



Climate-Resilient Development Pathways in Metropolitan Regions of Europe

Deliverable 1.1. – Target groups (stakeholders)
engagement strategy

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Table of Contents

List of figures	5
List of tables	5
Abbreviations	5
Executive summary	6
1 Introduction	8
1.1. System Innovation Approach (SIA)	8
2 Methodology - Case Study Areas (CSA)	11
2.1 Identification of Stakeholders	11
2.2 Stakeholder Identification Survey - Results	12
2.3 Workshop 1 (M9-M12)	13
Overall objectives	13
Workshop Description	14
In-between workshops	18
2.4 Workshop 2 (M15-M18)	18
Overall Objectives	18
Workshop Description	18
In-between workshops	21
2.5 Workshop 3 (M21-M24)	21
Objectives	21
Workshop Description	22
Next steps	24
Conclusions	25
References	26

List of figures

Figure 1. System Innovation Approach (Source: RRI tools, https://rri-tools.eu/-/visual-toolbox-for-system-innovation-a-resource-book-for-practitioners-to-map-analyse-and-facilitate-sustainability-transitions-)	8
Figure 2. Workshops timeline	10
Figure 3. PESTLE Analysis (Source: https://medium.com/@anirbanmukherjee1311/pestle-analysis-c6b822164d4)	15
Figure 4. Example of a mental mapping exercise with local stakeholders in a workshop (H2020 COASTAL project).....	16
Figure 5. Backcasting and co-development of Innovation Pathways – Travelling from the future to the present and back again (Source: De Vicente López & Matti, 2016)	22

List of tables

Table 1. Case Study Areas.	13
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Abbreviations

Abbreviations	Full wording
A&M	Adaptation & Mitigation
CC	Climate Change
CSA	Case Study Areas
DT	Digital Twin
ES	Ecosystem Services
IDSS	Impact-Based Decision Support Systems
LL	Living Labs
NBS	Nature-Based Solutions
SC-Hub	Stakeholder Community Hub
SDG	Sustainable Development Goals
SE	Stakeholder Engagement
SIA	System Innovation Approach
TG	Target Groups
WS	Workshop

Executive summary

CARMINE will deliver a series of iterative workshops containing impactful outputs and interactive activities that foster climate adaptation and resilience within the Case Study Area (CSA). Commencing with Workshop 1, the primary focus revolves around the creation of a comprehensive Climate Challenge Systems Map, coupled with the prioritization of Essential Ecosystem Services and promising Nature-Based Solutions (NBS). Engaging stakeholders in dynamic mapping exercises and in-depth discussions, this initial workshop lays the groundwork for subsequent endeavours. Moving forward, Workshop 2 co-designs a common vision providing sector-based climate adaptation and resilience goals seamlessly integrating Sustainable Development Goals (SDGs) and Nature-Based Solutions where applicable. Here, collaborative efforts channel into envisioning exercises, fostering enriched narratives tailored to sector-specific needs and aspirations. Building upon this momentum, Workshop 3 delves deeper into the realm of Adaptation and Mitigation (A&M) pathways within the CSA, where stakeholders validate and fine-tune the refined vision.

Using a back-casting approach, key milestones are identified, and the potential of adaptive solutions including NBS are explored to fortify climate resilience. Additionally, the Living Lab (LL) workshops will be an opportunity for stakeholders to interact with the digital tools developed within the project (WP5 – Impact-Based Decision Support Systems (IDSS) and WP4 Digital Twins (DT)) ensuring the end products meet the needs of the community. Each workshop, structured with introductions and recapitulations of prior outputs, fosters an environment conducive to collaborative engagement, ensuring that stakeholders actively contribute to the development of strategic frameworks aimed at addressing pressing climate challenges and advancing sustainability within the CSA. D1.1 presents the CARMINE stakeholder engagement strategy as a stepwise approach where stakeholders will be engaged through a series of workshops. It details the activities to be conducted within each workshop, designed to meet the project requirements.

Each CSA Living Lab (LL) will follow the same structure to ensure the outputs are comparable. Nevertheless, the strategy remains flexible and will be adapted to the specific context of each case study depending on the degree of in terms of climate adaptation strategy and policy advancement within the metropolitan area, as many CSAs have already started adapting to climate change. The present stakeholder engagement strategy is a general overview of the LL structure. It will be complemented by detailed guidelines for each workshop and dedicated facilitator training to ensure CSA leaders are well-equipped to implement the stakeholder engagement strategy. As it is an iterative process, the activities proposed might be revised according to the needs of the project and the development of each LLs, taking into consideration stakeholder needs.

This deliverable complements D1.7, which identified the stakeholders to be involved in the CARMINE LLs.

Key words

Climate Change Adaptation & Resilience, Metropolitan Regions, Case Study Areas, Sustainability Development Goals, Stakeholders Engagement Strategy, Geo-design, System Innovation Approach, Nature-Based Solutions.

1 Introduction

1.1. System Innovation Approach (SIA)

The System Innovation Approach (SIA) constitutes an analytical method geared towards catalysing systemic transformation through an interconnected array of innovations, where each facet influences the others, fostering innovation not only within individual components of the system but also in their interrelations. The notion of a system of innovation consolidates various best practices essential for nurturing innovation within the realm of climate adaptation. Over recent decades, the concept of system innovation has permeated academia and business, denoting significant overhauls in organizations, communities, and regional economies through socio-technical transitions. In a systems innovation approach, solutions manifest as a cohesive array of integrated interventions across economic, political, and social systems, supporting disparate yet interconnected initiatives (Hage & Meeus, 2006).

