

Coastal Climate Change Adaptation Pathways

A Practical Guide to Support the Development of Local Climate Change Adaptation Plans



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1 Introduction

1.1 Purpose of the Guidelines

These guidelines aim to support the development of community-based climate change adaptation pathways for coastal municipalities in the Baltic Sea region. Recognising the unique vulnerabilities and opportunities of coastal tourism in this region, the guidelines focus on:

- Fostering community understanding: Enabling municipalities to effectively engage with residents, businesses, and other stakeholders to understand their perceptions, values, and concerns regarding climate change impacts.
- **Promoting informed decision-making:** Guiding municipalities in accessing and utilising relevant climate information to inform adaptation planning and decision-making processes.
- **Developing effective adaptation strategies:** Providing practical methodologies and recommendations for developing and implementing locally-relevant and community-supported adaptation pathways for coastal tourism.
- Sharing knowledge and best practices: Documenting and disseminating the experiences and lessons learned from successful community-based adaptation projects, such as the Beach-SOS project in Saulkrasti, Latvia.
- These guidelines are supported by the interactive Story Map 'From the Ground up: Building Climate Resilience' <u>ej.uz/FromTheGroundUp</u> which provides visual examples and a case stuy of climate resilience efforts in the Baltic Sea region. This resource complements the guidelines by offering practical insights and demonstrating real-world applications of the recommendations presented herein.

1.2 Scope

This document focuses specifically on supporting the development of adaptation pathways for coastal tourism within the Baltic Sea region. While the principles and methodologies presented can be applied to other economic sectors and regions, the guidelines emphasise the unique challenges and opportunities faced by coastal communities in this region, including climate change related inidcators as:

- Sea-level rise (SLR): Impacts on coastal infrastructure, ecosystems, and tourism activities.
- **Increased storm intensity:** Impacts on coastal erosion, flooding, and the safety of tourists and residents.
- Changes in Universal Climate Conform Index (UTCI): Impacts on tourism demand, revenue streams, and the livelihoods of local communities.

1.3 Audience

These guidelines are designed to be a valuable resource for a range of stakeholders involved in coastal adaptation:

• **Municipal authorities:** Local government officials, planners, and decision-makers responsible for developing and implementing adaptation strategies.

- **Community organisations:** Non-Governmental Organisations (NGOs), communitybased organisations, and tourism associations actively engaged in climate change adaptation and community development.
- **Researchers and academics:** Institutions and individuals conducting research on climate change impacts, coastal tourism, and community-based adaptation in the Baltic Sea region.
- **Consultants and practitioners:** Professionals involved in climate change adaptation planning, risk assessment, and community engagement.
- **Capacity building programmes:** Initiatives aimed at enhancing the skills and knowledge of stakeholders involved in climate change adaptation and coastal tourism.

By utilising these guidelines, stakeholders can effectively engage with communities, develop informed adaptation plans, and implement strategies that enhance the resilience of coastal tourism in the Baltic Sea region while respecting local values and priorities.

2 Background

2.1 Climate Change and Coastal Tourism

The Baltic Sea region boasts a thriving tourism industry deeply intertwined with its stunning natural environment, featuring pristine beaches, diverse coastal ecosystems, and charming coastal towns. However, this vital sector faces significant threats from climate change.

Coastal tourism in the Baltic Sea region encompasses a wide range of values beyond "sun, sea, and sand." These include:

- **Stunning Scenery:** Beaches, cliffs, dunes, and the ocean offer breathtaking vistas, inspiring awe and relaxation.
- **Water-based Recreation:** A variety of activities, including swimming, surfing, boating, fishing, diving, and kayaking, provide opportunities for leisure and adventure.
- **Coastal Walks and Trails:** Walking, hiking, and cycling along the coast offer enjoyable ways to exercise, appreciate nature, and socialize.
- Cultural Heritage:
 - Rich historical and archaeological sites offer insights into past civilizations.
 - Traditional knowledge, including fishing practices and navigation techniques, is an integral part of the region's cultural identity.
 - Vibrant cultural festivals and events celebrate local heritage.
- **Spiritual and Religious Significance:** Sacred sites and the connection to the sea hold deep spiritual and emotional significance for many.
- **Education and Research:** The coast provides valuable opportunities for environmental education and scientific research.
- Aesthetic Appreciation: The scenic beauty inspires artists, photographers, and writers, contributing to the region's cultural richness.

Rising sea levels, warming waters, and the increasing frequency of extreme weather events are altering the region's ecosystems and landscapes, directly impacting its tourism appeal. These environmental challenges are compounded by socio-economic vulnerabilities. Many coastal communities heavily rely on seasonal tourism and may lack the resources to adapt to rapid environmental changes. The region's unique biodiversity, a key attraction for eco-tourists, is at risk due to habitat loss and species migration driven by rising temperatures. Furthermore, critical tourism infrastructure, such as accommodations, promenades, and water management systems, is increasingly vulnerable to storm surges and flooding.

As outlined by Arabadzhyan et al. (2020) climate change poses several significant risks to coastal tourism, including:

- Environmental Impacts:
 - **Degraded Marine Environments:** Ocean acidification and rising water temperatures negatively impact marine biodiversity, affecting activities like recreational fishing and seal watching.
 - **Reduced Beach Availability:** Sea-level rise and extreme weather events erode beaches, impacting destination appeal and leading to economic losses.
- Human Comfort Impacts: Extended summer seasons necessitate adaptations to ensure tourist comfort and maintain the region's attractiveness during warmer periods.
- **Infrastructure Impacts:** Damage to tourism infrastructure due to extreme weather events requires significant financial resources for repair and maintenance.
- Socioeconomic Impacts: Reduced attractiveness of key destinations can lead to lower tourist arrivals, shorter stays, and decreased spending. This can have significant economic consequences for coastal communities.

This report introduces a methodology designed to better understand how coastal communities perceive the impacts of climate change on their desired coastal environments, recreational activities and tourism industries, and to explore potential adaptation strategies. By engaging with local stakeholders, we aim to identify effective approaches to enhance climate resilience and ensure the long-term sustainability of the coastal tourism industry in the Baltic Sea Region.

