COASTAL CLIMATE CHANGE ADAPTATION, THROUGH URBAN PLANNING IN THE BASQUE COUNTRY

Guidelines for Local Authorities

Action to adapt. Workbook No. 1

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PUBLISHED BY

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This document has been prepared in
conjunction with AZTI and Tecnalia

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Executive Summary

Incorporating climate change adaptation in the policies, plans and strategies regarding the land-use and planning of the Basque coast has made great strides in recent years, thanks to the generating of data, information, tools, methodologies and studies on climate change adaptation that have been developed.

This document contains a set of guidelines for the adaptation of the Basque coast in order to progress further in this regard. These guidelines are set out in such a way that they can act as a guide and can help when integrating the climate component in the urban planning of the Basque coastline; the main point of reference is the results of the **Kostaegoki Project** (www.ihobe.eus/publicaciones/kostaegoki-i-analisis-vulnerabilidad-y-riesgo), which provide very important information and tools regarding the effects of the rise in the average sea level caused by climate change and the impact of waves on the Basque coast.

These guidelines are also based on the results of a series of technical sessions held during 2023 with representatives of coastal municipalities and professionals of the Basque Institute of Civil Engineers and the Professional Association of Basque-Navarre Architects, involved in spatial planning; when they discussed how to integrate the risk from the rising sea level due to climate change in the urban planning of the coastline of the BAC (Basque Autonomous Community).

The document is structured into three blocks. A **first block** that identifies the legal framework regarding climate change adaptation on the Basque coastline. A **second block** that sets out the guiding principles and the challenges in order to respond to climate change adaptation in the coastal municipalities of the BAC. A **third block** that offers guidelines to plan for adaptation from urban planning and offers:

I) pointers to **identify adaptation needs**, and criteria to use and exploit the information available in the BAC to assess the climate change risk due to the rising sea level

II) **adaptation options** regarding physical planning and urban planning

III) **the selection of adaptation measures on the coastline** - both structural and institutional and social - with a strong commitment to nature-based solutions

IV) **mechanisms for their implementation** from the point of view of the available urban planning tools.

The annex to the document provides a series of possible adaptation measures on the coast.

Key messages

✔ **Become aware of the opportunity offered by the obligation in current legislation to incorporate climate change risks arising.**

- Comply with the **Energy Transition and Climate Change 7/2021 Act** (Spanish Official Gazette (BOE), 2021), whose final fourth provision amends the consolidated text of the Land and Urban Regeneration Act, approved by Legislative Royal Decree 7/2015, of 30 December, incorporating the need to consider climate change risks in land use planning.
- Comply with the **Basque Energy Transition and Climate Change Act 1/2024**, whose Article 30 sets out a series of climate change adaptation targets for spatial planning, urban planning and urban regeneration.
- Comply with the **Spatial Planning Guidelines (DOT, 2019)** that refer to the need to use the most current available information on climate change.
- Use the **Coastal Sectoral Territorial Plan (PTS)**, which establishes planning limitations as the baseline and leaves space for specific studies with greater level of detail in municipalities with significant problems.

✔ **Address the coastal risk problem from the territorial perspective**

- Cascade planning, linking scales, importance of the supramunicipal scales = guidelines from the territorial scale.
- Have a pre-emptive and proactive attitude of the supramunicipal risks in the framework of the Partial **Territorial Plans** of the Functional Areas with coastline, which can mean a significant reduction of the impacts and of the costs associated with investment for municipal adaptation.

✔ **Consider climate change adaptation and urban planning as great allies:** Climate change adaptation is compatible with urban development practice as adaptation needs urban planning and urban planning cannot overlook the need for adaptation.

✔ **Working on scientific evidence to foster better informed decision making.**

✔ **Consider the knowledge of the specific conditions of the zone,** taking into account the available current information without underestimating the validity of qualitative studies and expert opinion.

✔ **Reflect on a necessary change of paradigm** in urban planning: Application of proactivity, the precautionary principle and self-restraint when defining climate change adaptation measures.

✔ **Combine the structural adaptation** (engineering, technological, nature-based solutions) **and non-adaptation** (institutional and social) measures.

✔ **Nature-based planning:** Work in tune with the natural processes as adaptation assets with a rewilding focus.

✔ **Combine different urban planning mechanisms and tools for adaptation**

- Zoning, amenity and infrastructure planning at structural planning scale, urban planning and building criteria from development planning.
- Bylaws to integrate adaptation criteria and provide flexibility with potential updating of requirements and criteria.
- Innovative public procurement. Explore the potential of this mechanism, with adaptation criteria incorporated in the tendering processes, innovative solutions implemented, and actions driven by the private sector.

✔ **Foster multi-sectoral and multi-scale territorial governance:** collaboration, support and participation of all the competent administrative authorities.

✔ **Commit to participatory planning to elicit consensus and voluntary agreements**

- Need for interinstitutional panels and dialogue.
- Awareness raising of local stakeholders and citizens.
- Training, skills-building, and further efforts regarding dissemination, communication and training local councils.

✔ **Earmark a specific financial allocation for climate change adaptation for** local authorities with the support of supramunicipal financing mechanisms.

✔ **Search for synergies among the adaptation and mitigation measures** (reducing greenhouse gas emissions) in order to build a more resilient territory model.

Introduction

Climate change threats on a constantly changing coast

Coastal areas are of vital importance from a natural, economic and social point of view. They are highly dynamic and are sensitive to any alteration.

The urban occupancy occurred in recent decades and the degradation suffered have placed pressure on the coast, exacerbated by the intensive exploitation of activities such as tourism, fishing, agriculture, industry and energy.

Pressures arising from climate change have to be added to these human-induced ones; the former are directly associated with the threats of the rising sea level, changes in temperature and precipitation patterns, and the frequency and intensity of extreme events, inter alia. In the coming decades, these threats are expected to threaten both the socio-economic system of the Basque coast, such as tourism, and the natural system; therefore, early and preventive action is required to face the expected risks and impacts.

Climate change is a phenomenon that - according to current scenarios and projects - involves a series of progressive transformations in our natural environment. The most notable impacts include gradual flooding due to the rising sea level, the possible intrusion of salt water in coastal areas, the altering of ecosystems, and the higher average temperature of the sea and air. Furthermore, it can be seen in the form of coastal erosion, which seriously affects our coastal landscapes.