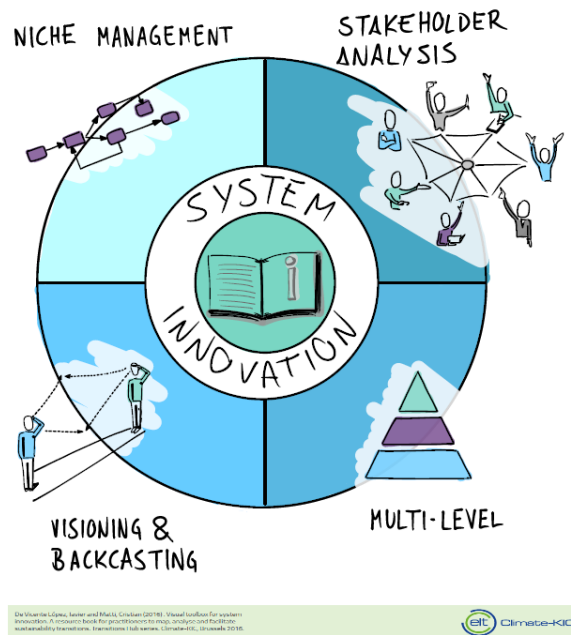


Figure 1. System Innovation Approach (Source: RRI tools, <https://rri-tools.eu/-/visual-toolbox-for-system-innovation-a-resource-book-for-practitioners-to-map-analyse-and-facilitate-sustainability-transitions->)

Central to the SIA is the recognition that innovation must be inclusive and participatory, involving all relevant actors in the co-creation process. This inclusivity ensures that solutions are not only technically sound but also socially acceptable and economically viable. SIA encourages the use of systems thinking tools and methodologies, such as scenario planning, causal loop diagrams, and multi-criteria analysis, to map out the complexities and interdependencies within systems. By doing so, it helps stakeholders identify leverage points where interventions can produce

significant positive changes. Moreover, SIA promotes iterative learning and adaptive management, allowing systems to evolve and improve over time. This dynamic and comprehensive approach is crucial for tackling today's most pressing issues, from climate change and resource depletion to social inequality and economic instability (Geels, 2011; Loorbach et al., 2017).

The SIA is particularly effective in addressing complex, interrelated global challenges because it promotes comprehensive and inclusive solutions that traditional methods often overlook. SIA focuses on the interconnectedness of societal, economic, and environmental systems, enabling stakeholders to identify and leverage key points of intervention for sustainable change. This approach encourages the participation of diverse actors, fostering collaboration and co-creation of solutions that are both technically sound and socially acceptable. Research highlights that SIA's holistic perspective and iterative learning processes enhance resilience and adaptability, essential for dealing with the uncertainties of modern challenges like climate change and economic instability. By integrating systems thinking tools and methodologies, SIA not only addresses the symptoms of problems but also tackles their root causes, making it a powerful strategy for achieving long-term, impactful innovations (Wiek & Lang, 2016).

The SIA is particularly useful because it provides a robust framework for addressing the multifaceted and interdependent challenges that characterize contemporary global issues. Traditional problem-solving methods often fall short in tackling these complex issues due to their tendency to isolate problems from their broader contexts. In contrast, SIA recognizes that issues such as climate change, poverty, and public health are deeply interconnected and require comprehensive solutions that account for various societal, environmental, and economic factors. By adopting a systems perspective, SIA allows stakeholders to see the bigger picture, understand the root causes of problems, and identify strategic intervention points that can lead to systemic and sustainable change. Additionally, the System Innovation Approach is valuable for fostering resilience and adaptability in the face of uncertainty and rapid change. In today's world, where disruptions and crises can emerge unpredictably, the ability to adapt and respond effectively is crucial. SIA's emphasis on iterative learning and continuous feedback loops enables organizations and communities to remain agile and responsive. By engaging a wide range of stakeholders in the innovation process, SIA ensures that diverse perspectives and knowledge bases are incorporated, leading to more robust and inclusive solutions. This collaborative and adaptive nature of SIA not only enhances the effectiveness of interventions but also builds a sense of ownership and commitment among participants, thereby increasing the likelihood of successful implementation and long-term sustainability.

