



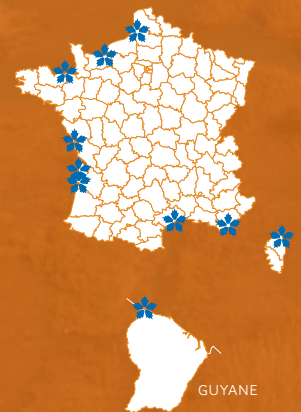
adapto

A SUMMARY OF RESULTS

The adapto project was launched by the Conservatoire du littoral and involved full-scale trials of nature-based coastal adaptation solutions. These policies were based on "flexible management" solutions with general consultation of all stakeholders, deployed at 11 sites on the French coast between 2017 and 2022.

In a world facing climate change, flexible management solutions involve using coastline movements as a means of managing natural hazards while restoring coastal ecosystems. These approaches take real shape in the field (coastal realignment, renaturalisation and removal of artificial structures, etc.) and in governance policies (management plans, regional projects) and through feedback provided and analysed.

The project was able to demonstrate the potential offered by solutions based on coastal dynamics and natural spaces for the efficient and sustainable adaptation of coastal areas from ecological, economic and human perspectives.



THE TEN PILOT SITES

IN MAINLAND FRANCE AND FRENCH GUIANA COVER A PANEL OF FIVE DIFFERENT TYPES OF COASTAL ENVIRONMENTS: THE SANDY ATLANTIC COAST, THE LOW-LYING RECLAIMED LAND ON THE ATLANTIC COAST, MEDITERRANEAN BEACHES, MEDITERRANEAN SALT MARSHES AND MANGROVES. WHEN THE PROJECT WAS LAUNCHED, EACH POLICY WAS ADAPTED TO THE LOCAL CONTEXT AND DIFFERING LEVELS OF MATURITY.

The principles underlying flexible management solutions

Thanks to the various approaches adopted, the **feasibility** and **pertinence** of flexible management policies were studied and the keys to success were identified, as well as shortcomings and limits. Networking was actively adopted between stakeholders in the different regions. The project attempted to highlight all approaches via various communications tools and educational methods.

- **Reconnecting reclaimed land to the sea:**

Orne, Lancieux, Gironde estuary, Leyre Delta

- **Renaturalised dune ridges:**

Vieux Salins, Petit travers, Golo Delta

- **Supporting coastal retreat:**

Authie, Lancieux, Brouage, Petit travers, Vieux Salins, Golo Delta, Mana

- **Adaptive management plans:**

Leyre Delta, Mana

- **Territorial projects:**

Orne, Brouage, Mana, Golo Delta

The Conservatoire du littoral took action at various levels as part of the adapto project:



As a land owner, aiming to protect the future of the natural and cultural heritage sites whose fate lies in its hands



As a regional stakeholder, responsible for suggesting how the coast should be adapted and how the natural environments where the land meets the sea should be managed.



As a facilitator, contributing to giving regional projects in these fields real shape

Here the possibility of simultaneously addressing issues related to heritage, the environment and uses of natural areas is under consideration through a support strategy for the gradual retreat of the coastline.

Lancieux Bay

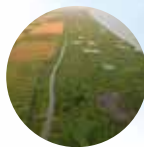


Moëze Marsh



In this vast marsh of historical, natural and human importance, the coastal dike has been weakened by recurring climatic events. Several coastal management/evolution scenarios are to be studied in relation to the site's future.

Gironde Estuary



Mortagne Polders

In the wake of the storm of 1999, a breach in the dike of the downstream polder caused this site to be reconnected to the estuary's natural environment. What lessons can be learnt for the neighbouring polders?



Île Nouvelle

Further upstream, Île Nouvelle has had a similar experience: storm Xynthia led to a breach in the dike on the north-west part of the island, causing it to become increasingly reconnected with the Gironde river. Its biological diversity has since increased considerably. These sites are undergoing numerous scientific monitoring campaigns.

Leyre Delta



Domaine de Certes et Graveyron

In former fish ponds, the decision was made not to prevent the tip of the polder, more exposed to marine risks, from being reconnected with the sea.



Malprat Island

This same management choice led to an increase in the surface area of salt marshes, thus helping to curb erosion and coastal flooding generated by wave action.

Authie



This estuary is the source of sediment where low-lying sea level

Orne Estuary

The Orne, a heavily engineered river, lacks space for expansion: this raises the question of opening up the neighbouring polders and marshland with a view to adapting to climate change.