2.2 Climate Change Adaptation Pathways

Adaptation Pathways are strategic plans that outline a series of flexible and adaptive measures to cope with the anticipated impacts of climate change. These pathways are designed to provide a structured approach to decision-making, ensuring that actions taken today remain effective under future climate scenarios. By establishing a sequence of actions, adaptation pathways allow communities to respond dynamically to changing conditions, adjusting as new information becomes available or as the climate evolves.

In the context of engaging local coastal communities, adaptation pathways play a crucial role in addressing climate change adaptation. Here's why they are important:

- 1. **Community Involvement:** Adaptation pathways foster active participation from local communities, ensuring that their needs, values, and preferences are considered in the planning process. By involving stakeholders from the outset, these pathways build trust and encourage collaborative problem-solving.
- 2. Flexibility and Responsiveness: Climate change presents uncertain and evolving challenges. Adaptation pathways provide a flexible framework that allows communities to implement incremental actions and adjust strategies as conditions change. This responsiveness helps to manage risks and seize emerging opportunities.
- 3. Long-term Vision: Developing adaptation pathways encourages communities to think long-term and envision their future in the face of climate change. By setting clear goals and milestones, pathways help align short-term actions with long-term objectives, promoting sustainable and resilient coastal development.
- 4. **Prioritization of Actions:** Adaptation pathways help prioritize actions based on their urgency, feasibility, and effectiveness. By evaluating different adaptation options and their potential outcomes, communities can make informed decisions about where to allocate resources and effort.
- 5. **Resource Optimization:** Efficient use of resources is critical in climate change adaptation. Adaptation pathways enable communities to strategically plan investments, reducing the risk of wasted efforts and ensuring that adaptation measures provide maximum benefits.
- 6. **Informed Decision-Making:** By integrating scientific data, local knowledge, and stakeholder input, adaptation pathways provide a comprehensive basis for decision-making. This holistic approach ensures that adaptation strategies are grounded in both empirical evidence and community insights.
- 7. Enhanced Resilience: Ultimately, the goal of adaptation pathways is to enhance the resilience of coastal communities. By proactively planning for climate impacts, communities can reduce vulnerabilities, safeguard livelihoods, and protect natural and built environments.



In summary, adaptation pathways offer a structured and participatory approach to climate change adaptation, empowering coastal communities to navigate the uncertainties of climate change and achieve their vision for a sustainable and resilient future.

3 Methodology

3.1 Framework for Developing Adaptation Pathways

Creating a sustainable and resilient future for coastal communities requires a comprehensive and inclusive approach. This framework outlines a step-by-step process to engage community members, assess climate impacts, and develop effective adaptation pathways. By involving local stakeholders from the beginning, the process ensures that the strategies are tailored to the unique needs and visions of each community. From initial visioning workshops to detailed action plans and continuous monitoring, this approach emphasizes inclusivity, flexibility, and collaboration.

Summary of Coastal Adaptation Pathways Planning Workflow



By following these steps, coastal communities in the Baltic Sea Region can proactively address climate change challenges and enhance their ability to thrive in the face of evolving environmental conditions.

3.2 Tools and Methods

Across the literature, multiple methods exist for developing adaptation pathways in coastal communities. These methods include Stakeholder Mapping and Analysis, Participatory Workshops, Visioning Exercises, Climate Impact and Vulnerability Assessment Tools, Scenario Planning, Surveys and Questionnaires, Stakeholder Interviews, Focus Group Discussions, Community-Based Vulnerability Assessment, SWOT Analysis, Cost-Benefit Analysis, and Monitoring and Evaluation Frameworks.

In the context of the BEACH-SOS Project, we will delve into the methods applied. By focusing on these specific methods, we aim to provide clearer and more detailed guidance. The methods will be presented chronologically as implemented in the BEACH-SOS Project. However, it's important to note that sometimes altering the order will not affect the outcomes. This flexibility allows for adaptation to specific project needs and circumstances. More detail on the tools and techniques and their practical application can be found in section 3.3



- 1. Stakeholder Mapping and Analysis
- **Purpose:** Identify and understand the roles, interests, and influence of different stakeholders within the community.
- **Technique:** Use stakeholder mapping charts and matrices to categorize stakeholders (e.g., local governments, businesses, residents, NGOs) and analyze their level of influence and interest in climate adaptation.
- Application: In the BEACH-SOS Project, stakeholder mapping helped identify key players whose support is crucial for the success of the adaptation pathways initiatives. The mapping exercise also helped to maintain the representativity of most relevant coastal groups. This process facilitated targeted engagement strategies and ensured that all relevant voices were considered.



2. Visioning Exercises

- **Purpose:** Help the community articulate a clear and shared vision(s) for the future of their coast and coastal tourism by 2050.
- **Technique:** Conduct visioning exercises using tools like vision boards, future scenario narratives, and visual storytelling to capture the community's aspirations and desired outcomes.
- Application: Visioning exercises in the BEACH-SOS Project enabled the community to envision their desired future. These exercises helped to understand the communities long term goals. At this time participants were not specifically requested to considering the impacts of climate change, but they were free to list any barrier they found relevant to achieve their vision. This exercise serves to align adaptation strategies with the community's long-term goals.



- 3. Participatory workshops
- **Purpose:** Engage community members to illustrate what climate change could mean for their communities and gather their input and perspectives.
- **Technique:** Organise interactive workshops where participants can discuss climate impacts, share their vision for the future, and brainstorm adaptation strategies. Use facilitated discussions, breakout groups, and interactive activities to encourage participation.
- Application: Participatory workshops in the BEACH-SOS Project provided a platform for community members to express their concerns and preferences. These workshops fostered a sense of ownership and collaboration, leading to more robust and community-driven adaptation plans.



4. Focus Group Discussions

- **Purpose:** Facilitate group discussions to gather diverse perspectives and foster consensus on adaptation pathways. (This is complementary to 3. Participatory workshops)
- **Technique:** Organise focus group discussions with different community segments (e.g., youth, elderly, business owners) to explore specific issues and adaptation options in-depth.
- Application: Focus group discussions on the BEACH-SOS Project provided a deeper understanding of the unique challenges and opportunities faced by municipal authorities. These discussions highlighted specific municipal departments needs and priorities, leading to more tailored and effective strategies.