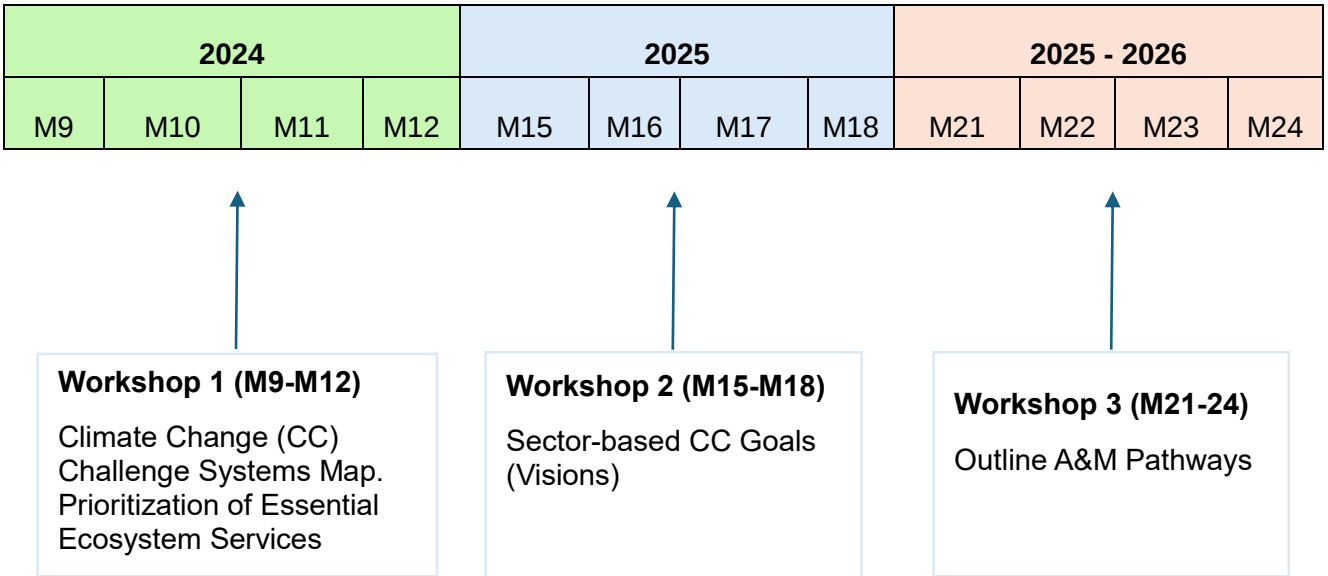


Figure 2. Workshops timeline

2 Methodology - Case Study Areas (CSA)

The groundwork for setting the context is largely completed, with case study leaders having outlined the primary challenges they aim to address climate mitigation and adaptation goals, as well as their expected outcomes from the LLs (addressed in D1.7). Of significant importance is the delineation of key objectives for each case study, as these will serve as the foundation for future innovation endeavours within the systems.

2.1 Identification of Stakeholders

The initial phase entailed identifying the primary sectors relevant to each case study, which determines the sectors from which stakeholders will be drawn. Within these sectors, it is imperative to pinpoint the challenges that each CSA faces.

Firstly, a survey was distributed to the CSA leaders (detailed results are presented in D1.7). The survey offers a comprehensive framework for analysing the CSA within the broader context of the CARMINE project. It served as a structured tool to gather essential information across various dimensions, such as climate hazards, mitigation and adaptation goals, stakeholder engagement, ongoing initiatives, climate actions, data availability, and relevant indicators. This information is crucial for understanding the climate landscape within the CSA and designing the LL activities accordingly.

Furthermore, the survey aimed at identifying the specific climate hazards and risks that the LL activities will address within the CSA. By pinpointing these hazards and risks, the survey was used as a tool to engage CSA lead teams in further reflections to ensure that the LL will focus on the most pressing climate challenges faced by the local community. Additionally, the survey requests data about existing climate mitigation and adaptation goals and measures, providing insights into the overarching objectives guiding local climate action. The purpose here was to ensure that the activities conducted within the CARMINE LLs effectively support the metropolitan regions in their climate adaptation and resilience strategies at any stage. Finally, the survey helped the WP1 team to anticipate the CSA's expected outcomes of LL activities, shedding light on the potential impact and efficacy of collaborative climate initiatives.

Moreover, the survey investigated existing climate actions undertaken at the metropolitan level within the CSA. It aimed to uncover plans, strategies, and reports detailing past and ongoing efforts to address climate risks and adaptation challenges as an initial mapping exercise in support of task 6.1. Furthermore, it identified specific solutions including nature-based solutions (NBS) already implemented, such as urban parks or green infrastructure projects, and funding mechanisms utilized to support climate action initiatives. In terms of stakeholder engagement, the survey assessed whether stakeholders have already been involved in participatory activities related to climate change risks, adaptation, and mitigation challenges. It also identified potential threats or difficulties foreseen in the stakeholder engagement process, ensuring proactive mitigation of challenges and fostering inclusive decision-making processes.

Lastly, the survey addressed data availability and indicators relevant to climate hazards and risks within the CSA to support WP2 activities. It examines whether indicators have already been developed, existing climate impact models, and the availability of critical datasets essential for understanding climate dynamics. Additionally, it identified data gaps that can be addressed within the CARMINE project, facilitating targeted data collection efforts to enhance climate resilience and adaptation strategies within the CSA.

2.2 Stakeholder Identification Survey - Results

The survey presents a thorough structure for examining CSAs within the wider framework of the CARMINE project. The overall objective of the survey was to provide an initial overview of each of the 8 CSAs, documenting achievements to date in climate change adaptation, stakeholder engagement, and data availability, while outlining expectations for the CARMINE LLs and anticipated impacts of these initiatives. A detailed analysis of the CSAs is presented in D1.7. The examination of diverse CSAs underscores a global commitment to addressing climate change through proactive adaptation measures with some CSAs, having already been actively engaging stakeholders in collaborative initiatives related to climate change challenges. Stakeholder engagement emerged as a pivotal aspect of climate adaptation strategies across all CSAs. Expected participatory workshops and collaborative platforms facilitate meaningful dialogue and the co-creation of solutions. Initiatives like the LLs showcase the importance of involving diverse stakeholders, including communities, policymakers, and experts, in the decision-making process. Moreover, the NBSs is a recurring theme, with a focus on leveraging natural systems to enhance resilience. Strategies such as coastal restoration, green infrastructure development, and urban forest preservation were prominent in CSAs. NBS are expected not only to offer climate adaptation benefits but also to contribute to carbon sequestration, biodiversity conservation, and improved quality of life for communities. Access to reliable data, including meteorological observations, demographic information, and ecological data, empowers stakeholders to make informed decisions and develop targeted interventions.

In conclusion, the comprehensive analysis of CSAs highlights the importance of multi-stakeholder collaboration, nature-based solutions, and data-driven decision-making in climate adaptation efforts. By fostering partnerships, embracing innovative solutions, and harnessing the power of data, communities can build resilience and thrive in the face of climate change.

In the CARMINE project, stakeholder engagement is pivotal for driving transformative adaptation and fostering climate resilience across diverse metropolitan regions. Participation in workshops, focus groups, alongside tracking and measuring social media campaigns and events, forms the cornerstone of our multi-stakeholder engagement strategy. This strategy, encompassing all stakeholder groups, acknowledges the diverse perspectives, resources, and priorities inherent in each stakeholder group within the CARMINE framework. As we delve into the case study areas, this introduction sets the stage for exploring how our stakeholder engagement strategy promotes consensus-building, transparency, and inclusive decision-making processes towards enhancing climate resilience in metropolitan regions.

Table 1. Case Study Areas.

