMU	
WP4	UNEXE	ICCS	
WP5	BRC		
WP7	AUEB		
WP8	GAC		

20 October 2022, 2022

Template for the reporting uploaded and discussed (KWR)

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Preparing the next workshop (December 6-agenda, material etc.) Collecting data about the trees (support from the municipality of Athens)
CS#2: Mediterranean ports	AUEB		Meeting last Monday. Mental maps from the 3 ports presented. Discussing the integration of the 3 mental mappings. Integrated mental mapping to be ready by the end of next week.
CS#3: Main River (Germany)	LMU	VKU	VKU conference ARSINOE presented, (Photo included) with members of the government. Links with Academia fostered. Organizing the 2nd workshop.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Working on the report for the LL and the mental map, collecting data (mostly AL), working on modelling (socio-economic analysis) meetings with municipalities.
CS#5: Canary Islands	ULL		Internal meeting (Tuesday). Rural women's day celebration at ULL, stakeholders invited, ARSINOE mentioned. National funding will use the ARSINOE sensors for it. (Important impact of the project)
CS#6: Black Sea	AUTH		LL took place 17/10/2022. Participants around 35 people (17 stakeholders from all the countries and different sectors), some "silent", 10-11 were active in the event. AUEB participated too. Preparing the mental map.
CS#7: Southern Denmark	EM	TUD	Not present
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting on Wednesday. Talking to the Environment Agency (flooding). PhD student to be involved from another related national/local project.
CS#9: Sardinia	AGRIS	UT, LMU	Revision of material from the LL-updated version sent to the stakeholders. Material and report to be finalized next week. List of technical equipment needed for the next season finalized and purchase procedures in progress. Presentation Nov 11 at ECOMONDO.
Task 6.2	UT		Improvement on the template for the report to be uploaded.
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Material for the 2nd workshop ready (UT-Carola). Training on Nov 7 (invitations to be sent) 9.00-11.30 CET- **All facilitators need to attend**. To be recorded too. Working on interactions with WP5
WP3	TUD	LMU	
WP4	UNEXE	ICCS	Dashboard discussion-meeting next week. Nav discussion on improvements for the wheel regarding including policy.
WP5	BRC		Nov 3 to be discussed in plenary.
WP7	AUEB		
WP8	GAC		

27 October 2022

Giannis (WP1):

1. We need to think how to report the work for each CS at a horizontal scale.

- Each WP leader will need to define from each CS.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Weekly meeting last Tuesday, preparing 2nd Workshop (Dec 6), adding stakeholders, follow-up material being prepared. Main topic to come to the vision of the CS. SDGs also to be discussed again. Working on material with ELIAMEP to be added from another project for synergies. Data: data about the trees found, more data are being sought. Data entered in GIS. Discussing also about input to the Resilience Framework and to the Knowledge Graph.
CS#2: Mediterranean ports	AUEB		Regular meeting on Monday. Working on the Mental Map (generic from the three ports). Identifying the port assets and vulnerabilities. Arranging meeting with them. Discussing the inputs for the Resilience Framework.
CS#3: Main River (Germany)	LMU	VKU	Bi-weekly meeting took place. Organising 2nd workshop for November 2022. How to encourage creative thinking for the vision. Info from other CS on the matter (e.g. the use of moderators to encourage creativity)? Info sought. Response by UNEXE.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Working on the report on the MIRO to be sent to WP2 tomorrow on the common issues (transboundary). Modelling team working entering data, discussion about AL data.
CS#5: Canary Islands	ULL		Working on the report, more detail on the data part needed. Meeting with a company working on treatment for water for irrigation. Invited to the next workshop.
CS#6: Black Sea	AUTH		Meeting last Tuesday. Presenting the document for the CS (reporting). Working on the reports from the LLs. Meeting planned for next week with all the CS partners.
CS#7: Southern Denmark	EM	TUD	Meeting on the LL workshop (follow up) discussing the mental map. One more meeting needed before WP2 feedback.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting yesterday about the knowledge graph and coupling with hybrid modelling. Discussing also work for 3.1. Alex starting work on flood modelling. Also separate meeting on the dashboard last Monday.
CS#9: Sardinia	AGRIS	UT, LMU	Material from LL sent out to the stakeholders for comments and feedback. Included in the WP2 template and uploaded on Teams (translated in English). Last Tuesday meeting with all the partners. Preparing presentation for the ECOMONDO.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Guidelines for the workshop given to all the CS, updated document with more details. There were questions about the

			SDGs. Decision: Work will be done before the meeting by WP2. **All CS are required to read the guidelines before the training sessions**. Activities are split into compulsory and additional ones. Everyone needs to follow the compulsory activities. To be circulated tomorrow. Invitations for the training by ATHENA
WP3	TUD	LMU	No specific news. Ralf and Martin at the EUCRA event (Climate Risk Assessment-Mini ICCP report for Europe). They were appointed at the special advisory group. ARSINOE results relevant for it.
WP4	UNEXE	ICCS	WP4 meeting about the dashboard. Definition of viewer categories and functionalities. Discussion about links between the knowledge graph and the hybrid modelling (CS#1 Athens working on the first view of the knowledge graph). The schema will be the same for all the CS.
WP5	BRC		Meeting WP5-WP2 and coordination team to shape the open calls. WP5 working on document with definitions and instructions next week. Synergies between WP2-WP5 going well.
WP7	AUEB		Meeting with WP1 next week and then announcement for the WP7 meetings (bi-monthly). List of participants TBD early next week.
WP8	GAC		Synergies with EUCRA to be included in the diss actions and the follow-up. VERY IMPORTANT.

November 3, 2022

- Sections for WP2 added to the reporting template.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Weekly meeting: Data collection ongoing (transport, Airbnb, green areas of Athens) socio-economic info sought (Charokopeio) heat island: Data obtained for the centre; data sought for the peri-urban area. Classification of stakeholders (horizontal), affecting all the CS (ongoing for assessment for all the CS, stakeholders by sectors, to be used for activities). Working the Resilience Framework (including bilateral meetings with other partners). 2nd LL scheduled for Dec 6.
CS#2: Mediterranean ports	AUEB		Weekly meeting: Working for the mental mapping for the international group, also on the vulnerability analysis for the 3 ports, discussion on resilience framework, discussion also on the dashboard, collecting info.
CS#3: Main River (Germany)	LMU	VKU	Preparing the 2nd LL, brainstorming for the activities for the next 6 months.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Reporting for WP2 completed, working on the reporting for the 18 month period. Modelling: initial assembling of data (temperature, precipitation for the whole region-measured data, also river flows). GR: 10 years data available only. Resolution grid 12X12 km. AL: they have data 50 km away from the site. Need to purchase the data for the AL stakeholders to be able to make decisions on solid data. No funding on the AL side. MK to help with allocating budget.

CS#5: Canary Islands	ULL		No meeting this week (holiday). Data to be collected in December through the campaign in La Palma. Working on existing data.
CS#6: Black Sea	AUTH		Meeting last Monday with WP2 about the LL. Hosting UTH tomorrow for the implementation of the SDM. Started preparing for the next LL.
CS#7: Southern Denmark	EM	TUD	Working on the report from the LL. Preparing for the WP2 meeting next week. 2nd LL planned before Christmas.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting yesterday. Working on the M1-M18 report, discussion about the dashboard-setting up a meeting with Torbay about the flooding visualisation needs. Preparing for the 2nd LL (Brixham- February). Sensus data are coming out of interest for ARSINOE.
CS#9: Sardinia	AGRIS	UT, LMU	Working on the report. Starting to plan activities with the stakeholders before the 2nd LL (planned for February). Preparing for the ECOMONDO presentation (Marco).
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Webinar planned for Monday (training) for all the CS. Link on Teams. All the facilitators need to attend. Emailing AUEB and UT when uploading reports from LLs on Teams at the WP2 subfolder.
WP3	TUD	LMU	Working on D3.1 and also on the refinement of the Resilience wheel in relation to the dashboard.
WP4	UNEXE	ICCS	Working on the dashboard. Draft of the dashboard on the Miro.
WP5	BRC		Open tenders 1st call – Mid January 2023. Working on the definitions, to be shared when finished. Identifying which CS will be ready to go for the 1st call- creating the selection committee-info to be provided. Getting in touch with each CS separately.
WP7	AUEB		WP7 invitations for weekly meetings. Main list uploaded in WP7 subfolder. 1 person from each organisation participation for WP7. Persons familiar with the related CS.
WP8	GAC		Two updates: Meeting with BRIGAID- end of month GAC, BRIGAIN and Energ Global. Video to be shared today. Sharing about 2 per month. Subscription to the newsletter.

November 10, 2022

- **Please all CS upload the reports from LL1**
- **Please let Isabelle and Carole (WP2) know the date of the 2nd LL for each CS, as soon as you know it.**

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Weekly meeting, 2nd LL to take place on Dec 6, Stakeholder, list finalised, some new ones. Invitations to be sent shortly. Climate data collected (1981-2000). To be used to validate the data coming from the models (?TBD with Ralf-WP3).
CS#2: Mediterranean ports	AUEB		Weekly meeting took place. Working on vulnerability analysis on port operations (1st meeting today with PIRAEUS). Physical meeting on Dec 7-Athens with participants from CS#2 (all ports). Working on the report offline.
CS#3: Main River (Germany)	LMU	VKU	Preparing the 2nd LL (on Nov 18). Participated in the training workshop. Meeting with WP2 planned.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Working on the report, attended the training workshop. Data from AL –no news, to be reported next week.
CS#5: Canary Islands	ULL		Conama congress (https://2022.conama.org/) invited to represent ARSINOE (Noelia as a speaker)- Dynamic Room 1. Collecting data for the aquifer from local sources too from the islands). Focusing on the aquifers for the moment.
CS#6: Black Sea	AUTH		Not present
CS#7: Southern Denmark	EM	TUD	Meeting on Tuesday, also meeting with WP2. Next LL planned for January 2023. Issue discussed with WP2: Short time between 1st and 2nd LL, but accepted by WP2.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting, Discussion on cascading effects and damages. Looking on wider expansion of attributes and transfer the results for the whole Devon area. 2nd LL in February 2023. Meeting UNEXE/TORBAY discussing former floods and reactions to get data for the dashboard (extra 2 hour meeting).
CS#9: Sardinia	AGRIS	UT, LMU	Presentation at ECOMONDO. Preparing the agricultural activities. Working also on the report.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Reports from LL1 to be uploaded. Next week WP2 will provide the template for the 2nd LL reporting. Recording from the training workshop (Nov 7) uploaded.
WP3	TUD	LMU	Presentation of the SDM from CS#1 as an example, to take place during the WP3/WP4 meetings (after Christmas). Went through all the Tasks in WP3/WP4 and upcoming Deliverables. T3.7 status is unknown. Martin to find out through Giannis.
WP4	UNEXE	ICCS	Mixed meeting with WP3. Review of all the tasks.
WP5	BRC		Participated in the WP2 training workshop. Receiving comments about terminology regarding the open tenders. Prepared the 1 page memo for the open tenders. Open tenders starting in mid-January 2023, depending on the dates of the LLs

			(Starting with CS#1 and CS#3). Time: Open for 3 months, followed by evaluation.
WP7	AUEB		Meeting last Monday-Presented the structure of WP7. WP7 meetings to start with weekly meetings. List of attendees defined.
WP8	GAC		Released the video with the interview by Chrysi, sharing on Social Media. Newsletter with REGILIENCE + mapping of all the CS from the 3 projects, to be released soon. Video of Marko on Italian TV.