One of the most concerning aspects of climate change is the greater frequency and severity of extreme climate events, which vary according to the geographical location. Such extreme events include flooding caused by intensive rainfall, flash floods due to storms, and combined threats when the rain and river drainage networks overflow. Risk management becomes an imperative need to face those challenges.

The Basque coast, in particular, is facing an additional problem due to the human influence in a region that is constantly evolving. The urban and industrial development of the coast, the transformation of the coast into artificial land reclaimed from the sea, and the concentration of population and infrastructures have contributed to the congestion of this space. Furthermore, the great administrative fragmentation hinders the implementation of effective management strategies.

This phenomenon is aggravated by the intensive use of the coastal strip and the installation of activities that are not suited to the characteristics of the territory (taken to be the social, environmental and physical aspects of the current and future location). This exceeding of the load capacity of the coastal territory leads to environmental, physical and, often, social degradation of the coastal space.

In short, climate change and its impacts on the Basque coast are a complex challenge that requires coordinated action to address both the effects of climate change and the human influence in this area. Risk management and adaptation are crucial to conserve our precious coastal environments and guarantee the safety of the infrastructures, economic resources and the communities that live there.

The role of spatial and urban planning (urban development project) is decisive

Integrating climate change adaptation in the plans and programmes that contribute to the management of the coastal strip allows climate change actions to be adopted; and, therefore, to progress towards a resilient and adapted territorial model. In recent years, climate change policies have highlighted the importance of integrating this climate perspective in spatial planning and management.

Local authorities have the necessary public policies and structures to contribute fundamental solutions in the addressing of the challenges of climate change. Their work is focused on different crucial aspects.

> Local government is the closest to the population and this means it has a transcendent role when channelling the participations of different stakeholders and citizenry. In their role to set an example, local councils can drive - among other adaptation policies -, the necessary change in urban design and development, as well as to citizen habits and life styles that allow them to face climate change more effectively.
>
> According to the distribution of powers between different authorities, municipalities have an important adaptive capacity by means of particularly relevant local policies, such as - in addition to urban planning - the supply of drinking water, sewers and waste water treatment, management of roads and public spaces, environmental protection and public health.

First, reducing the exposure of the population, infrastructures and economic activities to the climate threat, in particular, to the rising sea level. This measure significantly contributes to minimising the damage and to reducing the risk of harm to human life, along with damage to infrastructures and their serviceability.

Furthermore, local administrations play an essential role in strengthening society's adaptive capacity. However, this approach must be complemented with criteria to protect, conserve and restore the ecosystems, while considering the importance of environmental sustainability.

Regulating and protecting the different land uses is particularly important at local level, as the impact of the risk of the rising sea level depends on the specific social, ecological and geographical characteristics of each local reality. Therefore, addressing those aspects from a local perspective is highly relevant.

Nonetheless, implementing a change of paradigm in the decision making is imperative to efficiently address the climate change challenge. Climate change must not merely be an additional aspect in the planning, but rather a mainstay the redefines the perspective from which to address the problems and opportunities.

A shift is needed from seeing climate change as a 'problem' to considering it as a 'resource' with potentials and constraints. This transition will not only allow climate challenges to be faced effectively, but also to harness opportunities to build more resistant and sustainable communities.

BLOCK 1

THE LEGAL FRAMEWORK FOR ADAPTATION ON THE BASQUE COAST

The Basque coast is complex, from the socio-economic and geographic points of view and also due to the distribution of powers regarding the planning and management of the coastline: overlapping of legislation, powers approved at state (Spanish Coast Act, State Ports), regional, provincial and local levels. Knowledge of this complexity and identifying the conditions stemming from the legislation is crucial for effective and coherent adaptation.

The state and regional legislation with respect to the incorporation of the perspective of climate change adaptation on the coast is analysed below.

1.1 State scale

1.1.1 Spanish Act 2/2013 on the Protection and Sustainable Use of the Coastline, amending Act 22/1988

The Spanish Coast Act (Act 22/1988, of 28 July), amended by Act of 2013 (Act 2/2013, of 29 May, on the Protection and Sustainable Use of the Coastline, amending Act 22/1988, of 28 July), seeks to determine, protect, use and maintain the 'maritime-terrestrial public domain' and particularly of the 'shore'.

The 'Maritime-Terrestrial Public Domain' (DPMT hereinafter) is the set of public domain assets formed by the territorial sea, inland waters, the natural resources of the exclusive economic zone and of the continental platform, along with the beaches and coasts to the reach of the largest known storms.

The 'shore' is the maritime-terrestrial zone between the lowest low water or highest spring tide at the equinox, and the limit to where the waves reach in the largest known storms, or when greater, that of the highest spring tide at the equinox. This area also extends along the river banks to the tide limit.

The Coast Act requires the public administration to pursue the following goals, namely:

- Demarcate the DPMT, ensuring its integrity and adequate conservation.
- Guarantee the public use of the sea, of its shore and the rest of the DPMT.
- Regulate the rational use of those assets.

It is a benchmark instrument to defend and safeguard the DPMT. Since Act 22/1988, of 28 July, came into force, there have been multiple amendments, and Act 2/2013, of 29 May, is the one that establishes the new legislative framework.

The Act demarcates the adjacent lands into easement areas – access to sea, protection and transit easement - and establishes a catchment area, which is a *'strip at least 500 m in width measured from the inner limit of the shore'*. Regarding this catchment area, which is located outside the strict sphere of the DPMT, the Act creates an area of action, whose planning and management are the remit of the autonomous communities as they hold the spatial planning powers. The Act refers to its demarcation - by establishing that it will be determined in the relevant instruments covering at least 500 m of the inner limit of the shore - and to the allowed actions, as it only determines minimum requirements, consisting of:

- Reserving land for car parks to guarantee parking outside the transit easement.
- Adapting buildings to what is established in urban legislation.
- Avoiding the formation of architectural screens or accumulation of volumes.