« ABOUT NATURE-BASED SOLUTIONS. »

Nature-based solutions are initiatives which use ecosystem services to meet the challenges faced by society and raised by global changes. Such solutions offer an opportunity to form new bonds with nature, rather than simply considering the environment as a force to be fought back, or heritage to be protected. Nature is also an ally, a partner with benefits, although these benefits are never fully under control or foreseeable.

estuary in Picardy is
 one of complex
 entary exchanges
 dune erosion is
 egering the
 ing land that sits at
 vel.

Bay

In Mana, the former rice paddies are set to be revived through agricultural and ecotourism activities which will be adaptable to the gradual retreat of the coastline. The consolidation and stabilisation of the protective chenier (fossil dune) will help to reduce erosion.

Mana Rice Paddies



GUIANA
 MÉTROPOLIS
 MÉTROPOLE

Petit and Grand Travers

Following in-depth consultation, the coastal road was decommissioned to allow the dune area to be restored to its natural state and to improve public access to this sand bar separating the Etang de l'Or from the Mediterranean Sea.

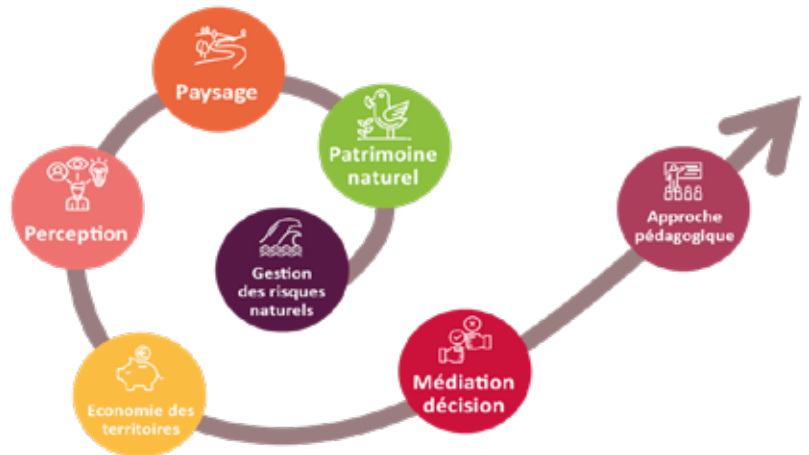
Hyères salt marshes

In this coastal wetland area, adaptive management actions are under consideration, such as coastal riprap removal with a view to land restoration.

Golo Delta

The strong natural dynamics at play on this stretch of coastline should be understood and used to organise the coexistence with major economic issues through the development of integrated coastal area management schemes.

The method used for the adapto project was based on both pragmatic policies aiming to meet individual local dynamics, as well as on the drive to take action as part of an overall coherent methodology, therefore the adapto project deployed a **multi-disciplinary** and **across-the-board approach**, dealing with the challenges of adapting the coast to climate change from many viewpoints.



Using technical approaches to establish a preliminary knowledge base...

These approaches were used to model hazards based on various assumptions and a rising mean sea level, and to characterise the potential changes impacting natural environments over various timescales and within different management scenarios. Morphological and ecological aspects were tracked at the most advanced adapto sites for the purpose of obtaining more detailed knowledge of the local impact of flexible coastline management solutions.

Targeting a better assimilation of priorities by an emotional approach

Focusing on the landscape provides a universal tool for dealing with the historical changes to the region and offers insight into future landscapes. The surveys to determine the views of the local population provide complementary input, ensuring that local perceptions are understood and locals are better involved in the project and preparing for decision-making processes. Educational materials and the site histories ensure that project feedback is widely accessible.

The joint preparation of regional development scenarios

Running an economic evaluation of various development scenarios can offer input for future consideration by local operators. The benefits of nature-based solutions will take clearer shape if the ecosystem services available within the region are also incorporated. The scenarios were debated via a specific support programme, and through existing bodies if applicable.

ABOUT REGIONAL PROJECTS.

Regional projects provide a strategic vision of the role played by the public authority targeting the future. Regional projects ensure that government-backed initiatives are consistent, improving the guidance provided for governance and allowing for sharing with contributors and inhabitants. The question of how coasts can adapt must be incorporated in regional planning and management methods. The adapto project must therefore contribute to the reconsideration of regional projects including the pilot sites.