17 November 2022

- **Please all CS upload the reports from LL1**
- **Please let Isabelle and Carole (WP2) know the date of the 2nd LL for each CS, as soon as you know it.**

Reminder to all case studies – first open call to be launched in January – CS to indicate whether they are ready. WP5 to contact each CS directly.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting held on Tuesday. Focusing on prep of 2nd stakeholder meeting on December 6th. ~34 people expected/invited. Additional stakeholders added compared to first meeting. Materials to be shared with participants in preparation. New participants to be brought up to speed before the workshop. Alice to join regular CS1 meeting to check whether preparations are in good position for this workshop. Athena presented on VR application to be used in CS1 regular meeting. CS1 as frontrunner case will test developments – possibly in Piraeus port. Before assessing potential to expand this work to other CSs. Data collection – under umbrella of resilience framework to determine how this can be used to organise/streamline data collection (both collected data and potentially still missing data).
CS#2: Mediterranean ports	AUEB		Regular meeting held on Monday. Physical meeting to take place on December 7th with all CS2 participants in Piraeus. 2nd LL to be scheduled for end of Jan – early Feb 2023. Meeting with port authority in Piraeus held for vulnerability analysis related to port operations and infrastructure – 1 or 2 more meetings needed (expected). Similar meetings to be started with port of Limassol.
CS#3: Main River (Germany)	LMU	VKU	Busy organising 2nd workshop (November 18th). Meeting with WP2 to finalise preparations. New stakeholders will join this second workshop – these have been brought up to speed. Information about call for tenders to be included in the workshop.

CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	15th November internal meeting held. Preparations for 2nd living lab started. Expected date in February, after working groups in January. Newsletter to be published before 2nd living lab. To be published in 3 languages of the CS plus English. SDM discussed with Nikos – data requirements discussed. NECCA had meeting with WP3 regarding SDM, collected data is being transferred. Additional data requirements identified and being collected (climatological, hydrological).
CS#5: Canary Islands	ULL		Internal meeting held on Tuesday. Data collection – temperature from national climatological station being expected. Stakeholder list being revised in preparation for 2nd LL session to be held in January. Contact established to local politician (Govn of Canary Islands) who would be good candidate to participate – meeting in December to take place for pre-discussion.
CS#6: Black Sea	AUTH		Nikos reports back a little from COP27 – very relevant for ARSINOE. CS6 – wrapping up outcomes of LL -> finalising report – meeting with WP2 on 18th November to cover last open points. Tuesday next week regular meeting – contribution on SDM and use planned. Meeting to prepare for open call in January needed. To be discussed next week and will contact WP5 after that.
CS#7: Southern Denmark	EM	TUD	Present – but no news since last week.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting held on Wednesday. LL no. 2 schedule for early February. Date to be agreed and invitations expected to be sent next week. Meeting with Exeter council taken place. Trying to arrange that Uni Exeter will be invited to present at regional first responder forum (Local Resilience Forum – for all local authorities, first responders, water utility, environment agency – covers Devon and Cornwall, but focus on Torbay area for contacts for ARSINOE). Meetings on Dashboard development taking place.
CS#9: Sardinia	AGRIS	UT, LMU	Attended Ecomondo (Italy) to present ARSINOE activities. Presentation was filmed and will be uploaded in ARSINOE website. Technical – wheat being processed (agri food activities ongoing). Reporting template being completed.
Task 6.2	UT		Preparations for 2nd workshops in progress. CS3 is the first one to take place. As soon as dates are available – CS leaders to inform WP2 to start preparations. URGENT CALL All to keep in mind – workshops cannot be pushed back too much, as other activities depend on the outcomes. Try as much as possible to keep to the 6 months intervals between workshops in the periods planned.

			NB: innovation is about more than identifying innovators through the open calls. Time is required for implementation.
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Reporting on first workshops being finalised.
WP3	TUD	LMU	Progress being made on programming. No direct input from WP6 needed.
WP4	UNEXE	ICCS	
WP5	BRC		In next 2 weeks all CS will be contacted to check whether ready to participate in the January call. Of course all CS are free to contact WP5 (Gloria, Gerardo) pro-actively.
WP7	AUEB		Working on T7.1 and T7.2. By end of the month analytical guidelines to be sent to all CSs.
WP8	GAC		Continuing to work on movies shows in Tenerife. Working with BRIGAID team. Reminder – report all participation in events in the communication Excel file. Reporting deadline coming up soon – so report all communication actions immediately – to prevent missing/forgetting them!

ovember 24, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Meeting this week. Decision NOT to participate in the 1st round of innovations (not ready yet). 2nd Workshop Dec 6. Working on the SDGs for the 2nd workshop. Selected the appropriate ones (3-4 SDGs) for the LLs. Meeting with WP2 next week to organize the LL.
CS#2: Mediterranean ports			Meeting today, discussing about the 2nd LL. Final decisions on Dec 7 (Piraeus)-physical meeting, finishing also with the report-follow-up, revising also the list of stakeholders. Mid-December for Valencia, Limassol/Piraeus 15-20 Jan 2023. NOT participating in the 1st round of the open tender calls.
CS#3: Main River (Germany)	LMU	VKU	Miro board for preparing the SDGs (to show to the others/will upload slides to MS Teams) and relation to mental map. Last week 2nd LL held (successfully), variety in participants, good feedback, creative ideas from the collective work. Distributed postcards and asked participants to write down how they will contribute to realising their vision in 2023, will mail everyone "their" postcard in January as a kind of "new year's resolution". Participating in the open call in January. Have communicated to stakeholders that they will be given more info about the open calls in January. Excellent cooperation with WP2. Selected 6 SDGs.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Comms with the stakeholders. 2nd LL in February 2023, working on the PR. NOT participating in the 1st tender (not ready yet). Working on data collection-buying from AL agency.
CS#5: Canary Islands	ULL		Last Monday participation in CONOMA, special space for the islands, where ARSINOE was presented. Info about the other projects thematically related. Participating in the 1st open call. 2nd LL 24 January 2023, formal invitations sent. IN contact with WP2 for the preparation. Working on data collection-data collection campaign Dec 12-14
CS#6: Black Sea	AUTH		Finalised the report for the LL, working on the revision of the stakeholder list for the 2nd LL (filling gaps), working on the PR. Participating in the 1st round of open tender calls. Meeting next week to discuss this among the partners on how to proceed. Nikos attended the COP27-told us about it.
CS#7: Southern Denmark	EM	TUD	On Monday this week, we (Martin and I) had a follow up meeting with Carola from WP2 discussing the mental map. We are now going to make adjustments to the map and then – after retranslating into Danish – we will test it on a few pre-selected attendants from the first workshop, before sharing it with the LL-community. NOT participating in the 1st round of the tender call.
CS#8: Torbay and Devon County	UNEXE	TC	Normal weekly meeting-2nd LL Feb 9, Discussing links of CI and CI assets-work related to T3.1, working on the PR. NOT participating in the 1st round of open tenders.
CS#9: Sardinia	AGRIS	UT, LMU	Meeting last Monday with UTH about SDM for Sardinia (preliminary meeting). 2nd meeting planned for mid-December, Marco participated in ECOMONDO, received the films from the presentation, inserting the translation to upload the

			presentation to the project website. Working on the PR. Preparing the material for the next cropping season. NOT participating in the 1st open tender call.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Selection of the SDGs for the 2nd workshop for all. Choose only the SDGs relevant for the LL only. We need to discuss about the training for the 3rd LL from now. Planned for early May. CS leaders to vote about the training: Suggestion to circulate an email to the CS leaders asking them about it.
WP3	TUD	LMU	Meeting this week, overview of all the tasks. T3.1 progressing, discussed again. No contact with the Citizen science team.
WP4	UNEXE	ICCS	Good meeting about the dashboard (T 4.1) UTH presented the main ideas and structure. First opinions from CS#1 and CS#8. To be reported in MS12 (M16). A longer report.
WP5	BRC		(24.11.2022) Not present due to calendar clashes – updates circulated via email to Lydia: 1. Gloria has circulated an email this week requesting all CS partners to let us know by **Friday 25 November** if they intend to participate in the first open tender that will be launched in mid-January 2023. On the basis of the CS responses we will set up a series of bilateral calls in early December to discuss further details and instructions. So far, we have heard from CS1 and CS5 (THANKS!). **We encourage the rest to let us know their intentions, or to reach out to us if they need additional information to make a decision.** 2. The ARSINOE project and the 1st Open Tender are being showcased by BRC this week in CONAMA in Madrid, with good traction picked up with several innovators from Spain and some international organisations (e.g. The Nature Conservancy). 3. An online form has been prepared by BRC for CS leads to share with their networks (e.g. during the LL sessions) and start spreading the word about the 1st Open Tender. This will also help us start expanding our database of interested innovators. If people have questions or comments, feedback is very welcome. The form can be found here: https://mailchi.mp/4e6d824f29e8/arsinoe-open-tenders-first-call 4. BRC is meeting (physically) with GAC and Enrich Global today and tomorrow in Madrid 5. The definitions document that we are working with WP2 on is on hold for the moment due to high workload. We will pick this up next week again.
WP7	AUEB		Meeting cancelled this week. Meeting next week, guidelines to be provided for the CS.
WP8	GAC		Informed WP8 about CONOMA by ULL. Marco to send info to WP8. New video available on resilience:

			https://www.linkedin.com/posts/h2020arsinoe_the-concept-of-resilience-by-alex-chatzistefanou-activity-7001192017078697985-GLxy?utm_source=share&utm_medium=member_desktop

December 1, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting on Tuesday, organising the LL. Mental map on the Miro, then 2nd version prepared (tree graph)-links with targets, rephrasing so as to have only keywords. Then printing this for the 4 tables for the LL (links with the SDGs). The mental map will also be shown during the LL, alongside the tree map
CS#2: Mediterranean ports	AUEB		Weekly meeting took place. Workshops dates: Valencia 15/12, Piraeus mid-late Jan. Limassol mid-late Feb. Collaboration with WP2-hysical meeting planned for Dec 7.
CS#3: Main River (Germany)	LMU	VKU	Post workshop meeting last Friday-still working on it, regular CS meeting took place. Participants in the workshop contacted. Questions for WP5 are being prepared. Organising a meeting with additional stakeholders in January. Working on the PR. Topics for MSc theses being prepared by LMU. Material from the workshop uploaded (in German).
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Weekly meeting tomorrow to decide also the dates for the working groups and LL. Continuing with data collection from all the countries. Meeting with UTH for the SDM. Working for the PR. Discussion about a separate participation of AL to the open tenders
CS#5: Canary Islands	ULL		Not present
CS#6: Black Sea	AUTH		Last Tuesday meeting-presentation of the SDM by UTH. Bi-lateral meetings planned with the other partners. Looks promising for CS#6 to highlight the connection(s) among the parts of the CS. 3 Working groups last week Feb, then LL a month later. FtF meeting planned in Istanbul (end of January-start of Feb 2023)-Other WPs and/or partners are welcome. Meeting with WP5 needed for the open call for tenders.
CS#7: Southern Denmark	EM	TUD	Waiting for the adjustment of the mental map by DTU, to be followed by pre-validation –report to be finalised and uploaded by Week 50. Meetings to re-start with the other partners in CS#7 by week 50-damage costs tool (LNH Water) to be used also during the LL
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting took place, discussion about the dashboard (CS#8), Data about major incident plan in Paignton from Torbay Council Emergency Planner to be included in ARSINOE; also about emergency failure-T3.1; Dec 13 visit planned to the MetOffice about data and radar. New researcher starting for CS#8-Flood modelling.
CS#9: Sardinia	AGRIS	UT, LMU	Meeting with other CS partners: Collaboration for the SDM with UTH; admin-amendment of GA (redistribution of the work for Univ. of Cagliari)-UTH notified; technical: measurement of hydrological variables re smart irrigation for the crops.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		

WP2	UT	AUEB	Doodle for the training for the 3rd workshop has been circulated. Missing some reports. **Dec 15 deadline for the date selection. Deliverables in progress**
WP3	TUD	LMU	Weekly meeting. Updated about the subtasks
WP4	UNEXE	ICCS	Weekly meeting. Updated about the subtasks
WP5	BRC		Contacted all the CS about the 1st round of participation in the tender. CS#5, CS#3, CS#6 to participate in the 1st round. To be contacted and set up a date for a join meeting.
WP7	AUEB		Bi-weekly meetings-Working with the reports from the 1st workshop. Plan to the CS about their help
WP8	GAC		Met in Madrid with BRIGAID and IS Global about exploitation, working also on the videos.