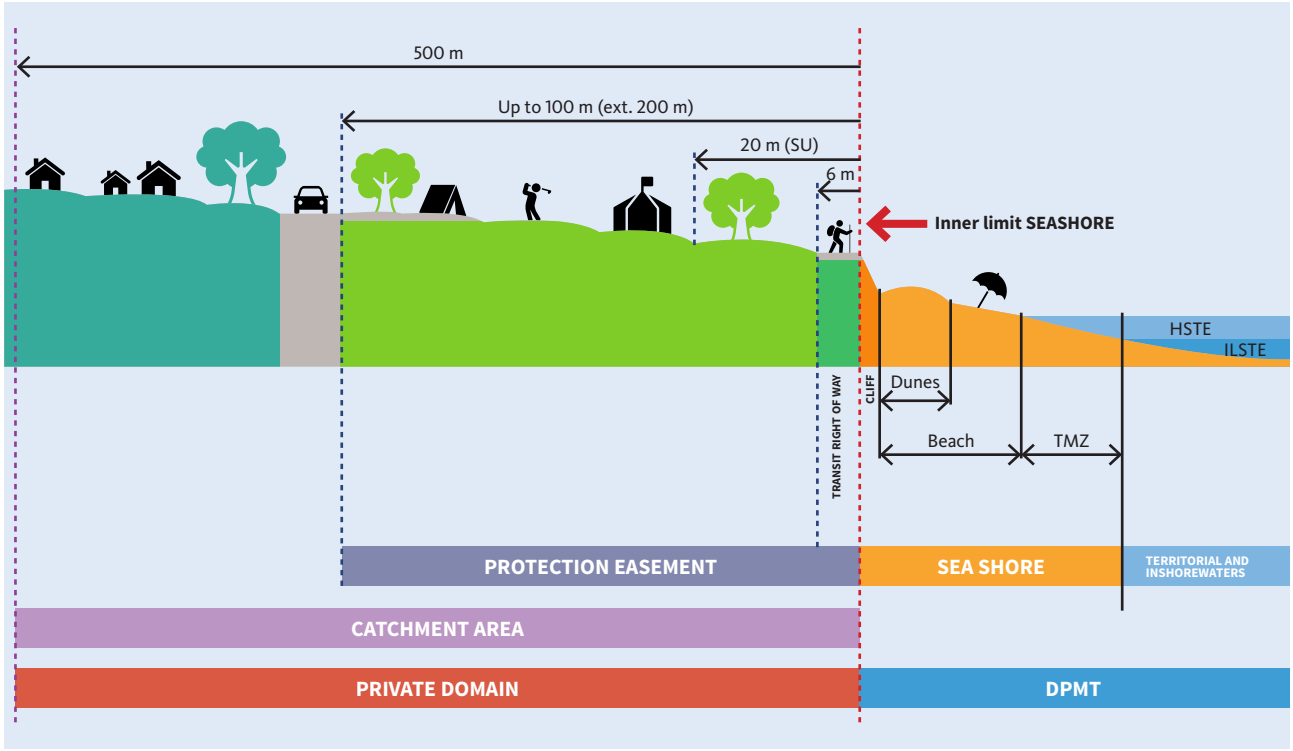


Illustration 1. Constraints and easements on the adjacent land (Coast Act and its application, 2023).

The alignment of this Act with climate change adaptation is set out in the Preamble, Section III, which reads as follows:

> *'Finally, it should be stressed that this reform introduces specific regulations to the Coast Act to successfully address the fight against the effects of climate change on the coast. Furthermore, projects to occupy the public domain are required to be accompanied by a prospective assessment on the possible effects of climate change. It likewise includes the case of there being a certain risk of the sea reaching the works or facilities as grounds for the termination of the concessions. Along with these legal measures, the Act sets the obligation for the Spanish Ministry of Agriculture, Food and the Environment to prepare a strategy to adapt the coast to the effects of climate change and for the Autonomous Communities that have been allocated public domain land to produce a plan to adapt that land. The aim will be to have a robust assessment of the climate change risks affecting our coast, and a series of measures to mitigate them.'*

These regulations are set out in its Article One, which specifies the amendments with respect to Act 22/1988, of 28 July, and in Additional Provision Eight *'Report on the possible impacts of climate change on the maritime-terrestrial public domain*'.

Therefore, it can be concluded that the Act incorporate climate change adaptation as it requires a risk assessment to be prepared and to have adaptation measures. However, the Act does not establish which spatial planning instruments have to be included; even though that is foreseeable given the diversity of planning instruments at state level.

1.1.2 Spanish Energy Transition and Climate Change Act 7/2021, of 20 May

At state level, Article 20 of the Spanish Energy Transition and Climate Change Act 7/2021, of 20 May, establishes that climate change be considered in the planning and management of the DPMT and the adaptation to the guidelines and measures envisaged in the Strategy to Adapt the Coast to the Effects of Climate Change, along with the Coast Act 22/1988, of 28 July, to manage DPMT occupancy licences. Special mention should be made of the two final provisions of this Act given their implications for land-use management on the coast:

Fourth Final Provision. Amendment of the consolidated text of the Land and Urban Regeneration Act, approved by Legislation Royal Decree 7/2015, of 30 October. Letter c) of Article 20.1 of the consolidated text of the Land and Urban Regeneration Act, approved by RD 7/2015, of 30 October, is amended and reads as follows:

> 'c) Address land use management and - taking into account the gender perspective - the principles of universal accessibility, mobility, energy efficiency, guaranteed water supply, prevention of natural risks and serious accidents, prevention and protecting against pollution, and limiting its impact on health or the environment.

When considering the principle of preventing natural risks and serious accidents in land use management, the risks arising from climate change will be included but not limited to as follows:

a) Risks arising from onslaughts by the sea, coastal flooding and rising sea level.

b) Risks arising from extreme weather events involving infrastructures and essential public services, such as water supply, electricity or emergency services.

c) Mortality and morbidity risks arising from the high temperatures and, in particular, those affecting vulnerable populations. Such data will be broken down by sex.

d) Risks associated to the loss of ecosystems and biodiversity, and, in particularly, to the deterioration or loss of goods, functions and essential ecosystem services.

e) Risk of fires, with special focus on the risks in the urban-forestry interface and between the infrastructures and forestry zones.'

Fifth Final Provision. Amendment of the Government Act 50/1997, of 27 November. A new point h) is introduced in Article 26.3 of the Government Act 50/1997, of 27 November, regarding the preparation of legislative bills, draft legislative royal decrees and regulatory standards, and worded as follows:

'h) Impact of climate change, which must be assessed in terms of mitigation and adaptation to it.'