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- 5. Community-Based Vulnerability Assessment
- **Purpose:** Assess the current and projected impacts of climate change on coastal environments and tourism, identifying vulnerable areas. CBVA engages local community members to identify vulnerabilities and develop adaptive strategies.
- **Techniques:** Various methods, qualitative and quantitative, including tools as mapping, climate models and projections, and vulnerability assessment frameworks. Coastal communities apply knowledge from workshops and local insights.
- Application: The BEACH-SOS Project used a qualitative approach, combining local knowledge with scientific data. Coastal communities evaluated the vulnerability of coastal economic sectors.



- 6. Scenario Planning
- **Purpose:** Explore different future scenarios based on varying degrees of climate change, climate impacts and community responses.
- **Technique:** Develop multiple scenarios with detailed narratives, impact assessments, and potential adaptation measures. Engage the community in selecting the most appropriate and realistic scenarios.
- Application: Scenario planning in the BEACH-SOS Project involved creating detailed scenarios that reflected possible future conditions. This process helped the community understand the range of potential impacts and evaluate the feasibility of different adaptation strategies. By comparing scenarios, the community could identify the most resilient and sustainable pathways.

By applying these methods, coastal communities in the Baltic Sea region can contribute to develop a robust and inclusive adaptation framework that aligns with their vision for a sustainable and resilient future in their municipality.

3.3 Case Study, Saulkrasti

Saulkrasti, which means "Sun shores" in Latvian, is a charming town located on the east coast of the Gulf of Riga in Latvia. It is the capital of the Saulkrasti municipality and stretches for about 17 kilometers from the Inčupe river in the south to the village of Skulte in the north. The town is known for its beautiful coastal scenery, including sandy beaches and a seaside belt of forests. Saulkrasti is a popular destination for tourists, especially during the summer months. The town also hosts the annual Saulkrasti Jazz Festival, attracting music enthusiasts from various regions.

The town of Saulkrasti has a permanent resident population of around 3,149 as of 2024. However, during the summer months, the town's population nearly doubles due to a significant influx of tourists and seasonal workers. This seasonal population boom is closely tied to Saulkrasti's popularity as a summer destination, attracting visitors with its beaches, nature, and recreational activities. The town also experiences increased activity during this period due to the seasonal demands of the tourism industry.

Like many other areas along the Baltic coast, Saulkrasti faces the pressures of climate change. Amongst other climate change related impacts, the town experiences coastal erosion, exacerbated by sea storms. This poses a challenge for the future of the town's infrastructure and scenic beauty.

Saulkrasti thrives on its natural beauty and summer tourism. However, the impact of climate change necessitates efforts to balance tourism with environmental protection and resilient coastal communities. Sustainable practices and coastal preservation initiatives are crucial to ensure Saulkrasti's charm endures for generations to come.

The Interreg Baltic Sea Region BEACH-SOS project seeks to enhance the climate resilience of coastal regions within the Baltic Sea. This is achieved through a bottom-up approach that prioritises the active involvement of coastal communities in the adaptation process.

The overarching goal of BEACH-SOS is to foster increased awareness and strengthen institutional capacity among local governments. This will enable them to effectively understand and integrate climate change considerations into their planning and decision-making frameworks.

The project places a strong emphasis on beach management and coastal tourism to ensure the long-term sustainability and resilience of the coastal environment and its communities.



Fig 1. From Vision to Action: A framework for developing adaptation pathways for coastal tourism in changing climates.

3.3.1 Stakeholders Mapping



To ensure the BEACH-SOS project is developed and implemented with the community's needs and perspectives in mind, the project team undertook a comprehensive stakeholder mapping process. This approach increases the likelihood of success.

Identifying Stakeholders: In Saulkrasti, the BEACH-SOS project team identified a diverse group of stakeholders, including:

- **Residents:** Local families, property owners, and community groups residing near the coastal areas.
- **Businesses:** Local shops, restaurants, and other enterprises potentially impacted by coastal changes or project activities.
- **Fishermen:** Both commercial and recreational fishermen who depend on the coastal waters.
- **Environmental Groups:** Organizations focused on preserving the coastal ecosystem and biodiversity.
- Schools: Educational institutions that can play a critical role in community awareness and engagement
- **Government Agencies:** Local and regional government bodies and departments with interests in Saulkrasti and neighboring coastal areas.

Additionally, the methodology of identifying and engaging stakeholders included the "snowball effect". This approach began with a small group of key stakeholders, who then helped identify and connect the project team with other relevant stakeholders within their networks. This iterative process expanded the reach of stakeholder engagement, ensuring a broader representation of interests and perspectives.

Analyzing Stakeholder Interests: The project team reached out to the identified stakeholders, inviting them to participate in workshops and bilateral meetings. This engagement allowed the team to understand each stakeholder group's interests and concerns better. By compiling stakeholder information in a structured format, the team could efficiently track and analyze their interests and relationships.

By meticulously identifying, analyzing, and mapping stakeholders' interests and relationships, the BEACH-SOS project in Saulkrasti developed a more inclusive and effective approach to engaging with actors at local, sub-national, and national levels. This process ensured the needs and perspectives of the local community were prioritized while maintaining an inclusive process through other administrative levels. Ultimately, this led to more successful adaptation and mitigation strategies.

3.3.2 Building shared visions



The identified groups and stakeholders were invited to participants in the project workshops. The first of a series of three aimed at drafting a shared vision for coastal tourism in Saulkrati by 2050. The participants actively engaged in group discussions, not just exploring the potential challenges, but also collaboratively envisioning the future of Saulkrasti's coastal recreational and tourism related economic activities in 2050.

The BEACH-SOS project employed a participatory visioning approach to guide the Saulkrasti citizens towards a shared vision for their coastal future by 2050. The tools and methods applied for drafting the vision included:

Participatory workshops (with coastal communities and school students).

Focus groups discussions(with municipal authorities).

The methodology involved a combination of mapping exercises, brainstorming and group discussions, creating a co-production environment to capture the community's aspirations and desired outcomes for coastal tourism development.

3.3.2.1 Identifying areas with special interest and value

Group Mapping Exercise: Participants were randomly divided into 6 working groups (circa 7 participates per group) different groups worked at local scale and others at national scale. Each group was provided with an empty map to identify the most valuable natural and manmade areas and infrastructure from a coastal recreational and touristic perspective (Fig XX).

- **Local Level Groups:** Focused on identifying and mapping local coastal tourism and recreational attractions within the municipality of Saulkrasti.
- **National Level Groups:** Focused on identifying and mapping local coastal tourism and recreational attractions within the full coast of Latvia.