December 8, 2022

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Yesterday LL in Athens, 26 participants (some new), all the tasks and goals from WP2 were achieved. Hosted at the Athens Impact Hub, easier to collaborate. Also note taker.
CS#2: Mediterranean ports	AUEB		Long meeting on Dec 7 (physical) for CS#2 (all matters), also about vulnerability analysis for all the ports. One international workshop (around March) after the 2nd national LLs.
CS#3: Main River (Germany)	LMU	VKU	Working on the report for the 2nd workshop, meeting with WP2, working also on the description for the open call tenders, meeting scheduled for Monday with WP5, 2nd meeting with the other CS (CS#5 and CS#6).
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Meeting on Dec 2, with all the CS partners. On Dec 1st, AL meeting with WP5, Dec 5th long meeting with WP2 (about the related matters). End of January national LLs, End of February international LL. Continuing to select data for modelling from all countries.
CS#5: Canary Islands	ULL		Not present-holiday
CS#6: Black Sea	AUTH		Meeting on Tuesday with all the partners, meeting with WP5 scheduled next week. Planning a F2F meeting in Istanbul 9-10 Feb or 13-14 Feb . WGs at the end of February, LLs, one month later.
CS#7: Southern Denmark	EM	TUD	Planning the next CS meeting for Dec 14, needs update on the coordination (new things happened)-Danish Coastal authority to adapt new flood model. Jan 2023, researchers from TUD and LMU to the CS to extend the damage costs model, to be used at the LL. Currently pre-validation of the mental map with selected stakeholders.
CS#8: Torbay and Devon County	UNEXE	TC	Regular meeting yesterday, cascading effects and T3.1 engine. Looking into closure of roads etc. Meeting with SWW last week, next week meeting with MetOffice. Working on the agenda for the 2nd LL (February 9)
CS#9: Sardinia	AGRIS	UT, LMU	During this week we were busy with the sowing of all experimental activities related to ARSINOE. Our sowing activities focused on: 1) yield trials concerning genetic improvement of durum wheat; 2) comparative trials concerning innovative irrigation and fertilization crop management techniques; 3) support for durum wheat local chains: supply of AGRIS selected durum wheat cultivars to the seed industry and farmers.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Continuing the meetings with the CS for the 2nd workshops. 1sh workshop reports next week. Also dates for workshop 2 the dates. Launching also T2.3 with CS#3

WP3	TUD	LMU	Working on the cascading failure engine for T3.1 (D3.1). Redefined the scope of the Paignton Case to a larger area, to include some critical infrastructures (e.g. the hospital). Probability estimation for consecutive events- coordination with TUD (Martin)
WP4	UNEXE	ICCS	No news.
WP5	BRC		Exchanges with the CS-Gloria circulated the draft text (V0) for the open tender. The 3 CS (CS#3, CS#5, CS#6) to comment by Monday Dec 12. The meeting with the 3 CS for Wednesday, to finalise the text for potential feedback to the LLs (expecting feedback by Jan 6). CS#3 the feedback after Jan 23.
WP7	AUEB		Next meeting on Monday Dec 12. Working for T7.1, reviewing the reports from all the LLs, desk research also on financial instruments.
WP8	GAC		Working on the exploitation (BRIGAID-Enrich Global), planning activities for next year. 3 videos released.

December 15, 2022
Announcement: Noelia has won PhD of the year price

- Periodical report – concerns technical and financial reporting. In coming days UTH to send instruction for the reporting. Input needed by early next year, in order to prepare for timely submission of report by end of March.

  Reporting to include e.g. used vs expected PMs, budget expenditures. Balance in spendings will be verified to prevent possible issues in remainder of the project.

  Concerning reporting – WP6 team has already initiated a document (to be found in Teams). Coordinating team will write major parts of the report, input from partners however also needed. The templates to be used to provide this input.

- Concern brought to attention of the participants – PM of the project noticed issues with communication and willingness to follow the procedures to defined for the project. The coordinator is working to solve the issues (via bilateral meetings). As the WP6 meeting is a 'small project meeting' this is also used as a place to share all information, including concerns.

- Request to all – if meetings are organised, ensure all relevant WPs are represented. And inform Ionannis (who monitors whether the right people/WPs are involved). E.g. WP5 has strong connection with WP2 – include representatives from WP2 in WP5 – CS interaction. To ensure homogeneous approaches, and proper validation of methodologies. Isabella adds – we are creating eco-system in which all activities are connecting. We need to be aware of what CSs are doing to be connected, in order to know when to assist and to integrate outcomes. Also note – that in complex CSs – with multiple site (CS2, CS4, CS6) ensure all sub elements follow same approach. E.g. - when connected to the open calls- if there is a decision to include one sub-element (e.g. national element) it needs to be a decision by the entire CS not a unilateral decision.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting held on Tuesday. Post workshop meeting with WP2 planned for next week. Methodology for stakeholder mapping – to be presented in next week's WP6 meeting (if not many people present due to Christmas, it will be repeated in the new year). Information – in international event last week – discovered about HE projects (starting in 2023) with overlapping activities to ARSINOE. Agreement reached - ARSINOE will be umbrella for these projects. There will be synergistic effects. Important note – in the case studies we are trying to facilitate the needs of the regions. Why the note – in discussion with municipality of Athens identified the need to extend the boundaries for CS1. Message to all CS – pay attention to this – that the overall goals need to be validated by the region. The workshops are the safeguard, but be careful to keep communication open and ongoing.

CS#2: Mediterranean ports	AUEB		Regular meeting held on Monday. Meeting with Port of Piraeus on vulnerability assessment. 2nd LL planned for yesterday (Valencia) - postponed to late January (need more time). Other two to go ahead on scheduled dates.
CS#3: Main River (Germany)	LMU	VKU	Participating in first call for tenders (WP5). Work done on preparations. Meeting on Monday with WP5 team on this. Also participated in meeting with CS5 and CS6 on WP5 / open call. Also meeting on governance analysis (to be performed next year).
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	12th of December – meeting with WP2 to discuss LL, stakeholders and innovation call. December 13th internal meeting in Athens with NECCA. Meeting with CS2 (face-to-face) on Dec 14. Coming week face-to-face meeting to prepare for LL meetings in January and February (date for last working groups and transboundary LL almost set, waiting for last input from Albanian partner). Report in LL finished. Periodical report for case study under preparation. Question – what is the deadline for this document. AW: end of March.
CS#5: Canary Islands	ULL		Internal meeting held on Tuesday. Meeting held with WP2 to prepare for LL session. Also participated in WP5 meeting to prepare for 1st open call. Decided to split budget in order to also participate in 2nd open call round.
CS#6: Black Sea	AUTH		Participated in WP5 meeting on Wednesday. Decided that Romanian partner to participate in first call in January, the other 2 partners to participate in later calls. Face to face meeting for CS partners on 13-14th of Feb in Istanbul. Other ARSINOE partners are welcome also at this CS meeting. Please notify Nikos if intention to join.
CS#7: Southern Denmark	EM	TUD	Wednesday CS7 meeting with alle Danish partners held. Agreed on activities for the coming months. January 12th a full day workshop about damage cost assessment to take place in Esbjerg. Together with LNH water and the Danish Coastal Authority. Finalised reporting for the first workshop. To be uploaded by end of this week. No date yet for 2nd LL workshop. Partners to be called to confirm the date. Expected in WK4-5 in 2023.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting held on Wednesday. Planning for LL on February 9th discussed. Additional stakeholders that were missing in first meeting identified and invited. Also working on modelling of traffic and impact on health issues (e.g. ambulance route/times) Tuesday – visit to the Met office in Exeter to identify rainfall radar data that can be used in (real time) modelling. Discussion on purchase of new equipment or use of data from existing data from the met office (costs associated)

			There will be a WP3 meeting with CS8 and CS1 (11th of January)
CS#9: Sardinia	AGRIS	UT, LMU	Busy with field operations. Sowing of experimental trials. No project team meeting on December 8th due to holidays.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	
WP4	UNEXE	ICCS	
WP5	BRC		Meeting this week held with participating CSs, planning to publish open call by end of January. When published 2 seminars will be held for applicants in February.
WP7	AUEB		File initiated in WP7 folder where all progress tracked for task 7.1. State of play in all CSs being mapped. Request – inform WP2 when they need to participate in WP7 activities/meetings.
WP8	GAC		

December 21, 2022

- Tasos (ICCS) presented the excel sheet about collecting data for the classification of the stakeholders. This part has been recorded and uploaded to Teams. **Deadline February 10, 2023**

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting took place, Today post workshop meeting with WP2. Decisions: To organise open calls for the volunteer communities of Athens to engage them for the Citizen Science. Event to take place on Biodiversity day (May). New project (Urban Relief) starting in January-to liaise with this project and organise a meeting. To collect all data-missing socio-economic data-working on it (e.g. social Atlas data). MINCA is ready for Citizen Science. Finishing the translation of the tool. 2023 a pilot year for MINCA (trying to engage citizens and through schools)
CS#2: Mediterranean ports	AUEB		Regular meeting on Monday. Revising the mental map for the 3 ports. Postponing the LL for Valencia to late January. The same for Piraeus, working on the vulnerability analysis. Meeting with Limassol scheduled for tomorrow for vulnerability analysis.
CS#3: Main River (Germany)	LMU	VKU	Invitation to the stakeholders sent (meeting on Jan 20). Arranging internal meetings and meeting with WP2.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Preparations for the 2nd LL. Dates have been set, also for Albania (27-30 January 2023). Transnational LL 24 Feb 2023. Preparing for it. Preparing also a brochure (in 3 languages). Working also on the SDGs for the LL.
CS#5: Canary Islands	ULL		On holiday
CS#6: Black Sea	AUTH		During the last week we have been discussing with our partners on the preparation of our face-to-face meeting in Istanbul on the 13th and 14th of February 2023. Whoever from other case studies or other work packages wishes to join us in person, please let us know in time so that we can make the necessary arrangements. Also, in preparation of our second round of working groups and living lab, we decided, in collaboration with WP2, to enrich our group of stakeholders. We decided on the names and organizations who will be invited to join our living lab. We are organizing a special meeting just with the new members, on January 25th, so that we can inform them about the project and what went on during the first living lab so that they can come prepared to the second one.
CS#7: Southern Denmark	EM	TUD	Invitations sent for the 2nd LL (for 30/1/2023), together with background documents. Post-interview material collected. Next weeks to be spent preparing for the LL.
CS#8: Torbay and Devon County	UNEXE	TC	Working on the preparation for the LL (Feb 9). Need to organise a separate meeting with CS#7. UNEXE (Mehdi) working on collecting socio-economic data collection. Also working on the distributed simulation model. We need to arrange a meeting between CS#7 and CS#8 in person.

CS#9: Sardinia	AGRIS	UT, LMU	On holiday
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	On holiday
WP3	TUD	LMU	Need to be in contact with the MINCA team. Detailed meeting yesterday. Deliverable T3.1 on track.
WP4	UNEXE	ICCS	Dashboard progress after the Christmas break. T4.2 presentation given Tasos. Data management is ready (Giota). During WP6 meeting in mid-January to present the dashboard to the CS.
WP5	BRC		On holiday. Preparing for the 1dt open call.
WP7	AUEB		No updates.
WP8	GAC		LVL to check the video.