Given how new it is, mention should be made to the Spanish Recovery, Transformation and Resilience of the Economy Plan (Spain Can)[1], of 7 October, which will steer the implement of €72 billion of European funds until 2023, and will mobilise 50% of the resources earmarked for Spain, thanks to the Next Generation EU mechanism, in the coming three years. This Plan is extremely relevant for adaptation, and particularly noteworthy is *'the development of nature-based solutions and the bolstering of climate adaptation and resilience in infrastructures, by harnessing digital tools to develop early warning and detection capabilities'*.

1.1.3 Spanish National Climate Change Adaptation Plan

The Spanish National Climate Change Adaptation Plan (PNACC) (MITECO, 2020) fosters the integration of adaptation in all those sectors, systems, resources and territories vulnerable to climate change; it has four core areas (knowledge generation; integrating climate change adaptation in the legislation; mobilisation of key players; and establishing a system of signs, proof and indicators), and two mainstays (bolstering R&D&I and strengthening coordination between administrations). One of its specific goals is to integrate adaptation in public policies: strategies, plans and programmes, as well as in legal rules and regulations. Therefore, it defines two lines of action affecting the coastline. Line 7.3, which envisages the integration of coastal risks in plans and programmes that include the coastal space, and Line of Action 13.2, which refers to protecting tourism resources, adapting infrastructures and amenities, and bolstering their resilience to the impacts of climate change.

[1] https://www.lamoncloa.gob.es/presidente/actividades/Paginas/2020/espana-puede.aspx

1.2 Level of the BAC (Basque Autonomous Community)

Climate change adaption is gradually establishing its own space in the different public policies, plans and strategies of the BAC. Integrating adaptive management in the territorial and sectoral policies is high on the political agenda of the Autonomous Community of the Basque Country (BAC). The **Basque Climate Change Strategy - KLIMA 2050** establishes ensuring the resilience of the Basque territory to climate change as a priority (Basque Government, 2015).

In order to achieve that goal, the KLIMA 2050 Strategy sets specific targets and lines of action, and deems territorial planning as the most appropriate framework for climate resilience, given its ability to structure other sectoral policies and the action of private stakeholders in each territory.

The Basque Energy Transition and Climate Change Plan 2021-2024 is based on 3 strategic core areas: Core Area 1. pathway to neutrality, Core Area 2. increasing resilience, and Core Area 3. mainstreaming climate action and energy transition, which is deployed in 9 Lines of Action, broken down into 27 work areas. In particular, Core Area 2 is deployed in two lines of action with explicit reference to the adaptative management of the territory (Line 4) and risk anticipation (Line 5).

The Basque Energy Transition and Climate Change Act 1/2024 explains territorial resilience, the most efficient actions to protect and manage the natural environment and adopt measures to integrate climate change in spatial planning and management.

The BAC spatial and urban planning instruments regulated by the Land and Urban Planning Act 2/2006, of 30 June, establishes specific requirements to incorporate climate change and, in particularly adaptation, even though its impact is still difficult to assess and quantify in the territory; therefore, the review of those documents refers to the type of document approved, to how to integrate climate change and to the type of planning and management determinants established regarding adaptation.

Thus, the aim is to have an image of how the coastal planning and management is being addressed in the BAC; the readiness of the territory given its great fragility; and how to cope with the great pressure of climate change.

1.2.1 Spatial Planning Guidelines

The Spatial Planning Guidelines (DOT hereinafter) define the Basque Territorial Strategy and are the benchmark for the spatial planning instruments of a lower rank, as are the Partial Territorial Plans and Sectoral Territorial Plans (hereinafter PTPs and PTSs, respectively); therefore, they are an ideal framework to integrate adaptative management and territorial resilience to climate change. The recently approved DOT (BG, 2019) expressly addresses the incorporation of the climate perspective in the coastal sphere; specifically, Article 31 of the Implementing Rules reads as follows:

> *'1.– Consider the causes and effects of climate change in the spatial and urban planning, contributing by means of their proposals to reduce the net balance of greenhouse gases and to improve resilience.*
>
> *2.– Include climate change adaptation by means of a thematic mapping of impacts and vulnerability.*
>
> *3.– Promote the green infrastructure and nature-based solutions as a means of climate change adaptation, along with how to restore ecosystems in order for the territory to remain resilient.*
>
> *4.– Improve forestry management, avoiding soil losses that deforestation can cause as soil is the main carbon sink. Furthermore, reforest the degraded areas and increase the natural forest surface area to act as a carbon sink.*
>
> *5.– Limit soil occupancy, fostering the mix of uses and the restoration of vulnerable spaces, along with giving impetus to intermodality and means of transports with lower greenhouse gas emissions.*
>
> *6.– Drive, particularly in urban areas, energy efficiency criteria in buildings and in transport, along with the renewable energies.*
>
> *7.– It specifies the incorporation of the climate perspective in spatial and urban planning as follows:*
>
> > *a) The **Sectoral Territorial Plan to Protect and Manage the Coastline** will be aligned by identifying in the coastal areas the adaptation measures to the adverse effects of the rising sea level and extreme swell.*
> >
> > *b) The **Sectoral Territorial Plan to Manage the Rivers and Streams and the Water Management Plans** will envisage the appropriate treatment of the areas subject to risks of flooding, with special attention paid to the areas where the flood factors overlap with other risks, including those linked to the coast.*
> >
> > *c) Permeation and greening public spaces, by encouraging green and blue infrastructures and nature-based solutions in areas likely to suffer flooding and thermal stress, and in particular the heat island effect.*
>
> *8.– The **partial territorial plans** will include the climate perspective by conducting a basic appraisal of the impacts and the associated vulnerability, establishing the application measures and, where applicable the necessary studies in greater detail.'*

Two (Points 7 and 8) out of the eight points in this article can be seen to have a direct application to the coast and establish the need to align the coastal management instruments (PTPs and PTSs) to climate change adaptation.

In the case of the PTPs, the minimum content is determined to be included as regards climate change adaptation (Point 8), which includes:

- Basis appraisal of the impacts and associated vulnerability.
- Defining adaptation measures.
- More detailed studies.

On the other hand, even though there is the need to have adaptation measures for the Coastal Protection and Management PTS, they are not included in the minimum documentation to be considered given the diversity and purpose of each.