Fig 2. Participants to the Local Communities session.

This phase of the exercise effectively fostered group cohesion and facilitated the collective identification of the study area's most iconic elements. Notably, it provided a valuable platform for diverse participants and stakeholders to articulate and document the multiple values they ascribe to the area, encompassing cultural, social, natural, and economic perspectives.

3.3.2.2 Projecting towards a desired future

Group Discussions and brainstorming: Participants engaged in discussions around three key questions:

- 1. How will tourism in Saulkrasti (or the Latvian coast) evolve by 2050?
- 2. What's the ideal vision for Saulkrasti (or the Latvian coast) coastal tourism development?
- 3. What challenges exist in achieving this vision?



Fig 3. Left, Mapping exercise with the results of one of the national level working groups, showing iconic, natural and people-made structures and facilities, on the coast of Latvia. **Right** the results working groups showcasing the tourism vision and barriers for Latvia by 2050.

Thus, for building a shared vision the project created spaces of conversation where residents, municipal authorities and students engage in co-production exercises. The result of this exercises concluded with four different and sometimes complementary visions for the coast and tourism in Saulkrasti.

3.3.2.3 The four shared visions for Saulkrasti

Each of the six working groups concluded their shared visions and identified key barriers for achieving their dreamed Saulkrasti 2050 (detailed in Annex 1: First Stakeholders Workshop Report, Cabana et al., 2024). The subsequent phase involved analysis to identify patterns and trends within these shared visions. This was conducted in two stages: 1) a prioritization of these key elements found across the visions, this part was undertaken in a dedicated workshop by representatives from various Local Action Groups in Saulkrasti, followed by 2) a desk-based grouping of visions with common key relevant drivers which included: Nature based vs Built infrastructure and Protect and Maintain vs Diversify and Grow (Detailed in Annex 2: Saulkrasti: A Vision for 2050. Drafting a Climate Smart Community Action Plan for Coastal Tourism. Cabana et al., 2024)."

Saulkrasti 2050: Community-Driven Visions for a Sustainable Future

Vision 1: A Sanctuary of Nature. Saulkrasti becomes a sustainable tourism destination with eco-friendly infrastructure like wooden pathways and solar panels. Local residents engage in tourism by offering nature walks and community cafes. The town focuses on ecosystem conservation, restoring wetlands, and increase resilience. Collaboration with neighbouring villages and strict zoning regulations ensure organized and environmentally friendly development.

Vision 3: Modern Amenities. Saulkrasti blends its history with modern amenities, featuring bike lanes, pedestrian pathways, and family-run businesses. Luxurious cruise ships dock at a new yacht harbour, and the town offers worldclass spas, trendy cafes, and boutiques. Cultural heritage is preserved through restored buildings and festivals. Familyfriendly attractions like an aquapark and carousel enhance the town's appeal.



Vision 2: A Green Oasis in Saulkrasti. This vision emphasizes preserving Saulkrasti natural beauty and local traditions. The town protects its coastline, dunes, and pine forests, creating birdwatching spots and wildlife sanctuaries. The river is revitalized for fishing and kayaking. The town center becomes pedestrian-friendly with electric bikes and scooters. Cultural events and traditional cuisine highlight local heritage, promoting sustainable development.

Vision 4: Year-Round Destination. Saulkrasti transforms into a year-round destination with diverse attractions like an ice-skating rink, hiking trails, a marine museum, and a wellness center. Educational programs and water sports events are available year-round. Innovative marketing draws tourists globally, and a well-connected transport system, including a ferry to Riga, improves accessibility and visitor experience.



Fig 4. Top: Summary of the 4 visions drafted during the 1st and 2nd stakeholder workshops in Saulkrasti. Summary of the four distinct yet complementary four visions. **Bottom:** The visions are articulated across two axes: the x-axis ranges from "Protect and Maintain" to "Diversify and Grow," while the y-axis ranges from "Nature-Based" to "Infrastructure-Based." The four visions are: 1) **Sanctuary of Nature; 2) Green Oasis in Saulkrasti; 3) Modern Amenities; 4) A Year-Round Experience.** For more details on the visions, refer to Annex 1 and 2.

3.3.3 Climate change impacts on key coastal economic sectors

After identifying the coastal communities visions the next step was to understand how climate change may impact the most relevant economic sectors for the municipality. For estimate how will climate change impact the achievement of the vision.

3.3.3.1 Coastal climate signals

During the workshop, coastal climate signals were presented to participants through a combination of presentations and open discussions. Based on best available scientific knowledge scientists selected climate change indicators that were easy to communicate and had a high potential impact on the region. These indicators included sea level rise, the Universal Thermal Climate Index (UTCI), and extreme rain events. Experts from the Climate Service Center Germany (GERICS) and the Latvian Environment, Geology, and Meteorology Center introduced these indicators, utilizing both Latvian National and GERICS in-house developed indices as the UTCI.

- Sea Level Rise (SLR) Projections: Discussions highlighted potential impacts such as increased coastal erosion, inundation, and infrastructure damage.
- Universal Thermal Climate Index (UTCI): This index measures the combined effects of temperature, humidity, wind speed, and radiation on human comfort. Participants explored how changes in UTCI, driven by climate change, could impact tourism and outdoor activities in Saulkrasti.
- **Extreme Rain Events**: The potential impacts of extreme rain events on the coastal economy of the Latvian Baltic Sea region were discussed.

The workshop provided to the coastal community members up-to-date climate change information relevant to Saulkrasti and facilitated structured discussions among participants.

This allowed them to identify and rank the perceived impacts of these climate signals on the most relevant economic sectors for Saulkrasti. The information gathered here will serve as crucial input for the next step in developing climate change adaptation strategies and ensuring the long-term sustainability of the region's economy.



Fig 5. Overview of the various climate change signals presented during the workshop.

3.3.3.2 Economic Sectors and Community Based Vulnerability Assessment



Through active participation, local community members are asked to identify and rank the potential impacts of climate change (previously introduced climate indicators) across various sectors, including tourism, fishing, maritime industry, renewable energy, retail, industry, finance, transportation, infrastructure, utilities, and public services. This approach reveals a mix of positive, negative, and neutral impacts, highlighting the complex nature of climate change and its potential to both challenge and create opportunities for different regions.

