

AdriaClim

Climate change information, monitoring and management tools for
adaptation strategies in Adriatic coastal areas

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Adaptation plan of the regional coast of Emilia- Romagna

PP16 – Emilia-Romagna Region

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Foreword

This document has been produced in the framework of the INTERREG Italy – Croatia Strategic, AdriaClim Project. AdriaClim aim is to improve climate resilience in the cooperation area, by increasing the capacity to develop new climate adaptation plans and update existing ones and develop mitigation strategies based on high resolution, more accurate and reliable climate information (observations and integrated modelling) focussed on the coastal and marine areas (threatened by risks such as sea level rise, sea temperature and salinity anomalies, coastal erosion and salinization of freshwater) and related economic sectors and ecosystem services. AdriaClim aims at developing an Adriatic scale regional plus local scale for each Pilot integrated information systems composed by hydro-meteo-marine climatological databases (model scenarios and observation) and knowledge-based tools (e.g indicators) for advanced dynamical implementation of regional climate adaptation plans relevant and accessible for entire the Programme area and Countries. AdriaClim aims also at the production of specific Adaptation Plans for the pilot Adriatic coastal areas involved. Additional information and updates on the AdriaClim can be found at <https://www.italy-croatia.eu/web/adriaclim>

1 Aims and content of the document

The present document represents a resume, introducing and describing in synthesis the GIDAC Strategy. The GIDAC Strategy is the main output of the pilot action that was developed in Region Emilia-Romagna in the scope of project AdriaClim and it constitutes the adaptation strategy for the coastal area of Emilia-Romagna with a short and medium period horizon, yet looking to a long period horizon through revising steps, thanks to the monitoring of its implementation and to the expected updating of its knowledge framework.

The Strategy is attached to this document as an Annex and, for obvious reasons, its text is completely in Italian. Therefore, the present document intends to serve as an introduction to the main contents of the GIDAC for non-Italian speakers and for the benefit of the project itself.

The **Main Document** is divided into six parts:

Part A) general framework, purpose, knowledge framework, participated process;

Part B) strategic vision, objectives, actions and management options, sustainability;

Part C) actions and implementation guidelines;

Part D) communication, awareness raising, participation (strategies and tools, intergenerational approach and involvement);

Part E) monitoring & evaluation (on strategy implementation and effectiveness of actions);

Part F) monographies of provincial coastal stretches (critical issues and hot spots, sustainability of coastal management, interventions and resources needed).

The Document is supplemented by three **Annexes**:

Annex 1 - Extended Scoreboard (Knowledge Framework)

Annex 2 - Results of the Territorial Participatory Workshops "Actions" for the provinces involved;
Annex 3 - Elements for the evaluation of costs/benefits of measures in the field of co-management.
Link to the Strategy document and Annexes is here:

https://ambiente.regione.emilia-romagna.it/it/suolo-bacino/argomenti/difesa-della-costa/gidac/gidac-dicembre-2022/strategiagidac_documento_dic22.pdf

The Actions under the GIDAC Strategy, for each of which specific Implementation Guidelines have been developed in Part C, are divided into four functional groups:

- Systemic Actions
 - Integrated management of coastal sediments
 - Improvement of river and coastal sediment transport
 - Management and sustainable use offshore sediment deposits
 - Management and use of sediments from building excavations
 - Further reduction of the anthropic component of subsidence
- Adaptation Actions
 - Urban regeneration and transformations of the urbanized fabric with adaptation purposes
 - Planning for the reduction of vulnerability in the coastal area
 - Widening and elevation adequation of the beach systems
 - Strengthening of the coastal early warning system
- Maintenance Actions
 - Beach maintenance with nourishment
 - Maintenance and remodelling of detached protection works
 - Maintenance and adequation of hard protections and internal embankments
 - Elevation adjustment of port fronts, docks and port channels
- Transversal Actions
 - Construction of a "Pact for the Emilia-Romagna Coast"
 - Update and further development of the Knowledge Framework
 - Cost-benefit assessment with coastal risks and environmental sustainability evaluation for the interventions on the coast

AdriaClim project and the objectives of WP5

AdriaClim aims to improve climate resilience in the cooperation area, by increasing the capacity to develop new climate Adaptation Plans, update existing ones, develop mitigation strategies based on high resolution, more accurate and reliable climate information, focused on the coastal and marine areas and related economic sectors and ecosystem services.