1.2.2 Coastal Sectoral Territorial Plan

Pursuant to the Basque Country Spatial Planning Act 4/19990, the PTS are the plans prepared by the departments of the Basque Country with territorial powers and they produce the DOTs. Within the coastal area, the PTSs that have a direct link are:

- Sectoral Territorial Plan (PTS) to Protect and Manage the Coast of the Autonomous Community of the Basque Country, approved finally in 2007. It is currently being reviewed and adapted to incorporate the climate change variable.
- Wetlands Sectoral Territorial Plan (PTS) approved in 2012.
- River and Stream Management Sectoral Territorial Plan (PTS), approved in 2013.
- Agroforestry Sectoral Territorial Plan (PTS), finally approved in 2014.
- Sectoral Territorial Plan for Renewable Energies in the Basque Country (in the pipeline).

1.2.2.1 Planning area and scope of the Coastal-PTS

At the time of writing, the Coastal-PTS is being revised in order to include the Climate risk. The planning area of this PTS is the Catchment Area defined in the Coast Act: '**strip at least 500 m in width measured from the inner limit of the shore**'. This area can be extended along the river banks up to the tide limit, which in the case of the Basque Country is **5 metres above sea level**. In that planning area, the PTS establishes:

- the criteria to **protect, improve and conserve the natural resources**, and the guidelines to **regulate public use** of the coastline.

And it proposes criteria for:

- the signage of **special protection areas**, for the purposes of the Coast Act,
- the inclusion of certain areas in the catalogue of **environmentally sensitive zones of the Basque coast**, for the purposes of the General Environment Act of the Basque Country.

For the purposes of that coastal protection, different **protection categories** and a series of **allowed uses** in each those categories are established, respecting what is laid down in other spatial or environmental planning instruments envisaged for certain areas on the coast (Urdabai, the Natural Parks, the Protected Biotopes, areas belonging to the European Natura 2000 Ecological Network, ports, etc.).

1. Consider the Basque coastline as valuable natural heritage where protection measures are required to lessen the impact from the important dynamics of implementing activities. It is therefore essential to **pinpoint and demarcate, both in the terrestrial and in the marine environment, those coast and coastline ecosystems, along with the landscape and geomorphological units, whose current or potential natural characteristics justify their conservation and protection**, by implementing Guideline 6.8.1. of the DOTs on Special Protection areas.

2. Provide the **criteria, guidelines and basic rules that must be observed when preparing municipal plans**, indicating the prevailing requirements and standards regarding the municipal urban planning regulations in force. Establish binding rules for non-developable land; highlight the existing disputes on land suitable for development; and establish guidelines and recommendations for planning on urban land.

3. **Make the planning proposed by the Plan** in its scope of applicable compatible with the regime of use established by the coast legislation, in the **DPMT and protection easement area**.

4. **Coordinate the Plan with the coastal nature, environmental or territorial planning instruments:** Partial Territorial Plans, Sectoral Territorial Plans (Wetlands, Ports, Agroforestry), Urdaibai, Protected Areas, Natura 2000 Network, Txingudi.

5. **Coordinate the Plan with the PTS to Manage the Rivers and Streams of the BAC** (Cantabrian slope), around the river estuaries.

6. Put forward to the competent authority agreed criteria for the signage of Special Protection Areas for the purposes of the application of Article 22 of the Coast Act and its Regulations.

7. Achieve optimum coordination of urban planning and territorial actions between the Administrations that operate on the coastline and its territorial setting (Local, regional and central administrations) provided that the administrative powers of each power and the coordination mechanisms in force are respected.

8. Provide criteria for the regulatory treatment of the items of the **Nature and Cultural Resources Inventory** of this PTS.

9. **Provide criteria for the inclusion of certain areas of the coastline in the Catalogue of Environmentally Sensitive Areas** as per its definition in Article 51 of the General Environmental Protection Act of the Basque Country 3/1998.

Reflections on the Coastal PTS

Approach with great precautionary principle by the PTS that each establish minimum limitations on the planning

Use of detailed information available in the BAC to prioritise/discriminate areas with significant problems.

The PTS has to leave room for specific studies in greater detail in municipalities with significant problems.

The PTS can establish criteria about how to apply the climate change risk in relation to timelines, climate change scenarios, risk assessment methods, etc.

1.2.3 Partial Territorial Plans

Pursuant to the Basque Country Spatial Planning Act 4/1990, the PTS roll out the DOTs in the supramunicipal areas or zones that they demarcate.

Six of the fifteen geographical areas that make up the Basque Country - known as Functional Areas, six of them are included in the planning and management of the Basque coastline.

- Metropolitan Bilbao Functional Area 2006; Amended 2009; Review underway
- Mungia Functional Area 2016.
- Gernika-Markina Functional Area (Busturialdea-Artibai) 2016.
- Eibar Functional Area (Bajo Deba) 2005.
- Zarautz-Azpeitia Functional Area (Urola Kosta) 2006; Amended 2018; Monitoring report 2020.
- Donostia-San Sebastián Functional Area (Donostialdea-Bajo Bidasoa) 2016; Landscape determinants amendment 2020.

Those PTPs not only allow the coordination of the municipal urban development plants and other local strategic interventions, but they are also the key instrument to establish guidance and priorities to prepare coastal climate change adaptation studies.

1.2.4 The Basque Country is already a trailblazer thanks to its integrating the climate change perspective in the spatial and urban planning instruments