January 5, 2023

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Working on the vision of the CS (as the outcome of the 2nd LL). Short text (consensus). MINKA in Greek available (software and platform). 6-8 Feb “train the trainers” seminar in Athens to engage with students (working with CSIC) collaboration with Prof. Maria Daskolia (University of Athens).
CS#2: Mediterranean ports	AUEB		Not present
CS#3: Main River (Germany)	LMU	VKU	Not present
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Not present
CS#5: Canary Islands	ULL		Not present
CS#6: Black Sea	AUTH		Not present
CS#7: Southern Denmark	EM	TUD	Meeting yesterday to prepare a workshop for the development of the tool to estimate damage costs to be used for spatial planning to be used also by other municipalities. Meeting planned with WP2 about the workshop. Meeting between CS#7 and CS#8 needed. To arrange dates and venue. Also to arrange a teleconference to prepare for the F2F meeting.
CS#8: Torbay and Devon County	UNEXE	TC	Meeting with CS#7 discussed (see above). Meeting yesterday. Model for T3.1 is being developed (Mehdi). Meeting with MINKA. Prospects for CS#8 to be investigated through WRT (previous links through CASCO project). Limited sites of observation existing in Devon/Torbay. Meeting with CSIC is needed about MINKA.
CS#9: Sardinia	AGRIS	UT, LMU	Not present
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Supporting the CS for the 2nd workshop. Not all the dates are fixed yet.
WP3	TUD	LMU	Established link and meeting with CSIC (MINKA presentation) about Task 3.7. Prospects for more CS to be involved were discussed. Progress with T3.1 under way.
WP4	UNEXE	ICCS	Meeting pending between UTH and UNEXE for the dashboard.
WP5	BRC		Not present
WP7	AUEB		Not present
WP8	GAC		Not present.

January 12, 2023

- End of January deadline for the CS long reports (WP6)

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Meeting took place, finalising the vision for the CS and the maps. Working on the training seminar and the MINKA. Link with the biodiversity day (May 23), using SynAthina platform (network for community volunteers). Launching the campaign in February to engage experienced teachers. Open call for volunteers for this activity and MINKA. RELEAF EU project: links and synergies (there are overlapping about the recording of trees). Work started with ICCS for D3.2. Presentation at Neo4j conference (Feb 8) about the knowledge graph work.
CS#2: Mediterranean ports	AUEB		Meeting on Monday (3 hours), finalising the combined mental map for the 3 ports. Final decision for the 2nd LL next week. Discussion about models (model for waves – Piraeus and Limassol and another, water temperature-Valencia). Vulnerability analysis: Meeting with Piraeus (2 meetings), meetings also scheduled for Limassol (end of January 2023)
CS#3: Main River (Germany)	LMU	VKU	Finalised the vision and the report for the 2nd LL. Internal meeting in preparation of the call for tenders (Jan 20). Meeting with WP5 scheduled for next Monday. Working on modelling in relation also to a MSc that will support the project. Postcards sent to stakeholders. Meeting with head of regional authority for forestry and agriculture to introduce and discuss ARSINOE.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Working on the preparation for the WGs (25/1 Jan MK, 27/1 Jan AL, 3/2 GR) and LL, Today internal meeting, also meeting with stakeholders MK and AL, meeting with the CS partners scheduled for next week. Meeting possible with UTH next week.
CS#5: Canary Islands	ULL		Tuesday meeting with WP2 in preparation for the 2nd LL (Jan 24). Feedback from WP5 about the open call, 1st open call with less budget as a test. Internal meeting last Tuesday. Working on stakeholder classification. Meeting arranged with CSIC for the use of MINKA (potential).
CS#6: Black Sea	AUTH		Meeting on Tuesday (also WP2 and WP5 participating). Issues with procurement RO partners-working on this with Gerardo. More people to be invited for the next LL –meeting with them Jan 25-26. F2F meeting in Istanbul 14/15 Feb. Other WPs are invited, if they wish, in person or remotely. Black Sea Operation organisation hosting (WP1, WP2, WP3 participating)
CS#7: Southern Denmark	EM	TUD	Organising with CS#8 common meeting (NOT PRESENT today)
CS#8: Torbay and Devon County	UNEXE	TC	Meeting yesterday, the latest for the LL (Feb 9), discussion about the modelling for T3.1 and also for the traffic model (T3.5). Also exploring possibility to cooperate with MINKA through WRT.
CS#9: Sardinia	AGRIS	UT, LMU	Field sensor for soil moisture installed, verifying data availability for SDM, discussing crop models with stakeholders.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		

Task 6.5	KWR		
WP2	UT	AUEB	Presentation by Alice about the reporting for the 2nd workshop. Preparation for the 2nd workshop: meetings with CS#8 and CS#5, another short meeting scheduled.
WP3	TUD	LMU	Meeting yesterday. Checking the status D3.1 to be submitted at the end of Jan. Reviewer Martin (agreed). LMU also to be present in the meeting CS#7-CS#8. To share the tools with REGILIENCE (LVL)
WP4	UNEXE	ICCS	Gareth (T 4.1) ill for 2-3 weeks. Dimitris is going to lead the MS for the end of January.
WP5	BRC		Meeting with CS#3 and new meeting scheduled in preparation for the open tender call. Draft for CS#5 received. CS#6 legal procedures for procurements followed up. CIW being updated in preparation of the open tender call.
WP7	AUEB		No meeting this week.
WP8	GAC		Video LVL shared last week, next video about the CIW. Working on the common newsletter. Isabelle in Morocco (Conference) presenting ARSINOE. Marco shared his video. Jan 26 MISSION CoP in Brussels for climate adaptation (attended by Chrysi and Lydia). Synergies with REGILIENCE ongoing (meeting yesterday-working on a common newsletter with REGILIENCE and also on a map with all the CS from the sister projects)

January 19, 2023

Horizontal Actions: Tools sent to REGILIENCE and a letter from REGILIENCE to the new projects (MISSION) for Synergies

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Meet. Deciding this week. Text outcome from the 2nd LL sent to the stakeholders. Finalising the report for WP2. Decided about the date for the 3rd LL (June 16). IN two weeks MINCA to be presented during the regular CS#1 meeting (internal) to prepare for the "train the trainers" workshop. Meeting with the new project (URBANRELEAF). There is a potential conflict (tree inventory) and concern for overlapping. Looking for alternatives, solutions.
CS#2: Mediterranean ports	AUEB		Meeting on Monday (mental mapping). Next Monday to discuss the dates for the 2nd LL.
CS#3: Main River (Germany)	LMU	VKU	Meeting with CS#9 for collaboration (details in CS#9), also the possibility of students from LMU travelling to Sardinia for field work. Preparing for the F2F meeting. Also meeting with WP5 about the call for tenders. Meeting with the stakeholders tomorrow about WP5 tomorrow. Meeting with WP2 (Tuesday) for recommendations. Planning sessions about the dissemination of the open call.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Preparing for the National WG (presentations etc.) meeting also with WP2 and with UTH for the SDM (WP3).
CS#5: Canary Islands	ULL		Next January 24th we have the second edition of the Living Lab. At the end of December, we did the third field campaign on the islands of El Hierro and La Palma. We already have enough data (plus historical data) to start building the hydrological models.
CS#6: Black Sea	AUTH		Two meetings 25-26 Jan with the new stakeholders (added ones). Working on the preparation of the F2F meeting in Istanbul (Feb 2023). Sessions organised during this meeting for other WPs. Invitation to other WPs for online participation. **Announcement in Teams for all with a deadline.**
CS#7: Southern Denmark	EM	TUD	Not present-Update below (with CS#8).
CS#8: Torbay and Devon County	UNEXE	TC	Meeting with CS#7 to organise a common F2F meeting in April (11-12-13)-two day meeting. First day with stakeholders, 2nd day WP3 meeting in Denmark. Weekly meeting: demonstrating the model for 3.1, in touch with Devon County Council for traffic data. Demonstration also of the traffic modelling.
CS#9: Sardinia	AGRIS	UT, LMU	Milestone: Sensors placed in 2 sites (high fertility and low fertility area to measure the humidity variation of the soil) to identify the water for smart irrigation. Online meeting with LMU looking for collaboration between AGRIS and LMU-meeting in Sardinia planned for April. Meeting with WP2 to organise another meeting about the governance of water in Sardinia.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		

Task 6.5	KWR		
WP2	UT	AUEB	Not present
WP3	TUD	LMU	Discussion (extensive) about D3.1. Arranged for cs#7 and CS#8 interactions/meeting. Discussion (also for WP4) on how to avoid self-plagiarism detection.
WP4	UNEXE	ICCS	Milestone MS12- Dimitris working. Contact also Gareth– See also above
WP5	BRC		Working on the open tenders-links with CIW and testing the CIW CS#3, 4, 5, 6 for the 1st round. Preparing with them. Dissemination for the open tender through WP8 and also through local channels, working with the CS.
WP7	AUEB		Working on 7.1-1st draft expected mid Feb. Meeting with the VR tool team about the choice experiments and the development of the environments.
WP8	GAC		Meeting with WP8. Feedback from Tenerife. Working also with CIW and BRIGAID. Meeting with UNSDN is being planned. Joined newsletter with the sister projects in February.

January 26, 2023

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Discussed about knowledge graph user friendliness (ICCS), well on track, ARSINOE to be a partner in a summer school (moma) which will focus on heat islands (2 weeks in July), Progressing on NBS, workshop to take place 2nd week of June, Training course regarding Minka planned
CS#2: Mediterranean ports	AUEB		Finalizing follow-up report and agendas of living labs (planned by Monday), they will take plane in February and March, mapped out SDG's to present to stakeholders
CS#3: Main River (Germany)	LMU	VKU	Meeting with stakeholders to discuss calls for innovation (interests mentioned: social/behavioural/governance change, water-related issues), call for innovation further discussed between LMU and VKU, discussion with new stakeholders: educational issues raised (with respect to climate change)
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Meeting with WP2 (19th Jan) regarding living labs and working groups, meeting with WP5 regarding innovation calls (Albania on 1st call, others on 2nd call), 25 Jan national working group of North Macedonia took place, very good feedback, 27 Jan Albania WG to take place, 3 Feb Greece working group and 25 Feb transnational one.
CS#5: Canary Islands	ULL		2nd living lab held on Tuesday, new attendees, very good feedback, meeting with Sonia (25 Jan) regarding possibilities of using Minka to CS5 activities (maybe for agriculture, changes in flora/ crops) , preparing for 1st call (interested in having a 2nd meeting with gloria regarding calls)
CS#6: Black Sea	AUTH		Finalizing agenda for meeting in Istanbul on 13-14 Feb, meetings with new stakeholders held (25,26 Jan) with interest to participate in working groups and living labs, planning to have working groups last week of February and living labs first week of March
CS#7: Southern Denmark	EM	TUD	12 Jan face to face meeting held, evaluated the process, well received, meeting with CS8 regarding common Case study meeting (to be held probably in April), meeting with Carola regarding 2nd living lab held
CS#8: Torbay and Devon County	UNEXE	TC	9th Feb 2nd living lab to be held, agenda being finalized, meeting with Carola planned regarding living lab, discussed regarding D3.1 deliverable
CS#9: Sardinia	AGRIS	UT, LMU	Presentation of ARSINOE completed and revised (available on YouTube), CS3 shared literature regarding common activities with CS9, planning field meeting with CS3 , dates tbd, planning activities with University of Tours (probably 1st week of April), meeting to be held tomorrow
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		