The main goal is to deliver to decision makers and coastal communities in vulnerable areas, the adequate updated, accurate and reliable climate information to develop integrated ecosystem-

based and shared planning options and adaptation measures to climate change. Adaptation measures and Plans are expected to be developed in cooperation with local authorities and with the participation of stakeholders, compliant with ICZM and MSP principles.

Conditions and reasons for the Integrated Management Strategy for Protection and Adaptation of the Regional Coast to Climate Change (GIDAC)

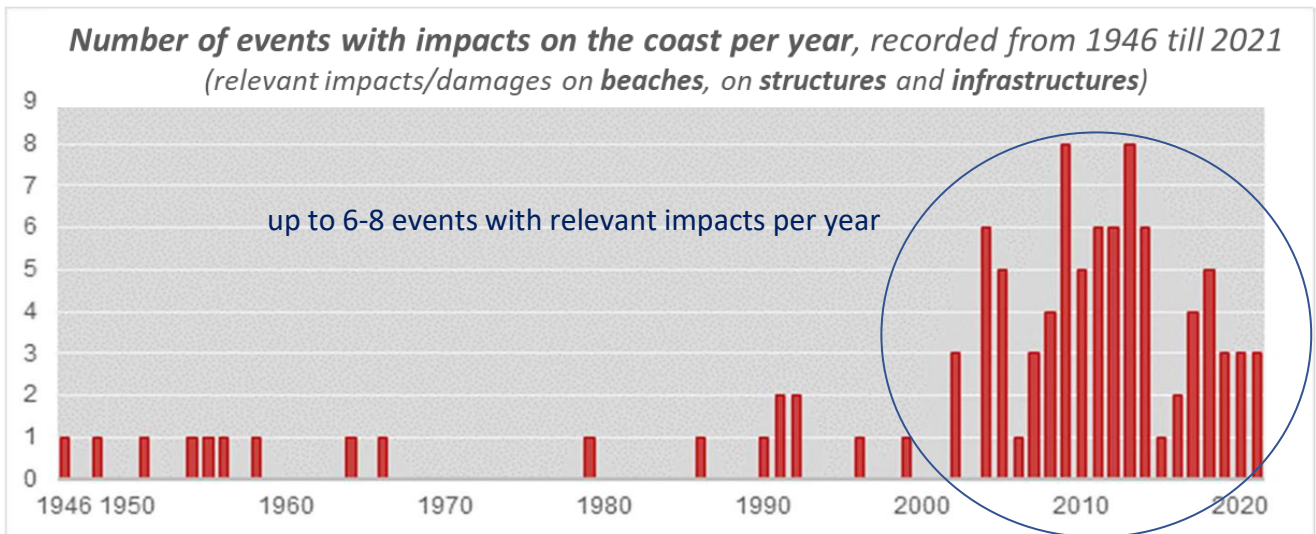
The vulnerability of the regional coastal territory to the phenomena of tidal wave, erosion, marine flood, saltwater intrusion, has been increasing in recent decades as the anthropization of the coastal belt did. The increased frequency of intense weather events associated with the phenomena of "high water" produce significant impacts on various stretches of the coastline, damage to urban areas and infrastructure, natural areas, protection works, bathing establishments and to the the coastal hydraulic system.

The most recent "Reports on storms" show that, out of a total of 180 events recorded in the "storm surges catalogue" since the beginning of the observation period and have produced significant impacts along the regional coasts, the most severe and impacting on the coastal territory have been concentrated in the last 15 years.

Unless appropriate mitigation and adaptation measures are taken, the effects of climate change already taking place will affect in the medium to long term (2030-2050) increasingly large areas of the regional territory, in particular the coastal belt, with important repercussions on the safety of people and on the development opportunities of the various economic sectors related to the coast.