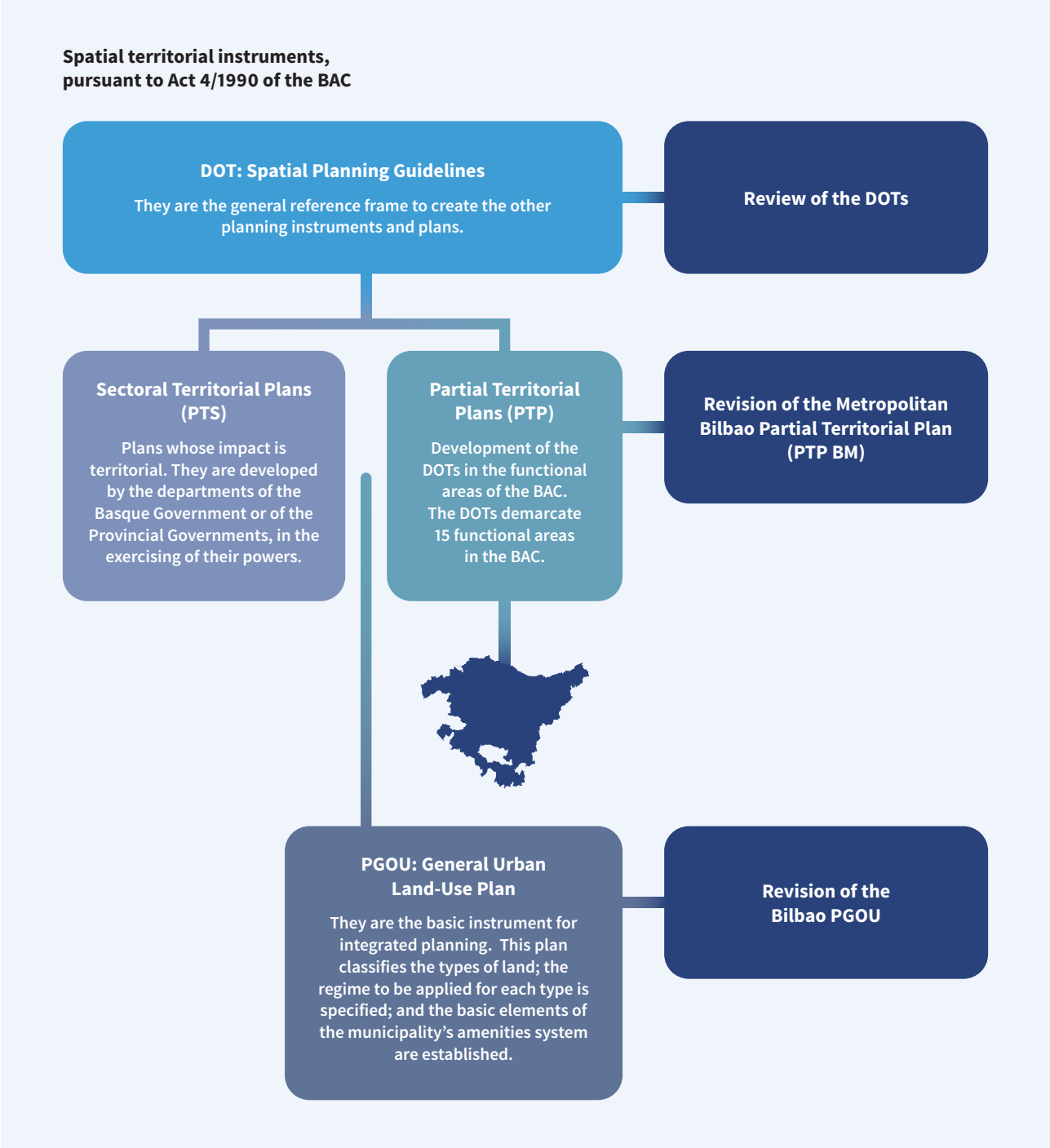


Illustration 2. Outline of the spatial planning system of the BAC in accordance with Act 4/199 and the instruments that now include the climate perspective. Source: Adaptation to Climate Change in the Spatial Planning instruments as part of the review of the DOTs (Ihobe, 2019)[2]

[2] https://www.euskadi.eus/contenidos/documentacion/lurradapt/es_def/adjuntos/Adaptacion_cambio_climatico_ordenacion_territorio_cast.pdf

The cases of the Metropolitan Bilbao PTP and the Bilbao PGOU (General Urban Land-Use Plan) are given below as examples of instruments that have incorporated the perspective of climate change risks and defined adaptation measures in their review process.

Climate Change Adaptation in the Metropolitan Bilbao Partial Territorial Plan

The Metropolitan Bilbao PTP is the most important spatial planning instrument after the DOTs. It incorporates Climate Change and adaptation as a cross-cutting aspect with the Review of the DOTs of the BAC, with climate change determinants as **recommendations**. Urban planning must apply the binding determinants established in the PTP and observe the recommendations set out in it.

Guidelines to delve further into the analysis of the effects of Climate Change (Article 113)

The PTP may require the most vulnerable municipalities and at greatest risk to conduct specific vulnerability studies or the grounds for introducing them.

Defining threshold to identify the municipalities of the functional area that have either provided the grounds for or conducted climate risks and vulnerability studies/reports.

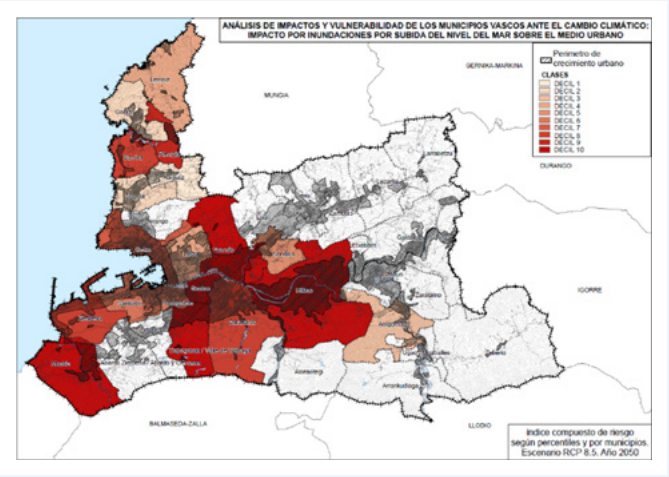


Illustration 3. Rise of the sea level over the urban average: Supramunicipal Strategic Area of the Bilbao River Estuary: Barakaldo-Bilbao-Getxo-Erandio-Sestao; Uribe Kosta Metropolitan Park with the action extended to Plentzia: Plentzia-Barrika and Valle de Trápaga – Trapagaran.

General guidelines for climate change adaptation (Article 115)

- Showcase the role of the blue and green infrastructure and the nature-based solutions in climate change adaptation.
- Foster the connection between the peri-urban and urban green spaces, and the integration of the river ecosystems to reduce the effects of heat islands in urban areas and contribute to their resilience compared to the effects of climate change. Not only protected soils, but also considering land with specific problems within those corridors, for the purposes of continuity, and which could be greatly improved with a little investment.

Article 12 - Management of the territorial model of the physical environment - 02.– Management of the Physical Environment and Overlapping Constraints of Natural Risks and Climate Change.

Climate Change in the Bilbao PGOU

The Bilbao PGOU - in accordance with the requirements of the DOTs and the Metropolitan Bilbao PTP, and the Energy Transition and Climate Change Act 7/2021, of 20 May (Spanish Official Gazette, 2021) - incorporate the climate change adaptation perspective as follows:

Consideration of the risks arising from climate change

Illustration 4. Sub-areas of action defined by the Plan with significant climate change risks.

