INTEGRATED STRATEGIES FOR CLIMATE RESILIENCE IN EU COASTAL CITIES - A JOINT POLICY BRIEF FROM FOUR EUROPEAN PROJECTS

ADAPT ~4~ COAST

Abstract

This policy brief presents critical findings from the Adapt4Coast Cluster, aiming to increase climate resilience in European coastal areas by using an integrated solution of smart technologies and nature-based solutions. Research findings offer crucial insights for government climate policy, spanning climate vulnerability assessments, climate modelling, coastal restoration, enhanced monitoring via low-cost sensors and satellite data, and stakeholder engagement through the living lab model. The European Coastal Cities face escalating climate hazards, demanding a proactive and long-term approach. This policy brief advocates for the integration of the Cluster's findings into the strategic planning of government policies, emphasizing the significance of effective climate modelling, robust Ecosystem-Based Approach (EBA) strategies for adaptation, and community involvement through the Coastal Cities Living Lab (CCLL) model. The adoption of low-cost sensing technologies and citizen science initiatives is recommended to augment climate data monitoring and support early warning systems. This policy brief aims to focus on co-creation principles, and possibly eco-system restoration.

Key points

Effective Climate Modelling and Risk Assessment: Enables predictive assessment of climate change impacts, crucial for policy and urban planning**.**

Ecosystem-Based Adaptation (EBA): EBA offers cost-effective and flexible solutions for climate adaptation, particularly in vulnerable and dynamic coastal systems that provide coastal protection functions.

Introduction

Coastal cities across Europe face an unprecedented challenge as climate change accelerates, with rising sea levels, more frequent and intense storms, and increased erosion threatening the very foundations of these communities. This policy brief results from the Adapt4Coast Cluster (composed of four EU-funded projects with similar objectives: CoCliCo, SCORE, PROTECT and REST-COAST), a concerted research effort aimed at increasing coastal resilience in European coastal cities through an innovative approach, combining EBAs, Smart Technologies, and the establishment of Coastal City Living Labs (CCLL). As the impacts of climate change become more evident, this document summarizes the lessons learned from the Adapt4Coast Cluster extensive research efforts, offering policy recommendations to empower policy makers in their quest for climate resilience.

Citizen Science and Low-Cost Sensors: Empower citizens to monitor coastal climate hazards, complementing institutional data.

Co-design of innovative governance arrangements and policies: Support to overcome barriers to large-scale restoration and promote transformative change at all governance levels.

The European Coastal cities face substantial climate challenges, including projections of up to 2 meters of sea-level rise by 2100 [1]. Existing risk management plans and climate strategies do not adequately address long-term climate impacts and adaptation. The European coastal cities have also experienced an uptick in climate hazards, including windstorms, riverine and coastal floods, heatwaves, droughts, coastal erosion, heatwaves, and precipitation patterns. These events have had detrimental impacts on local infrastructure and economic activities, affecting residential properties, businesses, transport networks, and public services. Urgent action is required to mitigate these challenges.

The Adapt4Coast Cluster has generated valuable insights and policy recommendations to address European Coastal Cities' climate resilience needs. These recommendations encompass different areas of action:

1. **Effective Climate Modeling and Risk Assessment**
Strengths: Accurate assessment of climate change impacts, data for evidence-based decision-making, and the development of early-warning systems. The scenarios generated for future climate change inform policy-planning for the short and long term.
Weaknesses: Requires specialized expertise and infrastructure.
Proposed Activities: Coastal Erosion Modeling, Coastal Flooding Modeling, Storm Surge Modeling, Integration of a Digital Twin Platform.

2. **Ecosystem-Based Adaptation (EBA)**
Strengths: EBA's cost-effectiveness and flexibility, co-benefits for communities, and suitability for vulnerable groups. EBAs have been studied through cost-benefit analysis and multi-criteria analysis. The results inform policy decisions and for comparison with grey-engineering-based solutions. Coastal ecosystems require space for dynamic processes.

Weaknesses: Challenges in data collection and stakeholder engagement.Coastal ecosystems are vulnerable to on land and seaward pressures. Even restored systems are prone to degadation.

Proposed Activities: Cost-Benefit Analysis of Sand Dune Management, Multi-Criteria Analysis of EBAs., Public Perception Analysis, Coastal City Living Lab (CCLL) Model for EBA Implementation, Role of EBA in Building Socioeconomic and Coastal Resilience.

3. Citizen Science and Low-Cost Sensors

Strengths: Citizen engagement, data complementarity, empowerment, and monitoring EBA efficiency. While low-cost sensors can be effective tools to monitor climate data, involving citizens can be effective to engage them in co-creation of climate science.

Weaknesses: Potential sensor damage and data quality issues.