The main points in synthesis are:

- 500.000 inhabitants along the 130 km of Emilia-Romagna coast, quite double up in the summer
- 40 million of touristic presences in the Emilia-Romagna coast during the summer season
- 34.000 hectares of natural protected areas along the coast (national, regional, nature 2000)
- 9% of total regional GDP produced on the coast (tourism and other Blue Economy sectors)
- Vulnerability of the territory increased in the last years (lack of sediments input, coastline retreats)
- Increased number of sea storm events with relevant impacts on the coast recorded in the last 15 years (3 storm surges with relevant impacts just in the last 5 months 2022-2023)



Opportunities given by the AdriaClim project

Among the conditions that allowed the development of the Strategy are surely the opportunities given by the project itself.

- Funding/supporting the preparation of Strategies and Plans for the Adriatic coastal areas
- Exchanging experience, sharing data and modelling, providing high resolution climate information
- Detailed climate scenarios on the Adriatic coastal and marine area
- Monitoring and forecasting tools

GIDAC strategy reference policy framework

The development of the Strategy took the move from a pre-existing regulatory and policy framework. Hereby we provide an overview of the main instruments and references.

- Recommendation for ICZM implementation in Europe (2002/413/EC)
- EUROSION Policy Recommendations (2004)
- Emilia-Romagna regional ICZM Guidelines (DCR 645/2005)
- The Flood Directive (2007/60/EC), Flood Risk Management Plan in E-R coastal area (II° cycle, 2022)
- ICZM Protocol of the Barcelona Convention (2008)
- Regional Law 15/2018 "Participation in the elaboration of public policies" (Aahrus Convention 1998)
- Regional Strategy for Mitigation and Adaptation to climate change in Emilia-Romagna (DAL 187/2018)
- EU Strategy for adaptation to climate change, COM(2021) 82 final

- Agenda 2030 of Emilia-Romagna Region (DGR 1840/2021), goal 11, 12, 13, 15
- The National Plan for Climate Change Adaptation (December 2022)

The Strategic Vision

To meet the current and future challenges of climate change, it is necessary to work with a system logic, through the participation of the different regional and local parties off the territory. This is the conviction from which we have parted to build together a Strategy capable of combining development objectives with the protection of environmental, ecosystem and socio-economic values of our coast. The Integrated Management Strategy for the Defence and Adaptation of the Regional Coast to Climate Change (GIDAC), developed thanks also to an articulated participatory path ("What Coast Will Be"), is based on the principles of the Regional ICZM Guidelines, on the indications of the Regional Strategy of Mitigation and Adaptation to Climate Change of the Emilia-Romagna Region (D.A.L. 187/2018), as well as the Flood Risk Management Plan (PGRA) and is aimed at reducing the vulnerability of the coastal territory to make it, today and in the future, more and more a safe and welcoming place, of meeting and active exchange, resilient to climate change and able to combine development and environmental sustainability.

Timeline and milestones of the GIDAC Strategy participated construction the Participatory Process "What Coast will it be?"