WP2	UT	AUEB	In touch with CS leaders, two meetings regarding preparation of 2nd workshop (SDG principles), templates need to be filled by case studies for deliverable, steering committee on 10 Feb
WP3	TUD	LMU	Finalizing D3.1 (includes initial resilience framework details), probably will have a presentation to case studies, organized meetings regarding task 3.7
WP4	UNEXE	ICCS	
WP5	BRC		Meeting with CS4 regarding open tender, meeting with WP8 regarding dissemination of the call (via ARSINOE website), CS6 (Romania will not be able to participate on the first round of open tender as initially planned), questionnaire shared with WP2, WP8 and case studies, feedback received
WP7	AUEB		Informed partners regarding progress, task 7.3 preparations, next meeting in 2 weeks presentation to be held regarding progress
WP8	GAC		Video released (Marco) on YouTube, dissemination of open calls via dedicated tab on website, preparing for dissemination regarding open calls next month and other videos to be released next month, next week CS1 video to be released, case studies to review info of resilience map

February 2, 2023

- **Deadline for CS information M1-18 + plans (in a separate file for each CS) Feb 9, 2023**

This is important for D6.2 and D6.5

- Message for the preparation of the PR posted by Giannis. Instructions sent-There are 4 files for the preparation of the PR.
- There are 7 Deliverables for the end of March.
- Instructions by Giannis to all about the Financial Report.
- UTH and KWR represented ARSINOE at the MISSION CoP event in Brussels on 26/02.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting took place, MINKA (Sonia) made a presentation. Next week 2nd training the trainers seminar (6-8 Feb)-online in Greek. Giannis to share the link with others.
CS#2: Mediterranean ports	AUEB		We finalized our Mediterranean Ports Mental Map, mapped all nodes to SDGs which are to be used as the guiding principles for the 2nd Living Labs. Date for the 2nd LL fixed for Limassol (1rst of March). Dates for Piraeus and Valencia to be fixed next Monday (Will happen at the earliest during the last week of February and the latest at the 1rs of Week of March). A physical meeting between AUEB and CUT (Limassol) was arranged at 1/2/2023 in Limassol and the details for the Implementation of the 2nd Living Lab were discussed. Also during the Meeting this Monday, CSIC representatives (Sonya) was invited and we discussed the possibility of CS2 to also use MINCA.
CS#3: Main River (Germany)	LMU	VKU	Working on the report for M18 and D6.2. Preparation for the tender open call, meeting planned with WP5, relevant document prepared for the applicants, also discussed the dissemination actions to attract applicants. Last Tuesday meeting LMU/VKU about the open call. New EU project RETOUCHNEXUS-UTH (Chrysi) will be a speaker at the kick-off. They have a CS also in Main. Ralf will be looking for possible/potential synergies. Coordinator Technical University of Munich (TUM).
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	In North Macedonia we had our National Working Group on 25.01. All stakeholders were there, very interesting information we received. They made visualization of a very nice future. It was very successful. On 27.01. Albanian partners AKPT had their National Working Group. All stakeholders were there, they also had very successful WG. On 3.02 Greek partners NECCA will have their National Working Group. On 30.01. we had a meeting with WP5, regarding the innovation calls. Some questions and issues that appeared were resolved with WP5. The Albanian partner will go on the 1st innovation call. At the moment we are preparing all post-information for the WGs, documentation, reports, maps, etc. Also we had some meetings with some more important stakeholders, Ministry of Environment, regarding the innovation

			call. Also we started with preparation for the Transnational LL, which will be held online on 24 .02.2023. Meanwhile, the teams for modelling are doing well. Modelling of the water and modelling of the socioeconomic aspects. Data is mainly gathered, and the teams are working on the modelling.
CS#5: Canary Islands	ULL		Holiday. Not present. Update: We are writing to tell you that the 2nd of February is holiday in Tenerife. Please note that this week we have met on Monday 30th January from 15:00 to 16:00 with work package 5 to finalise the last doubts regarding the call document that will be launched soon. Also, we have completed the stakeholders classification on Teams: https://uthnoc.sharepoint.com/:x:/r/sites/ARSINOE-WP6/_layouts/15/Doc.aspx?action=edit&sourcedoc=%7B20754db8-19d0-4a2d-9eeb-fa0eab80d657%7D&wdOrigin=TEAMS-WEB.teamsSdk.openFilePreview&wdExp=TEAMS-CONTROL&web=1 Next week, on the 7th of February, we will have the meeting with Carola (WP2) to analyse the second Living Lab session we had on the 24th of January (everything went fine
CS#6: Black Sea	AUTH		During the past week we have been working in finalizing the agenda of our face-to-face meeting that will take place in Istanbul on the 13th and 14th of February. At the same time we are trying to finalize the dates of the three national Working Groups. The WGs will take place during the last 10 days of February.
CS#7: Southern Denmark	EM	TUD	I can report that the LL workshop # 2 took place on Monday the 30th, successful, all the stakeholders (including new ones) attended. TUD and EM haven't had the chance yet to internally evaluate the workshop (and refine the vision), but next week they have a scheduled meeting with Carola (WP2), also to evaluate. Working on the CS file offline.
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting take place, progressing with data for CAFLOOD and flood modelling. Completing the CS report for D6.2. Next Thursday 2nd LL will take place. WRT (Sarah) discussed it with Carola (WP2). Sarah met with CSIC about MINKA about the possibility to use it also for CS#8.
CS#9: Sardinia	AGRIS	UT, LMU	Online meeting with WP2 about their visit to Sardinia (first week of April). Another meeting also planned. Expanding the stakeholder list for Sardinia, their participation to be formalized and their participation in the 2nd LL. Kick-off meeting of another EU project (INBEST SOIL)- potential synergies investigated (agricultural soils/fertility).
Task 6.2	UT		Deliverable D6.5 in preparation by UT. Days of the Workshops and LLs will be included, also the full reports for LL1.
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Working on the structure, framework etc. for D6.5. **Information/update by WP2 to all the CS about the LLs next**

			week Feb 9, during the WP6 meeting (CS#1, CS#3, CS#7) for the others to benefit from the experience. Two meetings with each CS needed to prepare the LL and then two meetings for the report will be needed. MS 5 submitted.
WP3	TUD	LMU	D3.1 submitted. Weekly meeting (discussing the deliverable and next steps), All the technical "tools" need to be applied to more than one CS (2-3 min). This holds for the technical tools in WP3, but also for the VR experiment (planning for CS#1 and CS#2-possibly, also videos planned to be coordinated by ATHENA).
WP4	UNEXE	ICCS	Discussions about the links of VR with the modelling tools. Ralf (LMU)+Albert (UNEXE) prepared a proposal for a summer school in Venice (July 2024) about Resilience, where demonstrations from ARSINOE will be presented. M16 delivered, now the 1st version of the data catalogue (https://catalogue.arsinoe-project.eu/), which the CS can upload their metadata, after registering. This will be connected with the knowledge graph. Open data from this catalogue will be available to all.
WP5	BRC		Working on the launching of the 1st tender, with feedback from UT, GAC and the participating CS. CS to check if all the info is correct in the last version of the questionnaire-Last check. Material to be published on the project website (new tab). Launching also the other material for the open tender. Legal advisors have been engaged to check everything. BRC to join the CS#6 meeting next week. Issues faced for tender 1, when published by a University-to be discussed with the legal advisors.
WP7	AUEB		Tasks 7.1 and 7.2 to be discussed next Monday. For Task 7.3 a meeting was arranged with AUEB's team in relation to the specific design of the Choice Experiments. Next 2 weeks meetings to be arranged with 1) the VR Team, 2) CS1 and CS2.
WP8	GAC		New video (Chrysi about CS#1), Lisa sent email to all the CS leaders about the review from REGILIENCE. Reminder to be sent to all to send news to WP8.

DATE, 9 February 2022

IMPORTANT; today is the deadline for the filled out templates for all case studies, which are the input for deliverables D6.2, D6.5 and the interim report.

Only CS5 and CS9 have uploaded a completed template to the Teams folder: when do we expect the rest?

Meeting held with Project Officer -> we will be informed about this in the general meeting tomorrow.

Sharing experience on CS with organising their 2nd workshops:
CS3:

- 2nd WS was held relatively early. Followed structure provided by WP2 and worked very well.
- Difference to proposed agenda – more time needed for envisioning than planned due to many ideas from the stakeholders. Not much time spent on merging narratives during the workshop (no time) - this was done after the workshop.
- After first into session (for new participants), problem statement was presented and confirmed. Having all to agree on this was a good action – everyone has the same understanding and opinion based on this.
- Not many new participants – therefore not much effort spent on group dynamics. If more new participants would join, this might be more important.
- Open call presented, as already clear CS3 would partake. Participants were interested.
- Nice idea – share empty postcards provided for participants to send new-year ambitions. This is shared to remind people / create interaction.
- Development of trust within group is important – this developed in workshops 1 and 2. Workshop 3 is about solutions – then it will be important to see what happens (and how open discussion can be).
- Group confirms social and governance issues are key to solving challenges.

CS1:

- Spent some time to introduce LL (as more new stakeholders)
- Spent time to validate the framework – valuable to do this, as some feedback was received that could be included.
- Visual notetaking (innovative approach) - performed in ~6 groups, supported by a member of the ARSINOE team at each table. Each team presented their visual /vision of each table to the entire group. The process was very much appreciated by the stakeholders. Managed to express vision for Athens that was deduced from this exercise.
- Important issues – help stakeholders express their opinion / ideas.
- Assisting questions used to support the envisioning exercise. Also in arranging the sub tables – ensure there is a mixture of backgrounds represented at each table. This was scheduled beforehand based on participant list.

Professional artist listened in to tables to prepare visual. (see Arsinoe VISION visual EN.png)

Essential – to keep track to the use of innovative approaches and assess effectiveness.

CS5:

- A lot of new input collected. More time than expected spent on first part.
- Envisioning part – worked very well. Split into small group, with a reporter assigned. All groups had similar narratives – so develop the overall vision was not too difficult.
- Possibility to have more sessions discussed, as the group was so good and enthusiastic.
- SDGs (general and specific for Canary Islands SDG) were presented and used as point of departure.

CS4:

- In North Macedonia – stakeholders in 3 groups -> keywords listed on vision for future of the region. Great commonality observed in the vision. (partly hybrid WS – all online people put together in one group)
- Albania case – as above
- Greek case - fully face to face meeting
- For transboundary WS – challenge will be the languages.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		CS1 – expected to be uploaded by Monday. 3-day train the trainers on Mon-Wed. Successful. Due to bad weather all days were virtual. Ready as CS1 to start building educational community with volunteers. Regular meeting on Tue held. Discussed report - first draft ready. Revisited conceptual framework to refresh approach to hazards. Ready now to develop and run models for monitoring (focus on extreme heat) and link NBS to this approach.
CS#2: Mediterranean ports	AUEB		CS2 – template to be uploaded on Friday 10th. 1st of march workshop in Limassol – invitation sent. Meeting with Piraeus to fix date for workshop (planned for last week Feb). For Valencia also to be fixed for last week of Feb. Team to visit Limassol to complete vulnerability assessment on 9 and 10 Feb.
CS#3: Main River (Germany)	LMU	VKU	CS3 – template has been uploaded. Completed table for periodic report with dissemination issues. Tender – meeting with CEO of municipal supply companies in LL region held to introduce tender. Interest was there, initiatives being identified that might respond.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	CS4 – finished, will be uploaded today. Dissemination report also to be uploaded today. Working groups (3) are finished, preparing for trans-national living lab (online). Planned on 24th of February. Internal meeting on 9th with all partners of CS to prepare for 2nd LL. WP3 joined in the meeting, to discuss SDM and data collection to feed SDM. WP2 meeting on the 9th of February to discuss issue concerning the 3 nations LL and to prepare upcoming LL. c Albanian partner will be part of 1st innovation call.