FLEXIBLE MANAGEMENT: PERTINENT, FEASIBLE AND REPRO

Reconnecting reclaimed land to the sea

HELPS TO PROMOTE THE RESTORATION OF SALT MARSHES AND THE INHERENT ECOLOGICAL ROLES. IT OFFERS A COST-EFFECTIVE ALTERNATIVE TO THE MAINTENANCE OF FIRST-RATE DYKES.



Lancieux Bay, reclaimed land, now flooded with no major mishap

The parties involved in this project were able to witness the ocean progressively reclaiming the land through an opening in the dyke protecting the Beaussais reclaimed land in 2020. This event was planned and controlled, and did not appear as a natural catastrophe in any way.

1990, 2006 and 2020 : The Marais Neufs dyke failed at several locations



40 ha OF MEADOWS RECONNECTED TO BEAUSSAIS SEA



Parts of the Gironde estuary (Mortagne, Ile Nouvelle) were successfully reconnected to the seawater as early as 1999.

The adapto project promoted in-depth monitoring: changes to biodiversity, landscapes, elevations, with a flexible management solution creating an open air laboratory.

BETWEEN 1999 AND 2021 IN MORTAGNE: AN INCREASE IN ELEVATION OF BETWEEN + 70 cm AND + 1,50 m



BETWEEN 2006 AND 2018, IN L'ÎLE NOUVELLE + 38 ha IN THICKETS + 128 ha IN REED MARSHES



Renaturalised dune ridges

HEALTHY DUNE RIDGES ABLE TO ROLL BACK PROVIDE NATURAL PROTECTION AGAINST COASTAL FLOODING AND CAN EVEN ADAPT TO PERIODS OF EROSION.



Vieux Salins d'Hyères : A renaturalised beach

The overall project is designed to allow the natural dynamics of the dune-beach system to return by progressively removing riprap from the ridge and adding picket fences and sand. Flexible coastline management brings benefits across the board for this site: hydro-sedimentary aspects, landscape, ecology, tourism and economy.

615 m OF COAST RENATURALISED



5 à 10 m ACCRETED IN THE AREA FORMERLY EXPOSED TO EROSION



Petit travers: Removal of a road and restoration of the dune

The works undertaken to remove the local road running over the dunes and improve the access routes used by visitors took over 10 years of consultation to come to fruition, but allowed both environmental and regional priorities to be met at this very busy site.

35 000 m² OF DUNES WERE RESTORED AFTER THE REMOVAL OF THE RD59 ROAD



91 % OF USERS SURVEYED ARE SATISFIED WITH THE RENATURALISATION WORKS COMPLETED



Territorial projects:

REGIONAL PROJECTS PLAY AN ESSENTIAL ROLE IN THE COLLECTIVE DEPLOYMENT AND LONG-TERM SURVIVAL OF FLEXIBLE MANAGEMENT SOLUTIONS.



Brouage marsh: An ambitious regional project as part of the "marsh agreement"

The adapto programme provided a solid, multidisciplinary foundation for reflections and real impetus for existing projects to promote the marsh, coordinated with the new coastline positions, in synergy with the preparation of a flood prevention action plan for the area.

DUCIBLE SOLUTIONS

Supporting coastal retreat

PRIORITIES AND DEVELOPMENTS MUST BE REALIGNED IN ORDER TO PROTECT ASSETS FROM COASTAL HAZARDS BY RECONCILING LOCAL ENVIRONMENTAL, SOCIAL AND ECONOMIC PRIORITIES.

Authie Bay: a new interface in front of the dykes



The adapto project is complementary to the regional flood prevention action plan which provides for the erection and repositioning of dykes, and represents a regional landscaping project in view of the future, revising the concepts of time-scales, how

the site is used and socio-economic activities, while helping to boost biodiversity on both banks of the Authie river.

50 ha OF DUNES ACQUIRED IN 2019, TO ACT AS A NATURAL BARRIER FOR THE NORTH BANK



12 ha ACQUIRED IN THE NEW INTERMEDIATE FLOODPLAIN



Golo Delta: Realigning dunes and car parks

Prospective scenarios, backed by economic information, provided a basis for dialogue with local operators. The dune was partially restored and realigned in areas affected by erosion and a car park in the Mucchiatana zone was relocated farther landwards of the dune ridge.