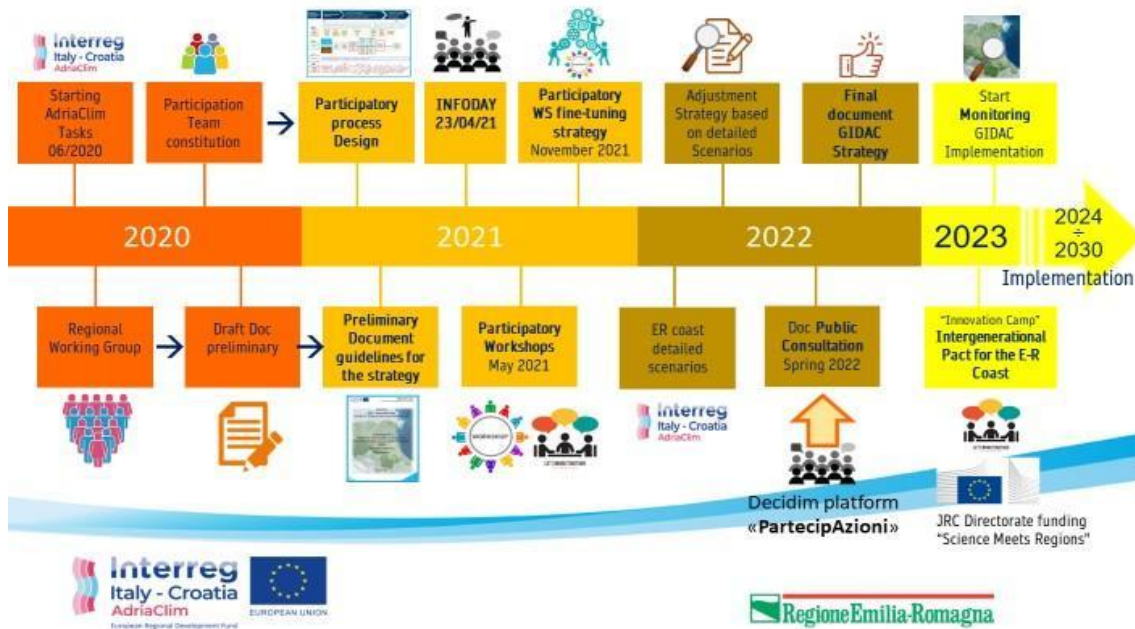


Figure 1. Development of the Strategy and of the Participatory Process at a glance



Figure 2. Who was involved and main steps of the Participatory Process building the Vision and the Strategy

What the Strategy proposes: Actions and Implementation Guidelines

Guidelines

The GIDAC identifies Actions and measures that are summarised in four Pillars (or cornerstones of the Strategy) and Objectives and Actions, drawn to the attention of administrators and technicians of different levels of government and land use of the coastal area. Actions and guidelines refer to that "common ground", emerged from the participatory process "CheCostaSarà?" on which a shared vision of the coast of the future was built, and objectives to be pursued as well as strategic choices have been defined to address the challenge of climate change. Here are the four main Pillars of the GIDAC:

- LD1** **Free up space along the coast and keep beaches free from structures and infrastructures** creating "buffer zones" for the unfolding of the dynamics of the sea, promoting the reorganization of critical coastal stretches and the retreat or realignment of the anthropic elements where necessary.
- LD2** **Ensure an adequate supply of sediments to the coastal system**, from the different internal and external sources, for the purpose of restoring and maintaining the sedimentary balance for current and expected climatic conditions.
- LD3** **Promote the integration of coastal risks costs into decision-making processes on coastal planning transformations and investments**, through a shared approach and a correct cost/benefit assessment.
- LD4** **Maintain a Knowledge System always updated** on coastal and river dynamics, on management of erosion and sediment sources, on coastal phenomena and risks in a current and forecast key, on the planning and implementation of interventions and transformations along the coastal area.

General Objectives

Within this framework, 6 General Objectives have been defined:

OG.1	Reduce the vulnerability of the coastal territory by ensuring an adequate safety asset of the coastline (beach system) in relation to its function of "first structure" for inland protection.
OG.2	Ensure the conservation and integrity of coastal ecosystems, landscapes and geomorphology for present and future generations.
OG.3	Promote the sustainable development of the coastal zone , with regard to a rational planning of human activities in relation to the expected scenarios of climate change.
OG.4	Prevent/reduce the impacts in coastal territories of sea level rise, storm surges, erosion and marine ingression.
OG.5	Ensure the sustainable and coordinated use and management of the different sediment resources useful for the nourishment and maintenance of beaches.

OG.6

Ensure coherence between public and private initiatives affecting the protection and adaptation of the coastal zone, the littorals management, the use and conservation of coastal resources.

Actions

Hereby, we present a synthetic scheme of the actions included in the Strategy.