CS#5: Canary Islands	ULL		CS5 – uploaded in Teams Meeting on the 7th of Feb with WP2 to discuss 2nd LL session. Weekly internal meeting – data will be obtained from national met. Office, approval finally obtained. Report for dissemination has been completed.
CS#6: Black Sea	AUTH		CS6 – report to be uploaded by end of 9th Focus on preparing face to face meeting next week with all CS partners in Istanbul. Important to sit together and discuss how to process all data and results. Next week outcomes to be reported. Also to be discussed how to prepare for the working groups and LLs. 3 working groups scheduled for end of February (RO, BUL, TR).
CS#7: Southern Denmark	EM	TUD	CS7 – template not to be uploaded today, latest Monday before noon. Meeting with WP2 on the 8th about reporting on 31st January. Reviewing whether changes need to be made for future workshops. Meeting went well (participants ~ 17 non-team participants) - good spirit and good engagement, but there is room for improvement (in particular the envisioning part of the meeting).
CS#8: Torbay and Devon County	UNEXE	TC	Not present.
CS#9: Sardinia	AGRIS	UT, LMU	CS9 – template uploaded. Last week planning field service for calibration parameters – link field activities with satellite passage. Focus on soil water content and irrigation practices. Finalising participation of new stakeholders in the next LL. In particular the meteo-climatic department of Sardinia and the national center Euro-Mediterranean Centre on Climate Change (EMCC)
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	
WP3	TUD	LMU	
WP4	UNEXE	ICCS	
WP5	BRC		Material for 1st open tender is with Water Europe and they are preparing the page on the website.
WP7	AUEB		
WP8	GAC		

February 16, 2023

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		No meeting this week. Working on the report. Working on the data. CS#1 report updated.
CS#2: Mediterranean ports	AUEB		Meeting on Monday, discussion about the report. Date for the Limassol LL (March 2), LL in Piraeus 6 or 7 March, LL for Valencia 27 or 28 Feb, no invitations sent for Piraeus and Valencia.
CS#3: Main River (Germany)	LMU	VKU	Stakeholder classification table finished. Working on the open tender. Looking for dates for the 3rd workshop. Not defined yet.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting today. Preparing for the transboundary meeting (Feb 24), invitations sent, working on the National Future narratives, Additional WG online for those who could not attend in person. Meetings with stakeholders (MK), filling the stakeholder classification table. Working also on modelling.
CS#5: Canary Islands	ULL		Meeting with WP2 on Monday to review the report from LL2, all finished now. Paper published about emerging pollutants (on the excel too), discussion about the open tender with the University.
CS#6: Black Sea	AUTH		Meeting in Istanbul took place, successful. 17 presents from the 4 countries, UTH also present. It was needed to smooth out the CS. Preparing for the LLs (next steps). Dates for BG (26/2) and RO (27/2) defined. It is needed to postpone the TU workshop of the earthquake-planned for mid-March, WP2 informed.
CS#7: Southern Denmark	EM	TUD	Not present.
CS#8: Torbay and Devon County	UNEXE	TC	Workshop 9/2 took place, 20 attendees, went very well. Weekly meeting yesterday for the report and the dashboard for CS#8. CAFLOOD modelling under way for Paignton and Torquay, Brixham to follow next week. Discussing about the meeting with CS#7, it will take place online in the end.
CS#9: Sardinia	AGRIS	UT, LMU	On farm demonstration fields treated with pesticides. Joined activities with UT: online meeting took place for the list of contacts during the trip to Sardinia (first week of April). Contacted by national TV to talk about ARSINOE.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Working on D6.5 and the RP1.
WP3	TUD	LMU	Following up on the modelling, refinements for the model in 3.1 (submitted).
WP4	UNEXE	ICCS	Discussed in detail about the dashboard, and also about the digital twins. Dissecting the GA, in detail.
WP5	BRC		Participation in CS#6 workshop with presentation (remote). More discussion with CS#6 needed. Ongoing discussion with WP8 for exploitation. Workshop planned with WP8 for the summer. Launching the open tender delayed by consultation with the legal advisors (red flags about transparency-main issue the invitation to innovators needs to be clarified) The CS involved have been

			updated so as to contact their own legal advisors (it will take 1-2 weeks to clarify).
WP7	AUEB		Two meetings with AUEB and with the team from WP2 for the VR choice experiment and its implementation. Next step to contact CS#1.
WP8	GAC		New Video published (Laia-BRIGAID-Innovation Window)– working on the next video, which will be delayed (Gerardo). Maybe to publish Jaume (T3.7-Citizen Science) instead. Article prepared on the LLs, also with the outcomes. Working with WP5 for the CIW exploitation. Internal and external workshops planned about exploitation. Support by the partners (regions) will be needed (to be specified). Working with REGILIENCE about the joint Newsletter, with articles about ARSINOE. Campaign "Women in STEM". Email to Lisa about other people (women in STEM)that are interested in being interviewed. Testimonials about the modelling tools are needed to be showcased in the workshop (CAFLOOD suggested). Joined article about the CoPs (Brussels meeting on Jan 27). Modifications on the REGILIENCE map to be sent to Lisa (CS#5 and CS#4 have sent emails). **Deadline was for Feb 8. ALL CS to check. Link:** https://regilience.eu/the-project/#map. Working on D8.7-Everyone needs to contribute. Message on Teams to be sent to all (Initial exploitation plan and exploitable results)

Feb 23, 2023
Annual meeting October 2023:
October 9 Starting at around lunch time separate meetings (IMPETUS)-ARSINOE will be travelling
October 10 Separate GAs for ARSINOE and IMPETUS- Social evening two projects together Utrecht.
October 11 Common day with the IMPETUS project (KWR)
October 12: Field trip to Zeeland – Ending at the airport at around 15.00

Recommended hotels at the centre.
Transport to the KWR offices every day by coach (organised by KWR). Departing from the centre.

Report:

- Please provide high resolution screenshots as separate files
- Please follow the structure for WP2
- Number of stakeholders per sector should be provided (WP2 to send separate emails)

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting on Tuesday, discussing the new Task (Choice experiments/VR) with AUEB and ATHENA. Specific instructions to be provided by AUEB about running the experiments. Working on data analysis, also meeting with Time series expert, WP4 also attended about the dashboard.
CS#2: Mediterranean ports	AUEB		Meeting took place, updated version to be uploaded for the report (highlights needed for the updates). Pre LL meeting for Limassol took place with WP2 (LL for March 2). Valencia pre- LL for 28 Feb, LL meeting for March 2. Piraeus pre-LL March 6 , LL on March 8. Discussion about the need to blur some names in the report.
CS#3: Main River (Germany)	LMU	VKU	3rd LL on May 3 agreed, emails to be sent. Follow-up activities with stakeholders are being planned, completing exploitation plans, data analysis, meeting with the other EU project (see previous notes) for potential synergies. IUGG conference (abstract submitted –Berlin July 2023)
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Internal meeting today, preparing for the 2nd LL tomorrow (online), working on preparations and modelling.
CS#5: Canary Islands	ULL		No internal meeting (holiday), working on the financial report. Meeting next week to find out how to finance the open tenders (I.e., how to fund the winners).
CS#6: Black Sea	AUTH		Regular meeting took place, discussion about the international LL (AUEB also participated), WGs have started (RO took place, BU planned, TR postponed), focusing on them.
CS#7: Southern Denmark	EM	TUD	Working on the reporting, updating on the report for WP8, meeting with all the partners about the future plans. Next step: to process the outcome of the 2nd LL. Probably early meeting for CS#7, CS#8 on October 9 .
CS#8: Torbay and Devon County	UNEXE	TC	Regular meeting yesterday, discussion about flood modelling (verification of the model from a flood in 2020-resolving some boundary issues), Torbay are modelling on their own about surface modelling, meeting monthly with the related National Project (DRIP), LL: UNEXE to meet with the stakeholders

			(SWW, National Power for the cascading effects), separate meeting with EA and Torbay Change officer(28 March –cascading effects). Debrief about the LL with WP2 on March 8
CS#9: Sardinia	AGRIS	UT, LMU	Meeting with ICM (Barcelona) about the possibility to incorporate MINKA in Sardinia and links with the local Agricultural School. Interview by a journalist about the links between Sardinia and the EU-Planning a special instalment/programme about ARSINOE, invitation to the ARSINOE farm during the LMU visit to film. Organising the 2nd LL (6-10 March-day not fixed yet). Experimental fields (smart irrigation) fertilised.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Announcement at the top. Working on the report
WP3	TUD	LMU	Working on the report-
WP4	UNEXE	ICCS	Working on the report- Filled the KPIs
WP5	BRC		Material ready for open tender, but checking the legal status for each country involved.
WP7	AUEB		Working on the report, meeting with CS#1, request by REGILIENCE for PPPs
WP8	GAC		Completed the reporting, WP* meeting took place, templates for events shared, published new video (Phoebe), working on the 2nd newsletter. **CS#1, 2, 7, 8 REGILIENCE map feedback needed. Please complete the exploitation plan.**

Mar 2, 2023

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Discussed about May activities (citizen involvement), 22 May activity to be held (involve institutions/ organizations such as Goulandris museum, NECCA etc.), ARSINOE educational network developed (schools), which will participate in the activities, April youth assembly to be held, similar assembly to be planned for students, Database from NCSR received regarding socioeconomical data. Models, required data etc. revisited.
CS#2: Mediterranean ports	AUEB		Finalized the M1-M18 template for CS2. 2nd Living Labs in Limassol (CUT and AUEB facilitates) and Valencia (FV facilitates) held. Living Lab for Piraeus to be held on the 8th March (PPA and AUEB facilitates).
CS#3: Main River (Germany)	LMU	VKU	Stakeholders informed about 3rd workshop, brainstormed about activities that will follow after workshop, exploitation plan and financial reporting worked on (to be ready in next weeks), Discussion with local forest authorities (ARSINOE invited to participate in relevant conference), next week internal meeting for interviews and questions to be asked.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Transboundary LL held, participation and outcome satisfactory, LL data post-processing being worked, newsletter prepared, Albania partner working on innovation call (funding agencies etc.)
CS#5: Canary Islands	ULL		Data from NAMD received, processing data and updating data management plan, Meetings regarding innovation calls held, budget-related issues discussed.
CS#6: Black Sea	AUTH		Two working groups held (Bulgaria and Romania), participation and outcome satisfactory, next working group (Turkey) to be held in March, scheduling international living lab (international) to take place in the end of March
CS#7: Southern Denmark	EM	TUD	Discussed damage costs assessment model, how to acquire needed data discussed (specific meeting regarding this to be held), future workshop regarding modelling discussed (with Danish coastal authority), discussed presentation at EGU in Vienna (on experience of ARSINOE)
CS#8: Torbay and Devon County	UNEXE	TC	Trying to inform cascading effects model based on expert (contact with University professors) and stakeholder input, discussed desired outcomes of flood models for the different modeling activities of the CS, UNEXE progressing on flood modelling (actual storm events being modelled for verification), meeting with WP2 to discuss 2nd LL results to be held. Synergies with CS7 being organized
CS#9: Sardinia	AGRIS	UT, LMU	Working on 2nd workshop LL (scheduled for next week), meeting with Isabelle and Carola to discuss organization. Finalized stakeholder classification, working on exploitation plan (to be uploaded shortly).
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		

Task 6.5	KWR		
WP2	UT	AUEB	Finished periodic reporting, exchanging with WP6 regarding KPIs, working D6.5
WP3	TUD	LMU	Open issues regarding periodic reporting being fixed, meeting with METU
WP4	UNEXE	ICCS	
WP5	BRC		Meetings with CSs regarding contracts, working on reporting, meeting to be held regarding open tenders next week (with CS6). Case studies need to start working on launching call logistists (subject to national legislative etc. regulations, requirements and restrictions)
WP7	AUEB		Task 7.3 working on the first draft of the models and the choice cards for the implementation of the Choice Experiment in CS1. Working to finalize M1-M18 template for WP7.
WP8	GAC		Working on D8.7 and D8.8, interviews held (regarding women in STEM), working on exploitation of CIW, preparing 2nd newsletter (coming out in upcoming week)

March 9, 2023

- Reviewer D6.2: Ralf Ludwig
- Reviewer D2.2: Giannis Adamos (Short text-Demo)
- Reviewer D3.2: Gerardo Anzaldua
- Reviewer D6.5: Joep van den Broeke
- Reviewer D8.7: Gerardo/Gloria
- Reviewer D8.8: Giannis Adamos

MS22: The content to be included in D6.2.