In Saulkrasti participants were divided into 4 working groups, each group focusing on specific sectors. For each sector, participants were asked to assess the potential impact of sea level rise (SLR), the Universal Thermal Climate Index (UTCI), and extreme rain events. They were required to rank the impact as positive (+), negative (-), or neutral (=) based on their knowledge and experience of the local context.



Fig 6. Community members in Saulkrasti collaboratively assessing the perceived impacts of climate change signals (SLR: sea level rise, UTCI: Universal Thermal Climate Index, and X Rain: extreme rain) on key economic sectors in their town.

The results from each working group were compiled and analyzed to identify the overall impact of climate change on the various economic sectors (see annex 3 Assessing Climate Change Impacts on Saulkrasti Coastal Economic Sectors. A community-Driven Workshop. Cabana et al 2024). This method can be adapted and applied to other regions to provide a comprehensive understanding of the local impacts of climate change and to develop targeted adaptation strategies.



Fig 7. Frequency of Perceived Climate Change Impacts on Saulkrasti's Economic Sectors This radar chart visualizes the frequency of positive, negative, and neutral impacts of climate change on various economic sectors in Saulkrasti, as perceived by local stakeholders. Each type of impact by a different color, and the distance from the center indicates the number of impacts identified.

As seen by community members, the impacts of climate change on Saulkrasti are multifaceted, presenting both opportunities and challenges for the region.

Positive Impacts:

- **Tourism:** Warmer temperatures could extend the tourism season, attracting more visitors and boosting the local economy.
- Fishing and Aquaculture: Rising sea temperatures might positively impact certain fish species.
- **Renewable Energy:** Longer periods of sunlight and warmer temperatures could enhance solar energy production.

Negative Impacts:

- **Coastal Infrastructure:** Rising sea levels pose a threat to roads, buildings, and harbors.
- **Storms and Erosion:** Increased frequency and intensity of storms could lead to erosion and flooding, damaging property and disrupting daily life.
- Agriculture and Forestry: Changes in weather patterns could impact agriculture and forestry, affecting local livelihoods.
- Water Resources: Warmer temperatures could lead to increased water demand, potentially straining water resources and impacting ecosystems.

The results of the workshop provide valuable insights into the perceptions of coastal communities regarding the impacts of climate change. These insights are crucial for expanding the knowledge base of local stakeholders and engaging them in decision-making processes. By understanding the specific concerns and opportunities identified by the community, planners and policymakers can develop more effective strategies to ensure the long-term sustainability and resilience of coastal communities and economies. The proactive involvement of local communities in assessing climate change impacts is essential for creating adaptive measures that address both immediate and future challenges.

3.3.4 Scenario planning



This section provides a general framework for developing a prioritized roadmap of adaptation measures to address specific challenges and achieve desired future outcomes (the four shared visions).

Objective: To collaboratively develop a prioritized roadmap of adaptation measures that will guide towards a desired future vision, while acknowledging the constraints of time and available resources.

Context: This exercise assumes an understanding of the climate challenges or threats to be addressed that were introduced in previous sessions. Participants are firstly introduced to

climate adaption measures to then be separated in groups for focus on selecting and prioritizing adaptation measures to achieve their vision for Saulkrasti 2050:

- **Policy and Governance:** Measures related to regulations, incentives, and decision-making processes.
- Social and Knowledge: Measures focused on community engagement, awareness, and capacity building.
- **Economic:** Measures aimed at diversifying resources, enhancing resilience of key systems, and attracting sustainable investments.
- **Physical and Ecological:** Measures related to infrastructure, natural resources, and the built environment.



Procedure:

- 1. **Define the Challenge:** Clearly articulate the specific challenges or threats to be addressed. In BEACH-SOS project this is climate change impacts on coastal communitas and economic sectors.
- 2. Embrace the Shared Vision: Collectively each working group was entitled to work with one of the shared visions developed in previous workshops. In our case, these visions included four distinct directions: Sanctuary of Nature, A Green Oasis, Modern Amenities and Year-round Experience. Thus, participants where split into 4 working groups and each group is asked to own and work with one of the visions for the desired future state.

- 3. **Identifying and Prioritizing Adaptation Measures:** Through open discussion and brainstorming, each working group is tasked with generating a comprehensive list of potential adaptation measures within each of the four categories mentioned above to achieve their vision by 2050, considering climate change impacts such as sea level rise, UTCI, and extreme rain. Participants are asked to:
 - Evaluate each measure based on its effectiveness in achieving the shared vision.
 - Assess the alignment of each measure with the identified challenges or threats.
 - **Consider the feasibility** of implementation, including factors such as available resources, technical expertise, and community support.
 - Select the highest-priority measures from each category, given the constraint of time (2050 vision) and limited resources.
- 4. Adaptation Pathways. Develop a Realistic Implementation Timeline: To ensure the successful implementation of the prioritized adaptation measures, it is essential to develop a realistic and achievable timeline. This involves:
 - Creating a timeline for implementing the prioritized adaptation measures.
 - **Considering dependencies** between measures and the availability of resources.
 - **Ensuring the timeline** is realistic and achievable within the desired timeframe.



Fig 9. Adaptation Pathways for the "Year-Round Destination" Vision. This figure illustrates the adaptation pathways developed by the working group for the "Year-Round Destination" vision, identifying the four most critical economic sectors relevant to this vision. Color coding is used to distinguish different types of climate adaptation measures: yellow for social and knowledge-focused measures, purple for policy and governance-oriented measures, blue for economic and financial measures, and orange for physical and ecological measures.

5. Results:

• **Prioritized List of Adaptation Measures for each of the four visions:** A clearly defined list of the highest-priority adaptation measures across from 2025 to 2050.



Fig 10. Adaptation Pathways for Four Visions. This figure illustrates the adaptation pathways developed by four working groups for each of four distinct coastal community visions. Each group identified the four most critical economic sectors relevant to their respective vision. Color coding is used to distinguish different types of climate adaptation measures: yellow for social and knowledge-focused measures, purple for policy and governance-oriented measures, blue for economic and financial measures, and orange for physical and ecological measures.