CSA	Lead organization	Challenge(s)
(1) Prague	ICS	Air quality
(2) Leipzig	UFR	Heat wave and wildfire and their indirect economic effects
(3) Funen - Odense	DTU	Flooding
(4) Athens	NOA	Heat waves
(5) Barcelona	MITIGA	Wildfires
(6) Bologna	CNR and CAAB	Heat waves; urban microclimate; population wellness; relationships in the urban environment between pollution and climate
(7) Brasov	INCDS	Drought Extreme events associated with water related hazards Heat waves
(8) Birmingham	UoBIR with BCC	Surface water flooding (particularly the interaction with trees and green infrastructure)

2.3 Workshop 1 (M9-M12)

Overall objectives

The workshop aims to produce a comprehensive CC Challenge Systems Map, which will highlight key challenges, interdependencies, and synergies within the CSA climate context. This map will provide insights into the underlying factors (drivers) of climate challenges, their impacts, and the intricate relationships between them. Participants will engage in a structured identification or review / validation process (depending on the pre-existence of similar work), utilizing the PESTLE framework, to collaboratively map out the multifaceted landscape of climate challenges, facilitating a deeper understanding of the complex issues at hand. This activity will help system thinking awareness among stakeholders to ensure holistic solutions are designed to tackle key impacts.

Another significant objective of the workshop is to prioritize adaptive solutions, including NBS, crucial for addressing climate challenges and implementing adaptation measures within each CSA. Participants will identify relevant adaptive solutions and connect them to the identified CC challenges and risks. Examples of adaptive solutions that may be considered include urban parks, green roofs, wetlands restoration, and urban agriculture. Through a participatory process, these

adaptive solutions will be ranked in the workshop setting using post-its, sticky notes, or mentimeter. This prioritization exercise will inform decision-making processes, guiding the allocation of resources and efforts towards safeguarding and enhancing solutions vital for climate resilience and adaptation.

The workshop also aims to build a sector-based narrative through group elaboration of the vision, based on CC goals and SDG-based guiding principles, while prominently featuring adaptive solutions including NBS. Participants will collaboratively develop a comprehensive vision that integrates sector-specific CC goals with broader sustainability principles. Examples of adaptive solutions to be considered include the creation of urban green spaces, such as parks and green roofs, to mitigate urban heat island effects and improve air quality; wetlands restoration to enhance flood control and water purification; and the implementation of green infrastructure, such as rain gardens and permeable pavements, to manage stormwater and support urban cooling. By integrating these and other adaptive solutions into the sector-based narrative, the workshop is expected to guide the strategic planning and implementation of effective, sustainable solutions that address both climate adaptation and mitigation needs within the CSA.

The specific objective for Task 1.4 is to apply these adaptive solutions in depth in 2 CSAs, ensuring a focused and impactful approach to climate resilience and adaptation.

Workshop Description

Introduction

The workshop will commence with an introduction to the overarching project objectives and the LL process, providing participants with a contextual understanding of the workshop's purpose and goals under the CARMINE project. A general timeline of workshop sessions will be outlined, offering a roadmap for the day's activities. Additionally, participants will be introduced to the Stakeholder Community Hub (SC-Hub) Tool, a collaborative platform designed to facilitate the operation of the LLs and their digital representation. Among others, data sharing functionality and decision-making processes will be supported through the SC-Hub. The first version of the SC-Hub will offer some of the foreseen functionalities and this workshop will be used for collecting additional requirements too. An icebreaker activity will be conducted to foster engagement and rapport among participants, setting a positive tone for the collaborative sessions ahead.

As the workshop progresses, adaptive measures and potential NBS will be discussed. Participants will have the opportunity to brainstorm various NBS options tailored to the specific challenges faced by each CSA, such as extreme heat, flooding, urban resilience, etc. and explore the co-benefits of NBS, such as carbon sequestration, biodiversity conservation, and improved community well-being

Finally, to support the implementation of T1.4. "Geo-designing adaptation and mitigation pathways", a geo-design activity will be conducted in the CSAs that will implement this task.

Activity 1: CC Challenges

During this activity, participants will engage in the identification or validation of CC challenges within the CSA by employing the flexible PESTLE framework. The PESTLE framework is a strategic analytical tool used to identify and analyse the key external factors that can impact an organization or a project. PESTLE stands for Political, Economic, Social, Technological, Legal, and Environmental factors (Figure 3). By examining these six categories, organizations can gain a comprehensive understanding of the macro-environmental elements that could influence their operations and strategic decisions. Political factors include government policies, stability, and regulations; Economic factors encompass economic growth, inflation, and exchange rates; Social factors involve demographic trends, cultural norms, and consumer behaviour; Technological factors cover advancements, innovation, and technological infrastructure; Legal factors pertain to laws, regulations, and legal frameworks; and Environmental factors focus on ecological and environmental aspects like climate change and sustainability. In CARMINE, this framework will be utilized to assist 8 case studies in identifying the factors that define their systems, aiming to pinpoint both the obstacles and facilitators for implementing innovation pathways in general, and specific innovations in particular.



Figure 3. PESTLE Analysis (Source: <https://medium.com/@anirbanmukherjee1311/pestle-analysis-c6b822164d4>)

This approach allows for adaptation to the specific context and level of advancement of the metropolitan area. For CSAs that already have established policy adaptation strategies, the activity will focus on validating and refining these strategies rather than starting anew. Through detailed mapping exercises (see Figure 3), participants will examine various environmental, social, and economic factors that influence climate resilience and adaptation. By delving into the underlying drivers of climate risks and hazards, as well as their potential impacts, the activity will facilitate a holistic understanding of the complex climate landscape. This nuanced approach ensures that existing efforts are recognized and built upon, while also identifying new challenges and opportunities for enhancement. The goal is to integrate local contexts with broader strategic objectives, thereby promoting more effective and tailored climate adaptation measures. Presented below (Figure 4) is an example of mental mapping exercise with local stakeholders.