6th European Adaptation Conference (ECCA June20-21). Approached by REGILIENCE about this. LMU to represent the project. BRIGAID also to be present.

RP1: Input missing from WP7 (Giannis to contact Conrad).

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Meeting took place. Finalised the structure about models and data, some concerns about noise data (TBD), all other data issues resolved. Planning to run a campaign about the citizen science events (letters, synergies, joined activities) throughout the year. Big event with citizens May 20-21 (in the form of a festival), progress about MINKA expected form Sonia (CSIC). Adapting the citizen involvement to make it easier for the citizens, but focus on biodiversity.
CS#2: Mediterranean ports	AUEB		A short report for CS2 : - 2nd Living Labs successfully took place for Limassol and Valencia on the 2nd of March. - For Piraeus, the LL was postponed from Wednesday 8/3 to Tuesday 14/3, as there was a general strike at 8/3 and we expected low participation if we proceed with the initial plan. - CS2 started working on the models to be used and by next week we expect a shortlist of the variables, we would need projections for.
CS#3: Main River (Germany)	LMU	VKU	Discussion with municipalities and with supply company. LL also discussed. Meeting with WP2 about governance analysis. Field trip may need to be postponed for June (interviews with stakeholders)
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Finished with 2nd round LL. Working on post LL material preparation for the 3 countries. Internal weekly meeting today (also UTH participated for the SDM). Next week another meeting planned about the SDM with UTH. Open Tender: meeting with WP5 planned for clarifications.
CS#5: Canary Islands	ULL		Internal meeting took place about the financial report and the open call tender. Financial report: ULL done, but CSIC to do it separately. Meeting with Gloria took place (WP5): Initial screening of the applications by the ULL admin team. WP5 informed about this.
CS#6: Black Sea	AUTH		Regarding WP2, two local Working Groups (Romania and Bulgaria) took place on the 25th and the 28th of February accordingly. The Romanian and Bulgarian colleagues have set

			post-workshop meetings with our colleagues from WP2 to discuss on the conducted WGs. Both teams reported that the WGs were successful and that the discussions were fruitful. The Turkish WG will take place on the 17th of March. It will be a face-to-face meeting between at least 20 participants. The 2nd LL will take place on the 31st of March online. Finally, we altered the WP6 report a little, in regard to WP2, after discussions with Carola. Finally, we have also asked for a meeting with Martin and Ralf to discuss about the Digital Twin and the Climate Scenarios WP3 develops. They provided their availability and we will book our meeting.
CS#7: Southern Denmark	EM	TUD	Finished with the WP6 reporting, weekly meeting cancelled. Postprocessing the 2nd LL.
CS#8: Torbay and Devon County	UNEXE	TC	Normal weekly meeting finalizing the reporting for CS#8. Completed. Discussion about the questionnaire for the stakeholders for the implementation of the model from 3.1. Kate (UNEXE) working on the post LL report-feedback coming in.
CS#9: Sardinia	AGRIS	UT, LMU	Working on the LL preparation (March 7), working now on the post LL report. Uploaded the inputs for the exploitation plan. LMU visiting next week, campaign with the students end of April. WP2 visiting on the 1st week of April for the Governance analysis.
Task 6.2	UT		Last LL (2nd round) finishing on March 31-on time!
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Working on the guidelines for LL#3. Training in May, but the guidelines will be sent earlier.
WP3	TUD	LMU	Regular meeting took place-went through the RP- Task 3.6 UTH input needed (Giannis notified)
WP4	UNEXE	ICCS	Reporting has been checked. No issues remain.
WP5	BRC		No gaps for the report. Progress with CS#5 for the tender. Working on the details. Planning a meeting for a meeting with LMU and Albania (the other open tenders). Telephone with Bulgaria (CleanTech) and Cyprus (Port of Limassol and Phoebe) preparing the next open tenders. Meeting scheduled with CS#8 next week.
WP7	AUEB		Meeting cancelled last Monday. Next Monday meeting. Time 14.00CET
WP8	GAC		Joined campaign with REGILIENCE about women in STEM (Teresa-LMU), next with Phoebe. New video on Citizen Science (Jaume). Lisa working on CS#3. Initial exploitation plan needed from the partners: info missing from DTU, KWR, UNEXE, WE and BLBG.

March 16, 2023
Deliverable 6.2 ready to go to Ralph for review (to be returned by March 27)
Giannis: Please finish the reporting (technical) and some financial parts still missing. Empty parts for WP7
The project review date needs to be fixed a.s.a.p.

Title		Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area		UTH		Regular meeting took place. Flowchart diagram completed, also distributed to the team that will work on it for the experiments on VR. Discussion with CSIC about MINKA-Greek version ready early April. Data uploaded to the data hub. First meeting with Nav and Otto (UNEXE) about ABM for CS#1. Regular bi-weekly meetings on this arranged.
CS#2: Mediterranean ports		AUEB		• Workshop for Piraeus took place, Tuesday 6th/4, PPA Premises, Piraeus. Participation was high and everything worked perfect. • Stakeholders Validated the Piraeus and the Mediterranean Ports Mental Maps, while actively participated in the creation of the vision for the port of Piraeus. • Next Monday all 3 ports will present the visions of their workshops and the Case Study will work on processing the outputs, so to meet late next week (Probably Friday 24/3 with WP2 for the Post-LL meeting). All 3 ports to participate in the meeting.
CS#3: Main River (Germany)		LMU	VKU	Working on the governance analysis and the legal requirements for the call for tenders. Attending conference on forests under drought stress (Marion and Raul). Disseminated info about first session of REGILIENCE-Workshops. Drafted invitations for 3rd workshop in the Living Lab. Researched initiatives that could be introduced in the Living Lab after the 3rd workshop (e.g. as inspiration for new projects in the region
CS#4: Prespa-Ohris Lakes		IECE	NECCA, AKPT	Internal meeting today. Discussion about the post LL reports, also inputs for the data catalogue, discussion on the open tender (questions by the AL partner). Investigating how to get involved with MINKA (GR partner-Greek language, MK-AL: in English)
CS#5: Canary Islands		ULL		Monday: Government event attended, networking, met new people from the agricultural sector. Mar 14 meeting with WP5 for the open tender (legal requirements). Paper published about the aquifer model (3D).
CS#6: Black Sea		AUTH		Tomorrow TR WG, on March 31 international LL. Tomorrow meeting with WP3 for the digital twin implementation. Suggestion to involve also WP4. .Last week Nikos visited Azerbaijan (Black Sea Organisation) and presented CS#6. Yesterday presentation at the climate change hub (Romania) CS#6 also presented.
CS#7: Southern Denmark		EM	TUD	Weekly meeting yesterday about the reporting, financial report in progress. Discussion about the 3rd

				LL. Suggestion by WP2 to split the 3rd LL in two parts (I.e., two meetings) before and after the summer. Started looking into the open calls, in contact with WP5.
CS#8: Torbay and Devon County		UNEXE	TC	Meeting yesterday. Meeting also with WP5 about the open tenders (talking to UNEXE). Working on the final report of the 2nd LL, preparing the 3rd LL for Late June-early July. UNEXE met with the Torbay Council emergency planner (Chris Packer) for the modelling. TC also met with him. Progress on the modelling side (calibration based on historical events). The resolution is very important-between 16 minutes and 11 hours, depending on the resolution. So, resolution TBD. Two extended abstracts for the CCWI Conference (September 2023)
CS#9: Sardinia		AGRIS	UT, LMU	LMU in Sardinia last week-collaboration with CS#3. Organised a field campaign with students from LMU in Sardinia, using drones, crop and hydrological modelling (also climate analysis). Goal: to work on a MSc on this. Report M1-M18 updated, with details and photos. Working on the report of the 2nd LL. Meeting planned on this with WP2.
Task 6.2		UT		D6.5 is under internal review (to be returned by 27/3)
Task 6.3		UNEXE	ATHENA	
Task 6.4		AUEB		
Task 6.5		KWR		
WP2		UT	AUEB	No news-all is well D2.2 ready for review
WP3		TUD	LMU	Meeting this week, went through the technical report. Small addition needed for T3.6. After the LLs there are various modeeling challenges not yet documented, so TUD/LMU will discuss with all the CS. Open invitation to ALL to join the Wednesday meetings for WP3/WP4 to keep up with the most recent developments and needs about modelling.
WP4		UNEXE	ICCS	Meeting yesterday. We went through the report, practically finished. Meeting about the digital twin (CS#6) planned
WP5		BRC		Meetings with the CS#5 and CS#8, also scheduled meeting with CS#4. Message to all the CS about the legal requirements to all the CS. Working on the requirements and evaluation criteria for the applicants. Waiting for D3.2 and D8.7 to review.
WP7		AUEB		CS1 delivered important details related to the risk assessment plan and models sequence for CS1. - Professor Halkos team, working for the implementation of the Questionnaire and Choice Cards to be used for CS1.
WP8		GAC		D8.7 still missing details from KWR and UNEXE (Explanation provided to use the GA entries). Publishing the 2nd interview with Phoebe. Next week new video about CS#3 (Ralph).

23rd of March, 2023

Interim reporting – all missing text has been added to the report. Today offline editing will start. Some statistics might be required. A request with specific information will be sent.