The vision for Saulkrasti as a **"Sanctuary of Nature"** by 2050 focuses on four key economic sectors: tourism and hospitality, transportation and infrastructure, retail and services, and fishing and aquaculture. Immediate measures, seen as most urgent, include risk awareness workshops, dune restoration, tax incentives for eco-friendly businesses, and land use restrictions. Soon, the plan involves developing climate-resilient infrastructure, diversifying tourism, and forming public-private partnerships for sustainable infrastructure. Later measures include shore water management, innovative research grants, and constructing offshore breakwaters. Stakeholders have mapped out these priorities to ensure a comprehensive approach to climate adaptation, addressing social, policy, economic, and ecological aspects. This vision aims to create a resilient and sustainable future for Saulkrasti, balancing economic growth with environmental preservation.

The vision for Saulkrasti as a **"Green Oasis"** by 2050 prioritizes tourism and hospitality for immediate climate adaptation measures, followed by utilities and infrastructure. Renewable energy is important but less urgent, while retail and services are prioritized for longer-term planning. Immediate actions include public campaigns, soft engineering like stone walls in dunes, and climate funds. Soon, the focus shifts to tourism diversification and developing water and sewer systems. Later measures involve EU co-financing for projects and constructing resilient infrastructure. Stakeholders have outlined these priorities to ensure a comprehensive approach to climate adaptation, addressing social, policy, economic, and ecological aspects. This vision aims to create a sustainable and resilient future for Saulkrasti, balancing economic growth with environmental preservation.

The vision for Saulkrasti as a destination with **"Modern Amenities"** by 2050 prioritizes economic and financing sectors for immediate climate adaptation measures, followed by transportation and infrastructure. Retail and services are considered less urgent, while tourism and hospitality are prioritized for longer-term planning. Immediate actions include enhanced stakeholder participation, tax incentives, public-private partnerships, and physical responses like seawalls. Soon, the focus shifts to promoting research and development, adaptive land use planning, and infrastructure developments such as harbors and pedestrian pathways. Later measures involve resilient infrastructure design, private investments, and pre-investment assessments for harbors. Stakeholders have outlined these priorities to ensure a comprehensive approach to climate adaptation, addressing social, policy, economic, and ecological aspects. This vision aims to create a sustainable and resilient future for Saulkrasti, balancing modern amenities with environmental preservation.

The vision for Saulkrasti as a destination offering a "Year-Round Experience" by 2050 prioritizes tourism and hospitality for immediate climate adaptation measures, followed by retail and services, transportation and infrastructure, and public services. Immediate actions include risk assessments for all-season attractions, dune management, attracting investors, and developing a city vision. Soon, the focus shifts to public-private partnerships, capacity building, and adaptive land use planning. Later measures involve creating all-season attraction points, ensuring space for business development, and increasing services in health transport and safety. Stakeholders have outlined these priorities to ensure a comprehensive approach to climate adaptation, addressing social, policy, economic, and ecological aspects. This vision aims to create a sustainable and resilient future for Saulkrasti, balancing year-round tourism with environmental prese

The four adaptation pathways for Saulkrasti's visions—Sanctuary of Nature, Green Oasis, Modern Amenities, and Year-Round Experience—each prioritize different sectors and measures to achieve a sustainable and resilient future by 2050.

- 1. Sanctuary of Nature focuses on immediate measures like risk awareness workshops and dune restoration, with later efforts on shore water management and innovative research grants. This vision emphasizes balancing economic growth with environmental preservation.
- 2. Green Oasis prioritizes tourism and hospitality, with immediate actions such as public campaigns and soft engineering. Later measures include EU co-financing for projects and resilient infrastructure. This vision aims to create a sustainable environment while promoting eco-tourism.
- Modern Amenities emphasizes economic and financing sectors, with immediate measures like stakeholder participation and tax incentives. Transportation and infrastructure developments follow, aiming to balance modern amenities with environmental sustainability.
- 4. Year-Round Experience prioritizes tourism and hospitality, with immediate actions like risk assessments for all-season attractions and dune management. Later measures focus on creating all-season attraction points and increasing services in health transport and safety. This vision aims to provide a sustainable, year-round tourism experience.

Overall, these pathways ensure a comprehensive approach to climate adaptation, addressing social, policy, economic, and ecological aspects, and aim to create a resilient and sustainable future for Saulkrasti.

3.4 Action Plan. Implementation and Monitoring.

Implementation:

- **Coordination with Local Governments:** Effective implementation requires strong collaboration with local government bodies. This includes aligning the action plan with existing policies, securing necessary permits, and ensuring that local authorities are fully on board with the adaptation strategies. It's important to note that the implementation phase should not be limited to specific projects but should be integrated into municipal agendas. This ensures that adaptation efforts are continuously prioritized and supported at the local government level.
- Engaging Stakeholders: Involving a wide range of stakeholders, such as community groups, businesses, environmental organizations, and academic institutions, is crucial. These stakeholders can provide valuable insights, resources, and support for the implementation process.
- Securing Funding: Identifying and securing funding sources is essential for the successful execution of the action plan. This may involve applying for grants, seeking private investments, or leveraging public funds. Transparent financial planning and management are key to maintaining trust and accountability.
- **Executing Actions:** The actual implementation of the planned actions involves a series of coordinated efforts. This could include constructing physical infrastructure (e.g., seawalls, flood barriers), restoring natural habitats (e.g., wetlands, mangroves), and implementing community-based initiatives (e.g., emergency preparedness programs, public awareness campaigns).

Monitoring and Evaluation:

- **Regular Monitoring:** Continuous monitoring is vital to track the progress of the implemented actions. This involves collecting data on key indicators, such as changes in coastal erosion rates, flood frequency, and ecosystem health. Advanced technologies like remote sensing and GIS can be used for effective monitoring.
- Assessing Effectiveness: Periodic evaluations are necessary to assess the effectiveness of the adaptation measures. This includes analyzing the collected data to determine whether the actions are achieving the desired outcomes and identifying any areas that need improvement.
- Adjusting: Based on the evaluation results, adjustments may be needed to optimize the adaptation strategies. This could involve modifying existing actions, introducing new measures, or reallocating resources to address emerging challenges.
- **Community Involvement:** Keeping the community engaged throughout the monitoring and evaluation process is crucial. Regular updates, public meetings, and feedback mechanisms help maintain transparency and ensure that the community remains informed and supportive of the adaptation efforts.

By focusing on these aspects, coastal communities can effectively implement and monitor their adaptation plans, ensuring they are resilient to the impacts of climate change while maintaining public trust and support.