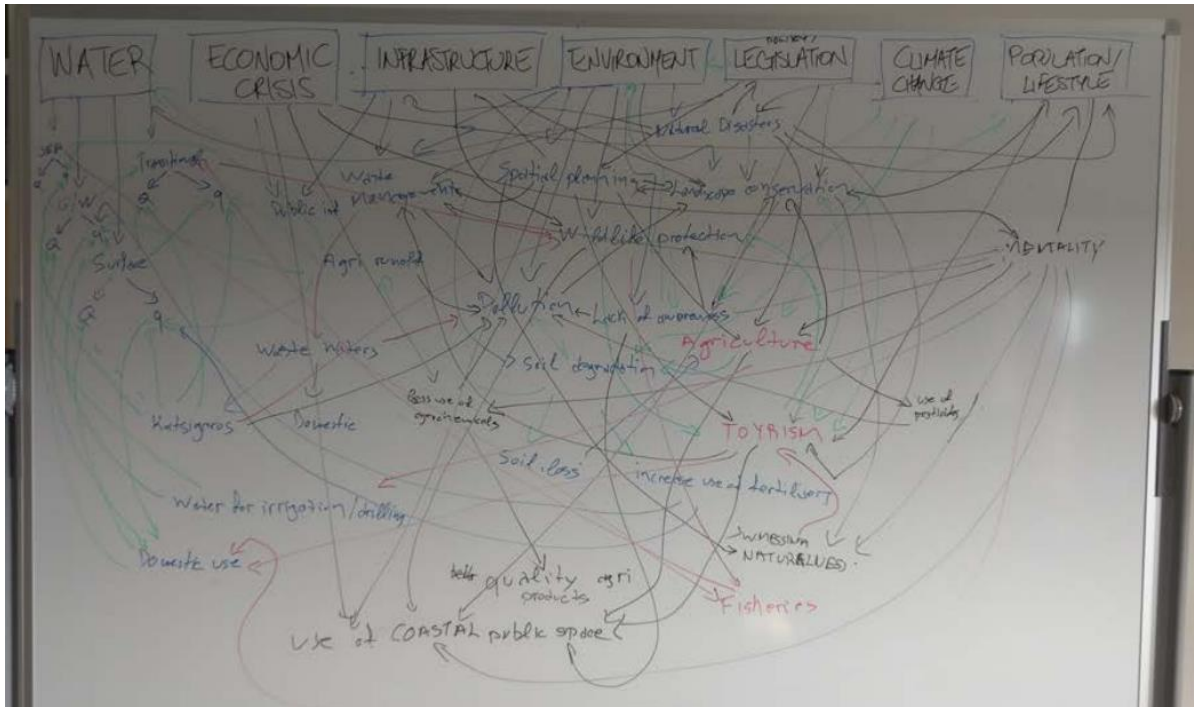


Figure 4. Example of a mental mapping exercise with local stakeholders in a workshop (H2020 COASTAL project)

Activity 2: Adaptive measures including Nature-Based Solutions

The second activity will focus on understanding and prioritizing adaptation measures critical for climate adaptation and resilience within the CSA. Participants will be introduced to various adaptive solutions, including NBS, and their roles in mitigating climate risks. Through collaborative discussions, they will identify relevant adaptive solutions and establish connections to the identified CC risks and impacts. Utilizing tools such as matrices, post-its, sticky notes, and potentially mentimeter in an online format, if necessary, participants will rank these solutions based on their perceived impacts and benefits. This participatory prioritization process aims to identify and prioritize solutions that the CARMINE project should focus on to support climate resilience and sustainability goals within the CSAs, facilitating informed decision-making and strategic planning in subsequent project phases.

Participants will engage in a focused activity aimed at prioritizing adaptive solutions, including NBS, based on their respective benefits. Employing various tools, this activity will rank adaptive solutions according to their perceived impacts and benefits. The objective is to pinpoint and prioritize solutions that the CARMINE project should emphasize to bolster climate resilience and sustainability within the CSAs, thereby aiding in strategic decision-making and planning for future project phases.

Activity 3: Challenge to Adaptation and Prioritization of Solutions

During this activity, participants will engage in a comprehensive assessment of challenges related to CC adaptation within the CSAs. This includes a first overarching identification of existing threats and barriers in adaptation planning, with a particular focus on validating current policies and strategies. The session will commence with a review of the key existing adaptation policies already identified within the CSA (T.6.1), ensuring no policy framework has been omitted.

Subsequently, participants will collaboratively prioritize solutions aimed at addressing these challenges, which may include NBS. Using workshop tools such as matrices, post-its, sticky notes, and potentially mentimeter for online sessions, if necessary, participants will rank these solutions based on their perceived benefits and impacts. This prioritization exercise aims to facilitate strategic decision-making and resource allocation within the CSAs.

If online sessions are required, provisions will be made to ensure the continuity and effectiveness of the prioritization process. The activity will conclude with a reflection phase, allowing participants to evaluate insights gained and refine strategies as needed. This structured approach ensures that adaptation efforts are well-informed, prioritized, and aligned with the overarching goals of enhancing climate resilience and sustainability in the CSAs.

Activity 4: Digital Twins concept finalisation

The focus of this activity will shift to outlining the concept, key features and data requirements for creating accurate and useful Digital Twins (DTs) of the CSAs. DTs are sophisticated virtual systems that simulate real-world environments and processes, providing valuable insights for planning and management. Participants will identify the types of environmental data, monitoring capabilities, and predictive analytics necessary for modelling different climate scenarios and their potential impacts and finalise the proposed concept. Understanding these needs is crucial for developing DTs that are technically robust and highly relevant to the stakeholders' operational contexts.