The actions are categorized in four sets:

- Systemic actions (AS)
- Adaptation actions (AA)
- Maintenance actions (AM)
- Cross-cutting actions (AT)

Systemic Actions (AS)

- **AS.1 - Implementation of a governance system for the implementation of the Strategy.**
 - AS-1.1 - Promoting a Compact for the protection and adaptation of the regional coast to climate change
- **AS.2 - Implementation of an integrated management system for accumulation of coastal sediment**
 - AS-2.1 - Identification of potential extraction areas
 - AS-2.2 - Implementation of a Thematic Database for the management system for accumulation of coastal sediment
 - AS-2.3 - Identification of "Important coastal stretches for management purposes - TLS"
 - AS-2.4 - Analysis campaigns on coastal sediment accumulations
 - AS-2.5 - Simplified authorization procedures for recurrent mobilization of sediment
- **AS.3 - Measures aimed at improving the solid fluvial transport along the coast**
 - AS-3.1 - Implementation of a thematic Database on the solid fluvial transport
 - AS-3.2 – Measures to improve the fluvial solid transport
 - AS-3.3 - Estimation of the volumes of sediments trapped in the water reservoirs
 - AS-3.4 - Actions and interventions for the by-pass of sediments from the water reservoirs
 - AS-3.5 - Actions and interventions aimed at improving the transportation of sediment along the coast

- AS-3.6 - Studies and analysis on solid transport along the coast
- **AS.4 - Extraordinary replenishment with offshore sands and sustainable management of submarine deposits**
 - AS-4.1 - Periodic programming of extraordinary replenishment interventions
 - AS-4.2 - Planning of further investigation and characterization
 - AS-4.3 - Sustainable exploitation of offshore sands deposits
 - AS-4.4 - Pre and post-intervention surveys and monitoring
- **AS.5 - Actions aimed at a further reduction of the anthropic component of the subsidence**
 - AS-5.1 - Regulated optimization of subsurface water emulsion
 - AS-5.2 - Strengthening of water saving measures and policies
 - AS-5.3 - Implementation of studies and monitoring of coastal aquifers
 - AS-5.4 - Regulated reduction of hydrocarbon extraction
- **AS.6 - Destination of the sands from excavations of building and infrastructural works to coastal maintenance and regeneration**
 - AS-6.1 - Provisions in building regulations for the reuse of sandy materials resulting from excavations
 - AS-6.2 - Identification of temporary storage areas for sandy materials
 - AS-6.3 - Destination of sandy materials for excavation to coastal replenishment
 - AS-6.4 - Implementation of Database on storage and reuse of excavation sands

Adaptation Actions (AA)

- **A.1 - Urban regeneration interventions and transformations of coastal urbanized fabric**
 - AA-1.1 - Redesign of the sea front and urban regeneration
 - AA-1.2 - Update and strengthening of the database of the requalification intervention of the sea fronts
- **AA.2 - Planning guidelines for the reduction of coastal vulnerability**
 - AA-2.1 - Uptake of the most up-to-date reference scenarios at the planning stages
 - AA-2.2 - Census of the anthropic elements localized on the beaches and in areas of high hazard
 - AA-2.3 - Increasing the resilience of territories to climate change

- AA-2.4 - Planning of the fruition area of the seashore (“arenile”)
- AA-2.5 - Update of Civil Protection Plans in relation to climate change
- **AA.3 - Coastal early-warning system upgrade**
 - AA-3.1 - Systematic monitoring of the reference parameters of the models
 - Strengthening of the monitoring of the tidal events
 - Update of the impact modelling
 - Update of critical meteo-marine reference thresholds
 - AA-3.2 - Thematic insights and adoption of good practices in collaboration with research institutes and universities
 - AA-3.3 - Training and constant information on the coastal early-warning system
- **AA.4 - Widening and elevation adjustment of the “beach system”**
 - AA-4.1 Assessment of the amplitude and altitude of the “beach system”
 - AA-4.2 Definition of a project design “beach”
 - AA-4.3 - Regeneration of the "beach system"

Maintenance Actions (AM)

- **AM.1 - Regular maintenance of beaches**
 - AM-1.1 - Beach maintenance
 - AM-1.2 – Implementation of a database of dredgings in harbour areas
 - AM-1.3 – Sediment by-pass systems for structures along the coast
 - AM-1.4 - Handling of sediments in the enclosed sections between barriers and shoreline
 - AM-1.5 - Beach cleaning with on-site screening
 - AM-1.6 - Management of stranded biomass
 - AM-1.7 - Construction of windbreak, seasonal or permanent barriers
 - AM-1.8 - Construction of winter protective embankments
 - AM-1.9 - Accessibility of the beach for maintenance operations
 - AM-1.10 - Use of the beach in connection with works or remediation
- **AM.2 - Maintenance and requalification of the shore protection structures**