4 Accessing Climate Information

4.1 Sources of Climate Information for the Baltic Sea Region.

Within the Beach SOS project, national institutes and in-house information were shared with local communities. If you aim to develop adaptation pathways, it is essential to use up-to-date, useful, and meaningful climate change information. The Intergovernmental Panel on Climate Change (IPCC) provides a wealth of data that is invaluable for this purpose. The IPCC's information is curated with a focus on traceability, stability, availability, and transparency, making it a reliable source for climate change assessment. Utilizing IPCC data and information allows for comprehensive regional climate risk assessments and climate impact studies, ensuring that adaptation strategies are based on the latest scientific findings.

The IPCC is an intergovernmental body of the United Nations, established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). It operates through three Working Groups and a Task Force:

- Working Group I: Focuses on the physical science basis of climate change.
- Working Group II: Addresses climate change impacts, adaptation, and vulnerability.
- Working Group III: Deals with the mitigation of climate change.
- Task Force: Develops methodologies for national greenhouse gas inventories.

The IPCC's reports are prepared by a large, global group of scientists and experts who contribute their time to drafting, revising, and reviewing the reports. These reports synthesize the best available scientific and technical literature and are intended to be policy-relevant but not policy-prescriptive. The rigorous review process ensures the credibility and reliability of the information provided.

Therefore, it is advisable to refer to IPCC last reports and the key national institutions and projects in the respective areas. For the Baltic Sea Region, the relevant institutes, projects, and organizations by country are listed below. Please note that this list is not exhaustive, and there are many more institutions and research centers actively working on climate change in these countries.

4.1.1 Denmark

- <u>National Centre for Climate Research (NCKF)</u>
- Danish Meteorological Institute
- <u>Climate Change Adaptation</u>

4.1.2 Estonia

- Estonian Institute for Sustainable Development (SEI-Tallinn)
- Estonian Environment Agency (EEA)
- Estonian Environmental Portal

4.1.3 Finland

- <u>Atmosphere and Climate Competence Center (ACCC)</u>
- <u>Finnish Meteorological Institute</u>
- <u>Climate Guide Finland</u>

4.1.4 Germany

- <u>Climate Service Center Germany (GERICS)</u>
- Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)
- <u>Deutscher Wetterdienst (DWD)</u>
- Deutsches Klimaportal

4.1.5 Latvia

- Latvian Environment, Geology and Meteorology Centre
- Latvian Klimata Portals
- <u>Climate Change Portal</u>
- <u>Ministry of Environmental Protection and Regional Development</u>

4.1.6 Lithuania

- Lithuanian Hydrometeorological Service (LHMS)
- <u>Klimato Kaita</u>

4.1.7 Poland

- Institute of Meteorology and Water Management (IMGW)
- <u>Ministry of Climate and Environment</u>

4.1.8 Sweden

- <u>Swedish Meteorological and Hydrological Institute (SMHI)</u>
- <u>Swedish Environmental Protection Agency</u>

4.2 Data Interpretation and Usability

To effectively understand and interpret climate change information, it is essential to have technical and expert support due to the inherent complexity of climate data. Climate change involves a multitude of variables, including temperature fluctuations, precipitation patterns, sea-level rise, and extreme weather events. These variables interact in intricate ways, influenced by both natural processes and human activities.

Analyzing climate data requires specialized tools and methodologies, such as climate models, statistical analyses, and remote sensing technologies. Experts in climate science, meteorology, and environmental policy possess the knowledge and skills to navigate these complexities. They can accurately interpret data trends, identify potential impacts, and provide context-specific recommendations.

Moreover, climate change information often comes with uncertainties and probabilistic forecasts. Understanding these uncertainties and their implications is crucial for making informed decisions. Technical experts can help stakeholders comprehend the limitations of the data and the range of possible outcomes, enabling more robust and adaptive planning.

Engaging with technical experts ensures that climate change information is not only accurate but also actionable. Their expertise helps translate complex data into practical strategies for adaptation and mitigation, ultimately enhancing resilience to climate impacts. Without this support, there is a risk of misinterpreting data, leading to ineffective or counterproductive actions. Therefore, having access to technical and expert support is indispensable for effectively addressing the challenges posed by climate change.

4.3 Integration Climate information into Municipal Planning

Incorporating climate information into coastal planning at the municipal level is crucial for several reasons. Coastal areas are particularly vulnerable to the impacts of climate change, such as sea-level rise, increased storm frequency, and coastal erosion. These changes can have significant consequences for infrastructure, ecosystems, and local communities. By integrating climate data into planning processes, municipalities can proactively address these risks, enhance resilience, and ensure sustainable development. The integration comprehends a number of actions:

- 1. **Data Collection and Analysis**: Municipalities should gather comprehensive climate data, including projections of sea-level rise, storm surge frequencies, and temperature changes. This data can be sourced from national climate institutes, research centers, and the IPCC.
- 2. **Risk Assessment**: Using the collected data, municipalities need to conduct thorough risk assessments to identify vulnerable areas and infrastructure. This includes evaluating the potential impacts of climate change on coastal ecosystems, public health, and local economies.
- 3. **Stakeholder Engagement**: Engaging with local communities, businesses, and other stakeholders is crucial. This ensures that the planning process is inclusive and that the concerns and insights of those directly affected by climate change are considered.
- 4. **Scenario Planning**: Municipalities should develop multiple scenarios based on different climate futures. Each scenario should outline potential adaptation measures, their costs, and benefits. This helps in understanding the range of possible outcomes and preparing for various contingencies.
- 5. **Policy and Regulation Development**: Based on the risk assessments and scenario planning, municipalities need to develop and implement policies and regulations that

promote sustainable coastal development. This includes zoning laws, building codes, and land-use planning that consider future climate risks.

6. **Monitoring and Evaluation**: Establishing a system for continuous monitoring and evaluation is vital. This allows municipalities to track the effectiveness of implemented measures, make necessary adjustments, and ensure that the planning process remains dynamic and responsive to new information.

By incorporating climate data into coastal planning processes, municipalities can enhance their resilience to climate impacts, protect their communities, and promote sustainable development. This proactive approach ensures that coastal areas are better prepared to face the challenges posed by a changing climate.