SINCE 1937 **58%** OF THE COASTLINE IS STABLE OR ACCRETING (GOLO RIVER MOUTH)



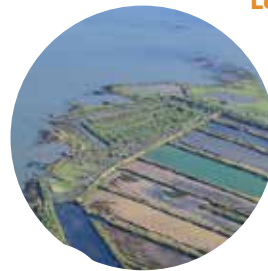
29% IS FACING MINOR EROSION, **15%** STRONG EROSION



Adaptive management plans

THE FLEXIBLE MANAGEMENT OF THE COASTLINE ALSO INCORPORATES MANAGEMENT PLANS FOR PROTECTED AREAS, WHICH MUST BE ADAPTED, SOMETIMES SUBSTANTIALLY.

Leyre Delta: the management plan looks ahead to future changes



The economic study evaluated the preferable benefits of allowing for coastal flooding compared with the lesser benefits of repairing all of the main dykes. By highlighting the most vulnerable areas, we can define the successive realignments required and the new ecological equilibrium expected.

BY RESISTING CHANGE AND MAINTAINING THE MAIN DYKES UP TO 2050, THE HEIGHT OF THE DYKES WOULD NEED TO BE INCREASED BY **1.3 m** ON AVERAGE TO HOLD OFF THE RISING SEA LEVEL..



Mana Rice Paddies: Resilient trial solutions which could be upgraded

Considering both actual and forecast coastal retreat (up to an additional 1,700 m by 2050), adaptive management is mandatory, combining recolonisation by mangroves with agro-ecological activities and an appreciation for the landscape and tourism.

209 BIRD SPECIES RECORDED, INCLUDING **53** PROTECTED SPECIES



Orne estuary: Making a contribution at "Caen la mer"

The estuary of the future is considered as a whole, running from the mouth to the heart of the urban sprawl of Caen: viewing this area as a landscape feature and in-depth cooperation with local stakeholders proved key factors in the policy.

16 ha AFFECTED BY TIDAL FLOW ON THE FORMER FRANCOIS RECLAIMED LAND



2 500 pupils DIRECTLY INVOLVED IN THE ADAPTO PROJECT VIA:
- **35 CLASSROOM SESSIONS**
- **17 FIELD TRIPS**
- **1 EXHIBITION**



The benefits of a flexible management policy

Why is a flexible management policy appropriate?



A flexible and often efficient solution for managing natural coastal hazards



Resilient natural habitats, supporting many ecosystem services .



New opportunities for landscapes and residential environments.

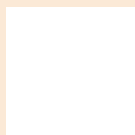
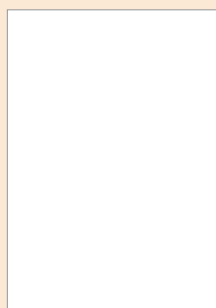


Solutions with long-term economic benefits for the site and region.



Anticipated adaptation pathways to support the joint development of a regional project.

AN ADVOCACY DOCUMENT FOR THE FLEXIBLE MANAGEMENT OF THE COAST, **based on project results and feedback highlights the benefits of this climate change adaptation solution.**



SO A FLEXIBLE MANAGEMENT POLICY IS GREAT, but how do we apply it?

FEEDBACK ON DRIVERS AND THE CONDITIONS FOR DEPLOYING FLEXIBLE MANAGEMENT SOLUTIONS AS PART OF THE ADAPTO PROJECT:

» Working at the right scales

Surface areas

consider the areas which are or could be affected by hazards and integrate the different challenges at regional level.

Timescales

take action today, to simplify the decisions required in the future (in the long-term)

» Providing illustrated example

We can observe past changes

in order to understand how the coastline can move.

Flexible management solutions bring

economic, social and environmental opportunities for the region

Using multiple key tools such as:

- Historical and prospective studies on the changing landscape, biodiversity (ecological-quality indicator) and regional land use.
- Awareness and reference events ("Moving banks" exhibition)
- Partial comparisons between different coastal management strategies: "Uncontrolled circumstances, Resist or Adapt?" (cost-benefit analysis, multi-criteria analysis)



inaction



resistance



adaptation

» Integrate the actions and governance of the approach into land-use planning choices

- Flexible management approaches imply a territorial vision of the coastal strip. Therefore, to be relevant, they must be part of a territorial project, which may be of various kinds (PAPI, town planning document, ad hoc approach, etc.) or, failing that, encourage its emergence.
- Several points seem essential:



SHARE THE MAIN ISSUES WITH THE RELEVANT AUTHORITIES



HAVE DEDICATED HUMAN RESOURCES TO OFFER PERMANENT ANIMATION AND INTERACTION CAPACITY



USE EXPERT SKILLS IN CONSULTATION, TERRITORIAL DEVELOPMENT AND PROSPECTIVE

» Communicate and involve the population from the early stages and throughout the project

Via educational actions and communications

targeting politicians, the general public, school pupils and the personnel of coastal authorities.