Optional - Activity 5 (only for CSAs fully implementing T1.4.): Nature-based Solutions (NBS) Opportunity Space Mapping

This activity is tailored for CSAs planning to implement Task 1.4 under the CARMINE project, focusing on mapping NBS opportunity spaces. The first phase involves validating pre-identified NBS opportunity spaces through comprehensive stakeholder engagement. Participants will engage in collaborative discussions to ensure the identified NBS align with local conditions and adaptation needs within the CSA.

Building on activity 2 and 3, stakeholders will proceed to collectively refine and prioritize priority NBS based on their respective benefits. Utilizing interactive tools, participants will rank these solutions according to their perceived impacts and benefits. This prioritization process aims to guide strategic decision-making and resource allocation towards the most effective NBS that enhance climate resilience and sustainability within the CSA.

The activity concludes with a reflective phase, allowing participants to evaluate the outcomes of the NBS opportunity mapping exercise. This reflection enables stakeholders to assess insights gained, consider additional factors or perspectives, and refine strategies as needed to ensure alignment with project goals and local adaptation priorities. By systematically mapping opportunity spaces and prioritizing NBS, CSAs can better integrate nature-based approaches into their climate adaptation strategies, fostering resilience and sustainable development in their communities.

In-between workshops

Following Workshop 1 and preceding Workshop 2, an interim phase is dedicated to the meticulous analysis of Workshop 1 outputs to delineate Key Sectors and any associated CC goals, if pertinent, serving as pivotal inputs for Workshop 2 proceedings. The workshop outputs also feed into Deliverable 1.2: report on Climate Change Challenges in each CSA. This stage also involves linking the analysis with Task 6.3 to ensure seamless integration with project objectives. Concurrently, a comprehensive examination of the participant list is conducted to facilitate any necessary revisions. Additionally, the interim phase encompasses the crucial task of SDG Mapping, aiming to identify relevant SDGs and guiding principles that underpin project activities. Furthermore, efforts are directed towards producing a detailed catalogue of relevant NBS, laying the groundwork for informed decision-making and strategic planning in subsequent workshops, within the CARMINE project.

2.4 Workshop 2 (M15-M18)

Overall Objectives

The workshop will culminate in the formulation of a visions describing sector-based climate change goals, tailored to the specific needs and priorities of key sectors within the CSA. These sector-specific goals will outline ambitious yet attainable climate adaption and resilience goals, serving as guiding principles for sectoral actions and interventions. Through collaborative exercises and group discussions, participants will validate key sectors, based on the outputs of WS1.

Workshop Description

Introduction

The workshop will commence with a presentation of the outputs from Workshop 1 (the mental map produced based on WS1 outputs) providing participants with an opportunity to validate and build upon the findings from the previous session. An overview of Workshop 2 (WS2) objectives and activities will be presented, setting the stage for the day's engagements. An icebreaker activity centred around sector selection will be conducted to foster engagement and facilitate the identification of key sectors for further exploration.

Activity 1: Sector Prioritization

The Sector Prioritization activity serves as a foundational step within the workshop framework, dedicated to meticulously identifying and ranking key sectors crucial for addressing climate change adaptation and resilience within the designated CSAs. This essential phase commences with a thorough validation process wherein stakeholders engage in discussions to confirm the relevance and significance of pre-identified sectors. Through collaborative dialogue and expert input, participants assess each sector's alignment with local climate challenges, ensuring a comprehensive understanding of their contextual importance.

Subsequently, the prioritization phase unfolds using online tools such as the menti meter, facilitating dynamic and real-time ranking based on participant input. This interactive approach empowers stakeholders to collectively determine the priority order of sectors, considering their potential impacts on climate resilience and adaptation strategies. The outcome of this exercise provides the basis of the envisioning exercise.

Activity 2: Envisioning

Envisioning is a critical component of the workshop, aimed at crafting a comprehensive vision for CC adaptation and resilience across various sectors within the CSAs. This activity is structured in three pivotal phases to ensure a thorough and collaborative approach.

The first phase involves the identification or reviewing of CC goals per sector through group discussions. Participants will engage in an in-depth review of pre-identified CC goals, scrutinizing their relevance and completeness at the CSA level. This process includes identifying any existing gaps and determining if the goals remain pertinent to current climate challenges. Participants will explore whether these goals are effectively translated into actionable strategies within the CSA and what additional elements or modifications might be necessary to ensure a comprehensive and robust climate adaptation framework.

In the second phase, participants will focus on building a sector-based narrative. This collaborative effort involves elaborating on the vision based on the identified CC goals and integrating the SDG-based guiding principles. The narrative will also prominently feature NBS, aligning local sector-specific aspirations with broader global sustainability objectives. Through this process, participants will synthesize their insights and strategies into a cohesive and compelling vision that addresses both local climate challenges and contributes to overarching sustainability targets.

The final phase of the activity is the presentation in plenary. During this session, each group will present their sector-based narrative to the broader workshop participants. This presentation serves multiple purposes: it validates the developed vision, gathers feedback from a diverse set of stakeholders, and refines the strategies as necessary. The plenary session ensures that the collective vision is aligned with stakeholder expectations and project objectives, fostering a shared understanding and commitment to the proposed climate adaptation and resilience strategies.

By systematically identifying CC goals, constructing a detailed sector-based narrative, and presenting these in a plenary session, activity 2: ensures a well-rounded and participatory approach to developing effective and sustainable climate adaptation strategies within the CSAs.

Activity 3: Digital Tools requirements and feedback

This activity presents the digital tools to be developed within the CARMINE project. This activity gathers comprehensive user requirements (needs) for the two critical digital systems that will be developed within the project: IDSS and DTs. Specifically for the DTs, it will help in finalising the concept and the initial approach and provide feedback on the developments thus far.

Participants will begin by engaging in discussions to ascertain the specific functionalities and capabilities required from the IDSS to enhance climate adaptation planning and decision-making processes. The objective is to understand the types of data inputs, analytical tools, and decision-making frameworks that users need to effectively address climate challenges. By capturing these requirements, the workshop aims to ensure that the CARMINE IDSS developed is tailored to meet the practical needs of stakeholders and supports informed, data-driven decision-making.