Proposed Activities: Engage citizens in monitoring marine variables (sea level and coastal erosion) using low-cost sensors and aerial imagery; improve communication of climate-related information.

### 4. Digital Twin and GIS-based Early Warning System:

GIS Early warning support and Digital Twin platform targeting countermeasures to mitigate the impact of extreme weather events. Strengths: Enables real-time monitoring and visualization of environmental data, infrastructure performance, and socio-economic indicators. Enhances collaboration between stakeholders, facilitating informed decision-making and resource allocation. Provides a testing ground for scenario analysis and policy simulation, fostering innovation and resilience.

5. Living Lab Model:

A Living Lab (LL) is a real-life testing environment that will enable citizens to co-create and co-design the solutions with scientists and engineers to make sure they are accepted by society. LL model can address various barriers in implementation of climate adaptation strategies (lack of dialogue, limited knowledge, etc) LL can support collaborative governance, which is key to climate change adaptation. LL can aid with scaling up of climate adaptation strategies by providing a user-centric platform for knowledge-sharing (2).

6. **Integrated Coastal Zone Management (ICZM):** ICZM is a dynamic process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning, decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in each coastal area, and to take actions towards meeting these objectives. It means integration of all relevant policy areas, sectors, and levels of administration.

7. **Citizen engagement:** A successful process for engaging stakeholders and citizens should: (I) Improve communication of climate-related information. (II) Design a sustained engagement strategy. (III) Provide opportunities for deliberative and inclusive dialogues. (IV) Catalyse stakeholders' and citizens' mobilisation, involvement, and action.

8. **Web-based platforms including ICT and Maritime spatial planning (MSP):** MSP is the tool to manage the use of our seas and oceans to ensure that human activities take place in an efficient, safe and sustainable way. The ICT platform being developed by SCORE collates and presents important climate data, being gathered through sensors, satellite-data, and more in order to support decision-making on coastal risk and adaptation.
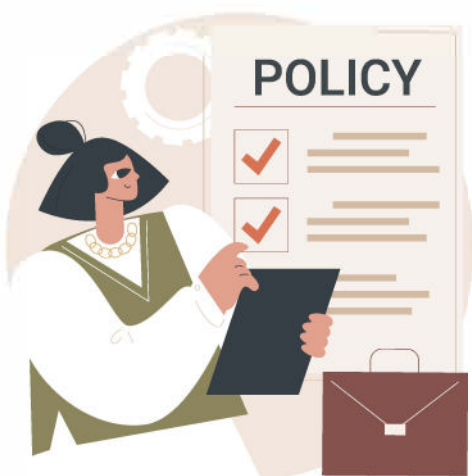
Conclusions and recommendations to policy makers and decision makers

The following policy recommendations emerge from the Adapt4Coast Cluster:

- **Leverage the Coastal City Living Lab (CCLL) approach** to inform climate strategies through stakeholder engagement and local knowledge.
- **Utilize low-cost sensor technologies** to enhance the efficiency of coastal climate data monitoring, thereby informing climate policy.
- **Continuously involve the community** in co-defining, co-creating, and co-designing climate adaptation strategies through the CCLL model.
- **Implement Ecosystem-Based Adaptation (EBA)** strategies, suitable for each Coastal City.

- **Evaluate the socioeconomic impacts** of adaptation strategies and actively **engage** with vulnerable communities. Local adaptation actions shall be undertaken.
- **Foster knowledge exchange** between European cities and not only, and projects to share lessons learned from the Living Lab models.
- **Coastal climate core services web platform** aiming to support decision-making on coastal risk and adaptation.
- **Sea level rise map** to support infrastructure planning and development
- The **what-if scenarios** being developed and tested by the integrated models can help shape climate policy.
- Studies like **shoreline erosion analysis** as well as other **earth observation studies** can provide important inputs for informing climate policy.
- **Dynamic storm surge models** can help inform early warning systems and digital twins, to make informed decisions in real-time.
- **Co-design innovative governance arrangements and policies:** Based on extensive analysis of existing data, the development of transformative governance approaches strive to create an enabling socio-economic environment for transformative and restoration-supportive governance that better integrates policies and mechanisms for large-scale coastal restoration.

The recommendations put forth in this policy brief are not just theories, but rather concrete steps towards a sustainable future. From enhancing climate modelling accuracy to prioritizing ecosystem-based adaptation, each proposal is tailored to address the unique challenges faced by European coastal cities.

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Learn more about Adapt4Coast Cluster:
- **SCORE - www.score-eu-project.eu**
- **REST-COAST - www.rest-coast.eu**
- **PROTECT - www.protect- slr.eu**
- **CoCliCo - www.coclicoservices.eu**

Bibliography

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