5 Recommendations

5.1 Best Practices

Key Recommendations for Developing Effective Adaptation Pathways:

- Engage Stakeholders Early and Often: Involve local communities, businesses, and other stakeholders from the beginning to ensure their concerns and insights are considered. This fosters a sense of ownership and collaboration.
- Utilize Comprehensive Climate Data: Gather and analyze data from reliable sources, such as national climate institutes and the IPCC, to inform decision-making. Ensure the data is up-to-date and relevant to the specific coastal area.
- **Conduct Thorough Risk Assessments**: Identify vulnerable areas and infrastructure through detailed risk assessments. Evaluate the potential impacts of climate change on ecosystems, public health, and local economies.
- **Develop Multiple Scenarios**: Create various scenarios based on different climate futures. Outline potential adaptation measures, their costs, and benefits for each scenario to prepare for a range of possible outcomes.
- **Prioritize Flexible and Adaptive Strategies**: Design adaptation pathways that can be adjusted as new information becomes available or as conditions change. Flexibility is key to responding effectively to unforeseen challenges.
- **Implement Robust Policies and Regulations**: Develop and enforce policies and regulations that promote sustainable coastal development. This includes zoning laws, building codes, and land-use planning that consider future climate risks.
- Monitor and Evaluate Continuously: Establish a system for ongoing monitoring and evaluation of adaptation measures. Track progress, assess effectiveness, and make necessary adjustments to ensure the strategies remain effective.
- Leverage Technical and Expert Support: Engage with climate scientists, meteorologists, and environmental policy experts to accurately interpret climate data and develop informed strategies. Their expertise is crucial for making sound decisions.

- **Promote Public Awareness and Education**: Increase public awareness about climate change impacts and adaptation strategies. Educate the community on the importance of resilience and the steps they can take to contribute.
- Secure Funding and Resources: Identify and secure funding sources to support adaptation initiatives. This may include government grants, private investments, and international aid.

By following these best practices, municipalities can develop effective adaptation pathways that enhance resilience to climate impacts and promote sustainable coastal development.

6 Conclusion

Including local communities in climate adaptation planning is crucial for developing effective and sustainable adaptation pathways. Community involvement ensures that the concerns, insights, and values of those directly affected by climate change are considered, fostering a sense of ownership and collaboration. By engaging stakeholders early and often, municipalities can develop more inclusive and tailored adaptation strategies that align with the unique needs and visions of each community.

This guideline document supports the process by providing a comprehensive framework and practical tools for engaging communities, assessing climate impacts, and developing adaptation pathways. It emphasizes the importance of inclusivity, flexibility, and collaboration, ensuring that adaptation efforts are grounded in local knowledge and supported by scientific data. By following these guidelines, municipalities can enhance their resilience to climate impacts, protect their communities, and promote sustainable coastal development.

7 Glossary

A

- Adaptation Pathways: A structured, participatory approach to climate change adaptation that helps communities navigate uncertainty and achieve their vision for a sustainable and resilient future. It involves a series of actions taken over time to adjust to the impacts of climate change. (UNFCC Technical Paper 7)
- Adaptive Capacity: The property of a system to adjust its characteristics or behavior, in order to expand its coping range under existing climate variability, or future climate conditions. (UNFCC Technical Paper 7)
- Action Plan: A detailed plan outlining the steps, timelines, resources, and responsibilities for implementing adaptation measures.

B

- **BEACH-SOS Project:** An Interreg Baltic Sea Region project focused on enhancing climate resilience in coastal regions through community-led adaptation.
- Climate Change Adaptation: The process of adjusting to current or expected effects of climate change. (IPCC, 2022, WGII)
- Climate Change Impacts: The effects of climate change on natural and human systems, including changes in temperature, precipitation, sea level, and extreme weather events.
- Climate Change Mitigation: Any action taken by governments, businesses, or people to reduce or prevent greenhouse gases, or to enhance carbon sinks that remove them from the atmosphere. (UNDP)
- Climate Data: The records of observed climate conditions taken at specific sites and times with particular instruments under a set of standard procedures. (WMO)
- Climate Information: The gathering and analysis of actual weather and climate observations as well as simulations of the climate for the past, the present, and the future. (Wikipedia)
- Climate Resilience: Capacity of social, economic, and ecosystems to cope with a hazardous event or trend or disturbance. (IPCC, 2022, WGII)
- Climate Risk: The potential for adverse consequences for human or ecological systems, recognizing the diversity of values and objectives. (IPCC AR6 WGI Glossary)
- Climate Service: The transformation of climate-related data into customized products such as projections, forecasts, and assessments, supporting adaptation, mitigation, and disaster risk management. (European Roadmap for Climate services)
- **Climate Vulnerability:** The propensity or predisposition to be adversely affected, encompassing sensitivity and lack of capacity to cope and adapt. (IPCC WG2 Glossary)
- **Community-Based Vulnerability Assessment:** A process where community members collaboratively identify and assess their vulnerabilities to climate change impacts.
- **Co-production:** The active engagement of actors who hold different types of knowledge and resources to generate collaboratively defined outcomes. (Voorberg et al., 2015)

- Focus Group Discussions: A qualitative research method where small groups of people discuss a specific topic, allowing researchers to gather in-depth insights.
- Р
- **Participatory Workshops:** Interactive events where stakeholders come together to discuss and collaborate on a specific topic, such as climate change adaptation.
- **Policy and Governance:** Rules, regulations, and institutional frameworks that guide decision-making and action related to climate change adaptation.

R

• **Resilience:** The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance. (IPCC, 2018)

S

- Scenario Planning: A process of developing plausible future scenarios based on different assumptions about climate change and other factors, used to inform adaptation planning.
- **Stakeholder:** A person or entity (e.g., employee, customer, citizen, organization) who is involved with an organization, society, etc., and therefore has responsibilities towards it and an interest in its success. (Cambridge Dictionary)
- **Stakeholder Mapping:** The process of identifying and analyzing the various stakeholders involved in a project, including their interests, relationships, and influence.
- **Sustainability:** A social goal for people to co-exist on Earth over a long period of time, typically with environmental, economic, and social dimensions.
- Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (UN World Commission on Environment and Development)
- **SWOT** Analysis: A framework for identifying and analyzing the Strengths, Weaknesses, Opportunities, and Threats related to a particular project or issue.

U

• Universal Thermal Climate Index (UTCI): An index that measures the combined effects of temperature, humidity, wind speed, and radiation on human comfort.

V

• Visioning Exercises: Participatory activities where stakeholders collaboratively develop a shared vision for the future, often used in the context of climate change adaptation.