The project review date needs to be fixed: no news since last week.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		No regular meeting this week (due to UN 2023 Water conference). Chrysi presented o.a. ARSINOE at this conference. Finalised D3.2 – submitted for internal review. Meeting concerning citizen science (Minka) – to run campaign starting in April. Now waiting for Greek version of the application (expected next week). Restriction – App only available for Andriod (not iOS). Discussion with people interested in nature to see whether historical data can be acquired and included. These people could also acts as mentors. There is a need for people with experience to validate what the participants are monitoring (data curators). Investigating exploitation opportunities – approached by international companies with interest in SustainGraph. Meeting held – preliminary discussion about collaboration. They would be looking to attract another target user group (e.g. private companies).
CS#2: Mediterranean ports	AUEB		Weekly meeting held on Monday. Outcomes from 2nd LLs presented. All ports validated their mental maps. Reports for the LLs now being drafted, next week meeting with WP2 to be planned to discuss. Meeting with CS1 to apply SDM model to CS2. Further discussion is needed before decision is made.
CS#3: Main River (Germany)	LMU	VKU	Governance analysis central last week. Met with WP2 to discuss whom to interview. Date set for interviews (last week of June). Compiling background information on case study (many primary sources are only available in German). Tuesday LMU-VKU meeting. Wednesday participated in the REGELIENCE workshop. Continuing to prepare for 3rd LL workshop. New stakeholders being contacted.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Meeting with WP3 about SDM held. Modellers for CS4 from North Macedonia as well as Greek partner involved participated. Decided to have these meetings every 2 weeks going forward. On 22nd March meeting with Gloria on open innovation call – Albanian partner provided with further information. Today weekly meeting with all partners held –

			finalizing post 2nd LL reports being finalised. Minka also discussed – will be used in CS4 – at least in Greek and Macedonian parts of the CS, Albania still under discussion. Next week further meeting will take place. (whether translation or use in English will be sufficient is being discussed). Data from NECCA for outflow of small to large Prespa lake – this was important missing data for modelling.
CS#5: Canary Islands	ULL		Internal meeting held on Tuesday. Started sea level rise modelling (both for La Palma and Hierro will be fully modelled). On 22rd March attended workshop attended by REGELIENCE regarding all the projects in the cluster.
CS#6: Black Sea	AUTH		Last Friday meeting with WP3 and WP4 held on implementation of digital twin in CS6 to clarify activities. Last Tuesday CS meeting held. Focussing on preparation of next international LL on March 31st. Invitations sent, expecting good participation. On 24th march there will be a presentation of Minka to the CS lead, after this to be presented to other partners to discuss where it can be used. BRIDGE project – project partners from ARSINOE will join and joint discussion to prepare LL will take place.
CS#7: Southern Denmark	EM	TUD	Weekly meeting held on Wednesday. Esbjerg still processing outcomes of 2nd LL. Next week online meeting with all Danish partners to be held on activities (discuss all upcoming activities).
CS#8: Torbay and Devon County	UNEXE	TC	Weekly meeting held on Wednesday. All report from 2nd LL submitted to UT. 3rd LL to be held on 10 or 11 of July. Cascading effects and resilience curves discussed – meeting planned next week to discuss with Env Agency and Torbay climate officer. Flood modelling work – UNEXE doing verification runs on real storm events and projected extreme events. Not yet satisfied with outcomes, issues being corrected (adjusted algorithm being developed for water flows around buildings). Torbay and UNEXE to meet in couple of weeks to discuss outcomes and compare with strategic flood modelling done by Torbay.
CS#9: Sardinia	AGRIS	UT, LMU	Meeting with WP2 for 2nd LL workshop held on 22nd March. Preparations are proceding well. Materials for stakeholders being prepared for this workshop. Water balance model completed. Ready to start irrigation (this week or next week). List of actors for local governance related to goals to be achieved pertaining to the LL outcomes in Sardinia compiled. These actors will be interviewed during stay of UT in Sardinia end or March – early April.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	

Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Two deliverables due to March (D2.2 and D6.5) have been submitted to reviewers. Still working on follow up of 2nd LL s (task 6.2). Preparing guidelines for 3rd workshop. To be circulated before training (on 3rd of May – 10-13h). Planning to meeting with WP5 to coordinate output from 3rd LL and WP5 work.
WP3	TUD	LMU	WP3 and WP4 meeting held yesterday. In context of WP3 and WP4 all CS are being revisited to see whether work related to the WPs is taking root in the CS and to identify feedback after 2 LLs to see whether there are any missing models/modelling issues. Meetings with C1, CS4, CS6 and CS7 on that topic already held. No new issues identified. Remaining case studies should join the Tuesday meetings – so elements of WP3 and WP4 that will be used in the CS can be identified or whether there are any cross cutting activities that need to be looked into. If timeslot is not convenient, please plan a bilateral meeting with WP3/WP4. Goal – use of developed tools in multiple CSs. SustianGraph also discussed – based on request from Tassos. The tool is now so mature it can be used for various tasks. All CS to be contacted by T3.2 to discuss how the CSs can use the tool.
WP4	UNEXE	ICCS	See WP3. Also looking for ideas/interest to be discussed in next GA for detailed meetings/discussion.
WP5	BRC		Meeting with CS4 on involvement of Albanian partner in first round. From CS1 procurement information has been received. Awaiting information from legal unit CS3: update – Ralf is in contact with legal department, progress is slow, waiting on information. Started to CS that have expressed interest in 2nd or 3rd round of the innovation call. (incl. CS2, CS7, CS8). Criteria for evaluation process – weighting of the criteria needs to be confirmed per CS depending on stakeholder priorities. That will be performed the coming two month – however being discussed whether this needs to be defined before the tender is published. If this needs to be done, then the co-creation process with stakeholders (in months after tender is published) is not possible. BRC looking into how this can be organized. Q Giannis – does the delay affect the progress in the CSs involved? This should be determined.

WP7	AUEB		Meeting WP7 last Monday. Task 7.1 – close to finalizing desktop research on EU regions. Drafting questionnaire template to be distributed to CSs in first week of April. 15 min in next meeting to present on this. Task 7.2 – CS1 data being processed – working on choice experiment. (output will be used in T7.3). Task 7.4 – model framework completed – first meeting with CS1 to be planned to discuss how model can be horizontally applied to all CSs.
WP8	GAC		D8.7 is currently under review.

<u>30 March, 2023</u>
WP7 announcement (AUEB-Conrad):

- Need for input from the CS for T7.2. Preparing a template for the CS, if possible next Thursday for D7.1. Templates to ask about consultation related to funding and local issues for all the CS. Discussed during the WP7 meetings. Need to liaise with WP2 before distributing.
- For T7.4: The framework and reporting model needs to be applied horizontally. Discussion with UTH and then with the CS over the next 2-3 months
- TBD: How financial instruments will enter the WP7/ARSINOE framework. Not discussed yet

<u>UTH:</u>

- 7 Deliverables to be submitted tomorrow. Corrections on D6.2 are ongoing. All Deliverables ready for submission on time.
- Some info for the RP1 report needed. Financing/Auditing to be avoided for early June. The review meeting will take place onlinee. Date to be fixed with the EC a.s.a.p.

Title	Main partner	Other partner(s)	Comments/Actions
CS#1: Athens Metropolitan Area	UTH		Regular meeting: Planning activities with citizens (MINKA), which is ready. Follow-up with teachers planned. Organising 1st event, which needs to move due to national elections. MINKA app now available for Android. Now being developed for IoS. Website version ready. Working on the storyline about the use of data for the citizens. 2nd meeting with Nav/Otto for AGM (regular meeting every 2 weeks). Detailed list of Socio-economic data, now developing profiles (clustering analysis) for the citizens out of it. This will result for heatmaps for the area, based on vulnerability. Another index in preparation (next week).
CS#2: Mediterranean ports	AUEB		Meeting on Monday, discussion on the outcomes from the 2nd LL, meeting with WP2 planned about this. Data and models are being gathered.
CS#3: Main River (Germany)	LMU	VKU	Meeting on Tuesday with LMU to decide how to proceed after 2LLs (3rd LL in May), but planning about will happen afterwards. Outreaching new stakeholders, to liaise with other organisations active on similar topics. These are mostly working on silos, and this needs to be faced (it is being discussed). Participants of the LL to be included in discussions to develop climate services across sectors. Meeting with WP3 planned.
CS#4: Prespa-Ohris Lakes	IECE	NECCA, AKPT	Meeting today within the CS. Preparing the reports from the 2nd LL. Meeting with MINKA next Monday. EL and MK partners to use it. AL TBD. MK: Organising a field trip for the Hydro-group in Albania. EL: NECCA trying to get data from the local municipality about the outflow from the small to the big Prespa lake. AL: Meetings organised with the Universities locally and municipalities (next month). Working on the innovation call. IECE: Waiting for data from AL for the modelling.
CS#5: Canary Islands	ULL		WP3 meeting attended where the sea-level rise model was. presented. After Easter 2nd presentation. Date for the next LL: 20 June. Two SMEs contacted for the innovation call (they are interested).
CS#6: Black Sea	AUTH		Last Friday we had a meeting with CSIC to investigate the possibility of implementing MINKA to the Black Sea case

			Study. We will discuss the outcomes of this meeting with our case study partners next Tuesday, during our regular meeting. We met with representatives of some of our partners (METU, BSEC, AUEB) on Wednesday during the BRIDGE-BS workshop in Thessaloniki. Today, we had a meeting with Alice (WP2) at AUTH, to clarify the final details before our 2nd International Living Lab that will take place, online, tomorrow Friday March 31st, at 09:00 (CET).
CS#7: Southern Denmark	EM	TUD	Monthly meeting yesterday with everyone involved: proceeding with the planning after M18: preparing workshop locally about sea-level rise (shortly after the summer), in time with the Danish coastal authority finishing their modelling on sea-level rise. New local model to be tested with LNHwater. Preparations for EGU. Diss/Comm: Decision to do more locally, assisted also by the Danish Coastal Authority. Working on the report from the last LL.
CS#8: Torbay and Devon County	UNEXE	TC	Numerous meetings: Tuesday with EA and TC climate officer: feedback from the LL. Health and well-being to be included. Mehdi working with them for the cascading effects (multiple discussions on this). Wednesday meeting: Discussing on ecosystem services and how they can be included. UNEXE asked EA about permutable services to be included. Flood modelling calibration taking place with UNEXE and TC. Meeting today TC and UNEXE (Nav and Otto) about the modelling. Feedback expected from Otto.
CS#9: Sardinia	AGRIS	UT, LMU	UT will interview locally stakeholders for the governance of water and the supply chain. Calibrating the water balance model. Working on the report from the 2nd LL. Preparing material for the stakeholders.
Task 6.2	UT		
Task 6.3	UNEXE	ATHENA	
Task 6.4	AUEB		
Task 6.5	KWR		
WP2	UT	AUEB	Deliverable D2.2 ready for submission. D6.5 corrected and goes for submission. Meeting with WP5 and WP7 about the last LL, which is the final for SIA. Planning about the stakeholder engagement after the last LL. It will be more case specific. Further discussion needed.
WP3	TUD	LMU	Presentation by CS#5 yesterday (Very good and recorded-available to all on Teams). Review D3.2 finished by BRC
WP4	UNEXE	ICCS	Not focus on WP4 this week, time taken for WP3. Looking into the knowledge graph taking place.
WP5	BRC		Gloria: We need to map out the coming tasks from WP2/WP5/WP7 and this needs to be done soon. Meeting tomorrow with LMU legal department for the open call. CS#5 is fine. Contacting the 3 CS about the impacts of the delay. Instructions for the applicants and reviewers to be sent.
WP7	AUEB		Specific announcement by AUEB (Conrad)

WP8	GAC		D8.7 review finished by BRC.D8.7 and D8.8 ready for submission. New video shared this morning. New video next week.

Systems Innovation Approach (SIA) addresses the growing complexity, interdependencies and interconnectedness of modern societies and economies, focusing on the functions of the cross-sectoral system? as a whole? and on the variety of actors. The Climate Innovation Window (CIW) is the EU reference innovations marketplace for climate adaptation technologies. ARSINOE shapes the pathways to resilience by bringing together SIA and CIW, to build an ecosystem for climate change adaptation solutions. Within the ARSINOE ecosystem, pathways to solutions are co-created and co-designed by stakeholders, who can then select either existing CIW technologies, or technologies by new providers (or a combination) to form an innovation package. This package may be designed for implementation to a specific region, but its building blocks are transferable and re-usable; they can be re-adapted and updated. In this way, the user (region) gets an innovation package consisting of validated technologies (expanding the market for CIW); new technologies implemented in the specific local innovation package get the opportunity to be validated and become CIW members, while the society (citizens, stakeholders) benefits as a whole. ARSINOE applies a three-tier, approach: (a) using SIA it integrates multi-faceted technological, digital, business, governance and environmental aspects with social innovation for the development of adaptation pathways to climate change for specific regions; (b) it links with CIW to form innovation packages by matching innovators with end-users/regions; (c) it fosters the ecosystem sustainability and growth with cross-fertilization and replication across regions and scales, at European level and beyond, using specific business models, exploitation and outreach actions. The ARSINOE approach is show-cased in nine widely varied demonstrators, as a proof-of-concept with regards to its applicability, replicability, potential and efficacy.

ARSINOE

CLIMATE-RESILIENT REGIONS THROUGH SYSTEMIC SOLUTIONS AND INNOVATIONS

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