Throughout the activity, various engagement tools for online sessions will be utilized. This participatory approach ensures that a diverse range of stakeholder inputs is captured, leading to a more comprehensive understanding of the digital needs.

The activity will conclude with a reflection session, where participants review and discuss the insights gained from the discussions. This reflection helps to refine the identified requirements and ensures that the strategies align with the overall project objectives. The outcome of Activity 3 will inform the development and enhancement of IDSS and DTs, thereby improving the digital infrastructure supporting climate adaptation efforts within the CSAs.

Optional Activity 4: Nature-Based Solutions (NBS) for Scenario Narratives

This activity is tailored for CSAs planning to implement Task 1.4 under the CARMINE project, focusing on refining NBS scenario narratives. This activity will generate information that is crucial to the development of Task 1.4 activities to be carried out in Workshop 3. The first phase involves participants validating pre-developed NBS scenario narratives through comprehensive stakeholder engagement. Participants will engage in collaborative discussions to ensure the NBS scenarios align with local conditions, realities, and adaptation needs within the CSA.

Following this, participants will collectively focus on validating vulnerability indicators to CSA climate challenges that can be addressed by the identified sector-relevant NBS. Participants will engage in an in-depth review of the pre-identified vulnerability indicators, scrutinizing their relevance in relation to their sectors and NBS. Engaging in discussions and utilizing interactive tools, participants will weigh these indicators according to their perceived relevance. This phase aims to supplement the work carried out in WP3 by generating information to guide strategic decision-making on how specific NBS can alter urban vulnerabilities.

The activity concludes with a reflection phase, where participants review and discuss the insights gained from the discussions. This reflection helps to refine the validated NBS scenario narratives and the vulnerability indicators. The outcome of Activity 4 will inform the development of NBS scenario narratives, thereby improving strategic decision-making and resource allocation towards the most effective NBS that enhance climate resilience and sustainability within the CSA.

In-between workshops

In the interim period between Workshop 2 and Workshop 3, several critical activities are undertaken to advance project objectives and refine strategic frameworks. Foremost, concerted efforts are directed towards refining the established visions, ensuring alignment with sector-based CC adaptation and resilience goals and SDGs. Simultaneously, the process of building a comprehensive catalogue of solutions including NBS continues, enriching the repository of actionable interventions. Additionally, the interim phase includes the initiation of IDSS (WP5) and stakeholder testing with selected LL members, facilitating iterative feedback and enhancements to these digital tools. Furthermore, Case Study leaders engage in the pre-identification of key milestones, laying the groundwork for strategic planning discussions. These concerted efforts during the interim phase serve to consolidate progress made in prior workshops and pave the way for informed decision-making and impactful actions in Workshop 3.

2.5 Workshop 3 (M21-M24)

Objectives

Outline Adaptation and Mitigation (A&M) Pathways

The workshop will result in the formulation of outlined Adaptation and Mitigation (A&M) Pathways, providing a strategic framework for advancing climate resilience and sustainability within the CSA. These pathways will outline actionable steps and interventions aimed at both adapting to and mitigating the impacts of climate change. Through collaborative exercises and group discussions, participants will validate and refine the vision established in Workshop 2 (WS2), identify key milestones for achieving the vision, explore NBS as part of the back-casting process, and assess the digital tools necessary to support decision-making and implementation efforts. Figure 4 presents the back-casting and co-development of Innovation Pathways.

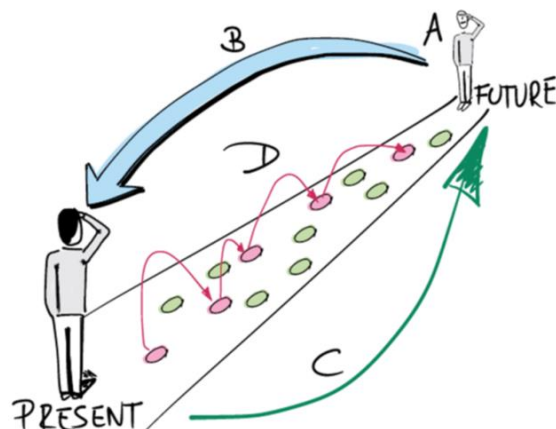


Figure 5. Back-casting and co-development of Innovation Pathways – Travelling from the future to the present and back again (Source: De Vicente López & Matti, 2016)

Workshop Description

Introduction

The workshop will commence with a presentation of the main outputs from Workshop 2 (WS2), allowing participants to validate and build upon the refined vision established in the previous session. An overview of Workshop 3 (WS3) objectives and activities will be provided, outlining the roadmap for the day's engagements.

Activity 1: Validation of the Vision

This activity focuses on presenting and validating the refined vision for climate adaptation and resilience within the CSAs. This crucial activity ensures that the strategic vision aligns with stakeholders' expectations and incorporates their insights. The session will begin with a comprehensive presentation of the refined vision, which has been developed based on prior workshops and stakeholder inputs. This presentation will outline the key elements of the vision, including overarching goals, strategic priorities, and anticipated outcomes for enhancing climate resilience within the CSAs. Following the presentation, participants will engage in a validation process. This involves a structured discussion where stakeholders review the refined vision, providing feedback on its relevance, comprehensiveness, and alignment with local needs and contexts. Participants will critically assess whether the vision effectively addresses the identified climate challenges and incorporates SDG-based guiding principles.

To facilitate an inclusive and thorough validation process, various engagement tools and possibly online feedback will be employed. These tools will help capture diverse perspectives and ensure that all participant voices are heard and considered. The validation session aims to achieve consensus on the vision, ensuring that it reflects a shared understanding and commitment among stakeholders. Any identified gaps or areas for improvement will be noted, and the vision will be refined accordingly. The outcome of Activity 1 will be a validated and refined vision that serves as

a strategic foundation for subsequent project activities. This validated vision will guide the planning and implementation of climate adaptation measures, ensuring that they are aligned with stakeholder expectations and contribute effectively to the resilience of the CSAs.