Based on information and different studies of climate and physical constraints with climate change projections, three municipality impact chains are assessed: Flooding on the built environment; Heat islands on health; Extreme precipitation on transport infrastructures. Crossing the Plan's subareas for action with the existing climate change projection studies identify the following as priorities because they present more significant climate change problems and an opportunity to include measures in their future developments: (DE.01.1 Elorrieta; DE.01.2 San Ignacio Park; DE.06.3 Deusto University Extension; AB.03 Abando Station; RE.01.1 Rekalde; RE.05.3. Peñaskal New Development: BZ.01 Zorrotza Headland). Specific studies on climate risks to justify detailed planning solutions and to envisage corrective measures are required for **urban land** and for future development plans (special plans). The minimum content of those studies is provided as a technical annex to the Plan. Annex 2 of the environmental sustainability report includes the general recommendations when designing buildings and urban planning.

Aligning the calculation and design of building and transport infrastructures to climate change. This is in line with the municipal bylaws of the Basque Land Act 2/2006. Providing instructions to calculate and design buildings and transport infrastructures to the effects of climate change:

- Draft Building bylaws with environmental measures and to fight against climate change (energy efficiency, etc.).
- Give impetus to Urban Planning bylaws with measures to fight against climate change, including those to adapt transport infrastructures in that regard.

BLOCK 2

GUIDING PRINCIPLES TO RESPOND TO CLIMATE CHANGE ADAPTATION ON THE BASQUE COASTLINE

✔ **Long-term strategic vision for risk anticipation**

- **Reduce exposure to the climate threat due to the rising sea level:** with the premises that the exposure of the population and of infrastructures and economic activities is sometimes increased more widely than the threat itself, due to dense occupancy and anthropization of the coastal areas.

✔ **Scientific evidence to foster better informed decision making**

- **Proactivity to accelerate climate action** based on the information, data and results of the most recent studies available regarding the risk assessment of the rising sea level along the coast.
- Regarding **the information relating to the rising sea level to be considered in urban planning**, it has to be:
  - consistent with regulations such as the Coast Act, as regards the demarcation, catchment area, delimitation, classification of beaches, and Article 9 that regulates defence works.
  - consistent with the Coastal Sectoral Territorial Plan (in the pipeline) as regards the defining of new urban development and building uses in floodable areas and preparing specific local studies if necessary.
  - the DOTs and the PTPs that envisage 'the risks of climate change as overlapping constraints'.
- **Achieve greater specificity in the risk assessment, with appropriate appraisals at municipal level**
- **Harness the potential of the qualitative risk assessment** by means of a SWOT (strengths, weaknesses, opportunities and threats) analysis and multi-criteria with expert judgement.

✔ **Considering combined threats**

- Given that the coastal municipalities of the BAC at risk are **highly anthropized environments**, where the threat of the rising sea level is aggravated by flooding phenomena associated with extreme precipitation, overflows of drainage networks and sewers, with rivers breaking their banks (even more so if they have been channelled or rerouted), and due to a rise of the water table. Understanding these dynamics is essential to identify the adaptation strategies, beyond protecting against the rising level, and they must also require adaptation of the sewers, sustainable urban drainage networks, or the more drastic flowback decision.

✔ **Managing uncertainty and infrastructure planning**

- **Managing uncertainty is inherent to the infrastructure planning to protect against and reduce flooding risks** and it is a challenge, even more so when the climate change variable is incorporated into the associated scenarios. How is it managed? How can it be applied in the decision-making process? Great uncertainties are generated when it comes to the local council signing reports and issuing permits.

- Coastal action projects have a very long development period, over 5-10 years. Given the uncertainty, and in line with a precautionary principle, it seems reasonable to take the worse climate change scenario available to plan risk prevention infrastructures, even though that involves greater investment.

- Concentrate on **adapting infrastructures**

- From the point of view of maintenance of the infrastructures to protect against and reduce the risk of flooding, **predictive maintenance with lower return periods** than those required by law or the procedures **can be introduced.**

✔ **Change of paradigm in the approach**

- **Precautionary principle:** Self-restraint in the planning is possible by applying the precautionary principle. More discretional action can be taken without needing information or expensive studies.

- **The General Urban Land Use Plan (PGOU) is a very strong instrument** to incorporate climate change adaptation. But a change of paradigm is necessary for climate change not to be merely an extra layer in decision-making, but rather a real cornerstone that should change the planning optics.

- **Define binding adaptation actions** to manage the significant current risks that are expected to worsen in a climate change scenario **and recommendations** for long-term adaptation actions.

✔ **Deal with the land ownership system**

- Intervening in the system to regulate/protect property in areas vulnerable to the rising of the average sea level due to climate change is a challenge. Mainly down to the uncertainty inherent to climate scenario information and to legal uncertainty that could lead from certain decisions.

- However, a phenomenon occurs that is an obstacle to adaptation. The land appreciation phenomenon may occur when very exposed coastal areas and at high risk of flooding due to the rising sea level are protected. One such example would the residential homes along the beachfront of some municipalities of the Basque Country. The value of that property is high and they are possibly a feature of the town's identity, which also makes them a tourist attraction with the capacity to generate wealth. Thus, there is an expectation for them to be protected against the risk of flooding. As the risk is reduced, their value increases even further. The protection strategy is self-reinforcing, and the activities and assets with the greatest value will be installed in the most protected areas. This protection strategy - even though it initially reduces the risk - leads to the population and activities being more expose should the protection measure be insufficient (that can occur due to Climate Change), and interferes with a more transformation adaptation strategy that would involve rezoning land in areas with very high exposure and risk levels.

✔ **Territorial governance and multilevel coordination to define coherent and coordinated adaptation strategies**

- Local authorities may need to address together adaptation to risks associated with climate change in order to be able to undertake larger actions with greater impact, that are economically more efficient and technically more effective.

- **Foster the company-science-administrations relationship** and interinstitutional work.

- **Greater link between urban planning and management.** Progress must be made in coordinating planning with the management reality. Planning decisions can often imply actions that are economically unfeasible.

✔ **Communication, awareness-raising and training in coastal adaptation**

… avoiding being alarmist, with press releases from the local council, mayor's and councillors' offices with media impact.

✔ **Importance of dissemination for social awareness**

… and the acceptance of planning decisions, mainly when they are decision that affect privately owned land zoning.