- AM-2.1 – Planned surveys for the verification of the conservation state and the functionality of shore protection structures
- AM-2.2 - Development/update of the Protection Structures Database
- AM-2.3 - Maintenance of Protection structures
- AM-2.4 - Improvement of the quality of the enclosed seabeds
- AM-2.5 - Redesigning of coastal areas protected by rigid works systems
- AM-2.6 - Evaluation of new protection structures and systems
- AM-2.7 - Experimentation of solutions for multi-objective interventions in coastal areas
- AM-2.8 - In-depth analysis of the weather-marine climate for design purposes
- AM-2.9 - Monitoring of sea protection interventions
- **AM.3 - Maintenance, restoration and upgrading of sea-level protection and internal protection embankments**
 - AM-3.1 - Survey on the conservation state and functionality of the sea-level protections
 - AM-3.2 - Survey on the conservation state and functionality of the internal protection embankments
 - AM-3.3 - Development/update of the Database of the conservation state of shore protection structures and internal banks
 - AM-3.4 - Mapping and cadastral survey of shore protection structures and internal protection banks
 - AM-3.5 - Maintenance and adaptation of shore protection structures
 - AM-3.6 - Maintenance and upgrading of the internal defence embankment network
 - AM-3.7 - Monitoring of interventions on shore protection structures and internal protection embankments
- **AM.4 - Maintenance and elevation adjustment, uplifting of fronts and docks and canal harbours**
 - AM-4.1 - Survey of the quotas of seafronts and harbour docks
 - AM-4.2 – Elevation adjustment of fronts and harbour docks
 - AM-4.3 - Connection with protection measure and urban fabric

Cross-cutting Actions (AT)

- **AT.1 – Set up of a "Pact/Compact for the Coast of Emilia-Romagna"**

- AT-1.1 -Guidelines for the construction of a Pact for the protection and adaptation of the regional coast to climate change
- **AT.2 - Updating and development of the regional coastal knowledge framework**
 - AT-2.1 - New data acquisition
 - AT-2.2 - Development of new thematic databases
 - AT-2.3 - Revision and updating of existing databases
 - AT-2.4 - Cooperation and information flow between agencies (Operational protocol)
 - AT-2.5 - Accessibility and information sharing
 - AT-2.6 - Acquisition of monitoring data of interventions carried out
- **AT.3 - Analysis and cost-benefit evaluation of coastal protection and transformation interventions**
 - AT-3.1 - Cost-benefit analysis of coastal protection interventions
 - AT-3.2 - Cost-benefit analysis of the transformation of the inland territory
 - AT-3.3 - Evaluation of the cost-benefit analysis of intervention projects

A Pact for the Coast

During the participatory process the need for a tool of governance of the Strategy emerged strongly, similar to the "Pact for Work and Climate" signed by the Region with the representatives of the regional territory. In order to follow up this need, we wanted to take the opportunity of a call "Science Meets Regions" of the European Union (DG JRC) presenting a project of "Innovation Camp", which obtained funding, for the construction with the territory of a "**Intergenerational Pact for the Coast of Emilia-Romagna**", through participatory workshops that focused on 3 challenges and products to prototype: a) Governance, how to establish an intergenerational collaboration for the defense and adaptation of the coast; b) how to co-design an intergenerational communication strategy for the Communication and Participation tools; c) the ways and means of learning, monitoring and continuous improvement.

Monitoring and evaluation

GIDAC is also being complemented with a monitoring system that over time will verify the actual state of implementation of the Strategy, how and when the Implementation Guidelines will be applied by coastal municipalities and other stakeholders involved, and to evaluate the effectiveness

of the actions/interventions envisaged in terms of reducing vulnerability and risk on the coastal territory.

The aim of the monitoring is, among others, the evaluation of possible adjustments and enhancements of actions and of the strategy itself, in relation to the foreseen updating of the knowledge framework and possibly of the climate scenarios for the coast, in a logic of continuous improvement of the GIDAC Strategy.

Annexes

1. GIDAC Strategy document (in Italian)