Activity 2: Back-casting

This activity focuses on identifying the intermediary steps to be achieved prior to end goals express in the vision using a back-casting process to strategically plan the path towards achieving the refined vision for climate adaptation and resilience within the CSAs. This activity aims to establish clear milestones, present and map adaptive solutions including NBS, and identify key actors, enablers, and barriers. Initially, participants will engage in identifying critical milestones that mark significant steps towards achieving the long-term vision. These milestones will serve as benchmarks to assess progress and ensure that the strategic objectives are met in a timely and effective manner. The process will involve collaborative discussions to pinpoint achievable targets and set realistic timelines.

Following the identification of milestones, the session will include a comprehensive presentation of adaptive solutions including NBS relevant to the CSAs. This presentation will highlight various options, showcasing their potential benefits and applications in addressing climate risks and enhancing ecosystem services. The aim is to familiarize participants with feasible NBS interventions and their role in the broader climate adaptation strategy. Subsequently, participants will undertake the mapping of actions, linking each solution to specific milestones and the overarching vision. This mapping exercise will involve detailed analysis to ensure that the selected solutions align with the identified milestones and contribute effectively to the climate adaptation goals. Additionally, the activity will focus on identifying key actors, enablers, and barriers that influence the successful implementation of the adaptive solutions including NBS and achievement of the milestones. Participants will collaboratively identify stakeholders who play critical roles, enablers who can facilitate progress, and barriers that may hinder implementation.

This comprehensive identification process aims to develop a clear understanding of the stakeholder landscape and the dynamics that impact the project's success. The outcome of Activity 2 will be an outline roadmap that includes strategic milestones, mapped solutions, and a thorough understanding of the key actors, enablers, and barriers. This roadmap will guide the project's implementation phase, ensuring that all actions are strategically aligned and supported by the necessary stakeholders, ultimately leading to the successful realization of the climate adaptation and resilience vision for the CSAs. These road maps will feed into Task 6.2.

Activity 3: Digital Tools

In this final activity, participants will have the opportunity to explore the CARMINE digital tools for supporting decision-making and implementation efforts within the CSA. They will engage in demonstrations and testing of IDSS and the DTs for each MRE, gaining hands-on experience with tools designed to enhance resilience and sustainability in the face of climate change. This activity will be aligned with the agile approach followed by the WP4 approach, where continuous feedback

and refinements will take place in the development of the DTs, aiming to ensure a robust and beneficial outcome.

Optional Activity 4: Geo-designing NBS A&M Pathways for Alternative Futures

This activity is tailored for CSAs planning to implement Task 1.4 under the CARMINE project, focusing on geo-designing NBS A&M pathways for alternative futures. The first phase focuses on presenting the refined NBS scenario narratives, which have been refined based on activities and stakeholder inputs from prior workshops. The presentation will outline the key elements of each scenario, including overarching goals, scope of NBS planning, and anticipated outcomes for enhancing climate resilience within the CSA.

In the second phase, participants will engage in a dynamic and geospatial exercise where they will geo-design NBS scenarios using interactive geospatial information systems (GIS). This crucial activity ensures that all participants will have the opportunity to actively engage within groups to design and map alternative NBS futures in line with the scenarios. The aim of this phase is to foster critical discussion amongst participants through the geo-design process to help to shape the development of alternative futures.

The activity will conclude with a reflection session, where participants review and discuss the insights gained from the geo-design process. This reflection helps to refine the developed NBS alternative futures and ensures that the NBS strategies align with the overall project objectives.

Next steps

Following the culmination of Workshop 3, the project enters a crucial phase dedicated to refining the established pathways for Adaptation and Mitigation (A&M) (WP6). This entails a meticulous examination of the strategic frameworks developed during the workshop, with a focus on enhancing their effectiveness and feasibility. Concurrently, an in-depth analysis of the pathways is conducted, aiming to preliminarily identify transformative adaptation measures within the CSAs. These measures are categorized based on their potential impact and feasibility, ranging from "no-regrets" and "low-regrets" options to "win-win" and "multiple benefits" interventions. This classification facilitates prioritization and strategic decision-making, ensuring that resources are allocated efficiently to maximise impact and resilience building efforts.

Through these concerted efforts, CARMINE aims to lay the foundation for tangible and sustainable climate action within the CSAs, driving transformative change and fostering resilience in the face of climate challenges.

Conclusions

In summary, our discourse has traversed a multifaceted landscape, encompassing the strategic formulation of frameworks aimed at fostering climate resilience, alongside the meticulous planning of workshop activities designed to operationalize these frameworks, under the CARMINE project.

Through collaborative endeavours and methodical analyses, pivotal outputs, including Climate Challenge Systems Maps, Sector-based Climate Change Goals, and Adaptation and Mitigation Pathways, have been delineated. These outputs stand as indispensable guiding principles, illuminating the trajectory towards a sustainable and resilient future for the CSAs under scrutiny. Moreover, the structured agendas of the workshops, augmented by interactive engagements and participatory exercises, have fostered an environment conducive to knowledge dissemination and decision-making. By harnessing digital tools, such as IDSS and DTs, in tandem with NBSs, stakeholders are empowered to make judicious decisions and effect transformative change within their respective communities.

As the project progresses, continuous refinement and rigorous analysis of these outputs, coupled with sustained stakeholder engagement and collaborative endeavours, will remain imperative in realizing the overarching objectives of bolstering climate resilience and sustainability. Through these collective endeavours, we aspire to forge a future wherein communities are fortified to thrive amidst the challenges posed by climate variability, thus bequeathing a legacy of enduring resilience.

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