4 322
PUPILS PARTICIPATED IN AWARENESS SESSIONS



1 963
PARTICIPANTS IN TRIPS AND EVENTS



5
EXHIBITIONS



Via surveys

to determine the perception of the users of the different adapto pilot sites

1 678
PEOPLE SURVEYED



Via awareness sessions

focusing on the concept of flexible coastal management solutions at local and national level.

231
MEDIA REFERENCES FOR THE ADAPTO PROJECT, INCLUDING **107** IN 2022

» Using data, disseminating methods and highlighting feedback

Accessible and reproducible methods

1
TOOLBOX WITH 6 METHODOLOGICAL GUIDES



A CATALOGUE OF EDUCATIONAL TOOLS: **128** EDUCATIONAL TOOLS



TRAINING: OVER **300** COAST GUARDS AND OFFICERS TRAINED

A wide range of feedback

6
SITE HISTORIES REVEALING THE DIFFERENT PHASES OF EACH POLICY



11
VIDEOS AND SUMMARY BROCHURES

5
INTER-SITE EXCHANGE VISITS



Advertising to highlight the benefits

of a flexible management policy at national, European and international levels

350
PARTICIPANTS AT THE FINAL SEMINAR



1
ADVOCACY DOCUMENT FOR FLEXIBLE MANAGEMENT SOLUTIONS

OVER **60**
NETWORKING EVENTS (61 NATIONAL EVENTS, INCLUDING 16 WITH AN INTERNATIONAL REACH)



Multiple promising partnerships

- Public authorities enriching their regional project,
- Government operators working together,
- Scientific partnerships.

And tomorrow?

The Conservatoire du littoral, with all the dunes, beaches, marshes, lagoons and mangroves benefitting from its protection, is on the front line for managing the effects of a rising sea level: flooding, erosion, salinisation, changing land use, etc.

When faced with these hazards, the Conservatoire du littoral is convinced that we must find an intermediate solution between a "static" coastline and "do nothing": flexible coastline management. The basic principle of accompanying a changing coastline without attempting to stabilise movements is new, and the adapto project aimed to document, trial and consolidate this approach in terms of methods and expertise. This intermediate solution excludes both totally natural shores, where nature is left to run its course freely, and extensive coastal urbanisation, where safety is necessarily the number one consideration.

In intermediate low-lying or sandy areas, where many challenges overlap, a flexible management policy now appears as a pertinent and sustainable solution:

- For risk management,
- For the local economy,
- For the quality of ecosystems, landscapes and the lives of local inhabitants.

These initiatives will probably continue, as many challenges still await if we aim to render these flexible solutions globally convincing, to reduce our uncertainty over how coastal systems behave when faced with hazards, to provide practical solutions for private land owners and agricultural operations vulnerable to risks, etc. This process will require an extended partnership with clear objectives set as part of the French National Strategy for the Sea and Coastline (SNGITC): consolidate methods, launch more local policies, disseminate and advertise flexible coastline management "engineering" at all levels, in terms of technical, organisational and political aspects.



Partnerships for actions and ensuring awareness

Associated beneficiary

BRGM Bureau de Recherches Géologiques et Minières
French geological surveys

Partners and financial backers

European Union
Water agencies
French Biodiversity Agency
Fondation TotalEnergies
Fondation de France (charity)

Scientific and technical partners

ENSP Ecole nationale supérieure du paysage (Landscape institute)
MNHN Muséum national d'histoire naturelle (French natural history museum)
UNCPIE Union nationale des centres permanents d'initiatives pour l'environnement (French Union of Standing Environmental Action Centres)
UBO Université de Bretagne occidentale
ULCO Université du littoral Côte d'Opale
EPHE Ecole pratique des Hautes études
ULR Université de La Rochelle

OUR BROCHURES FOR THE FULL COLLECTION CAN BE FOUND ON THE WEBSITE

www.lifeadapto.eu

ACCESS COMPREHENSIVE ADAPTO PROJECT RESOURCES FOR THIS SITE:



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