BLOCK 3

URBAN DEVELOPMENT GUIDELINES TO PLAN THE ADAPTATION OF THE COAST TO CLIMATE CHANGE DUE TO THE RISING SEA LEVEL

Importance of adaptation planning

Adaptation implies reducing risks, searching for opportunities and strengthening communities' capacity to face the impacts of climate change. In other words, adaptation is the process of adjustment to actual or expected climate and its effects, in order to avoid harm or exploit beneficial opportunities (Intergovernmental Panel on Climate Change AR6, 2021)[3].

Therefore, adaptation planning is key (Illustration 5), to anticipate the risks and be able to reduce them, identify the adaptation needs, find the adaption options from urban planning, select the appropriate adaptation measures and the mechanisms for their implementation and monitoring.

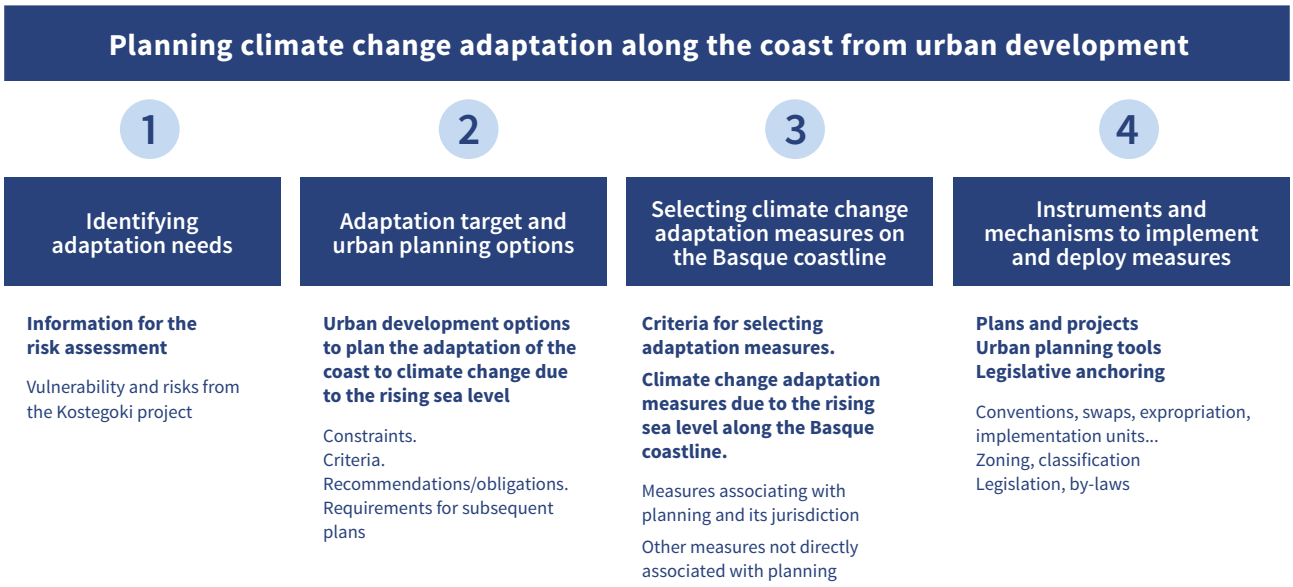


Illustration 5. Planning climate change adaptation along the coast from urban development.

[3] https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WG1_SPM_Spanish.pdf

3.1 Identifying adaptation needs: information for the risk assessment

In order to face the risks associated to climate change, a necessary initial step is to analyse how climate can vary in the territory, which areas can be affected by that climate variability and to which extent, and which are the municipality's mechanisms to respect to the possible impact and adapt to changes.

According to the IPCC glossary, risk is taken to be a function of the following components:

- **Climate hazards:** taken to be climate trends or events that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision and environmental resources.
- **Exposure:** the presence of people; livelihoods; species or ecosystems; environmental services and resources; infrastructure; or economic, social and/or cultural assets in places that could be adversely affected.
- **Sensitivity:** the degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (for example, a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (for example, damages caused by an increase in the frequency of coastal flooding due to the rising sea level).
- **Adaptive capacity:** the capacity of systems, institutions, humans and other being to adapt to potential changes, harness opportunities and react to their consequences.

Vulnerability is assessed according to sensitivity and adaptive capacity.

In the context of the BAC, relevant information is available that has allowed the risk assessment of the coast due to the rising sea level, as described below.

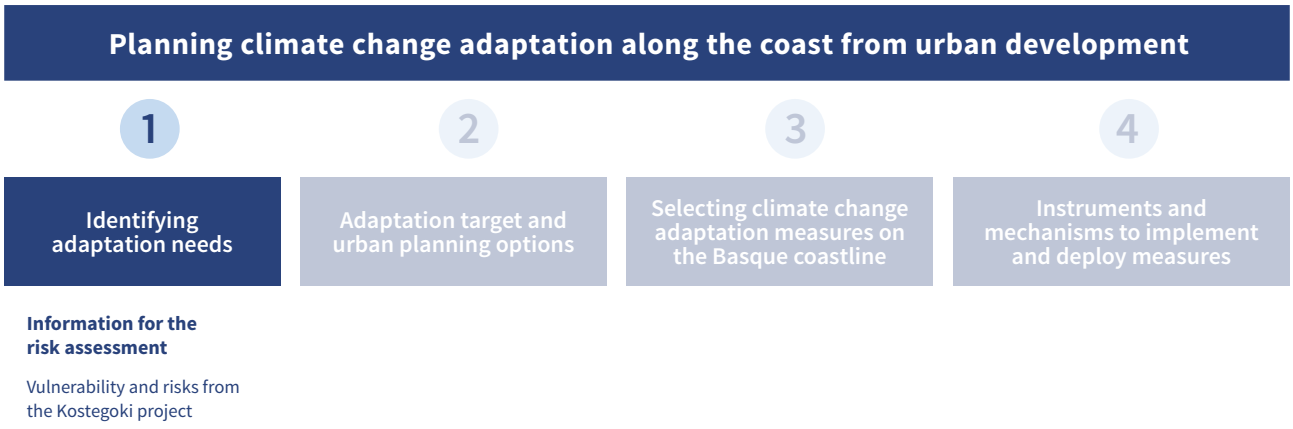


Illustration 6. Identifying adaptation needs.

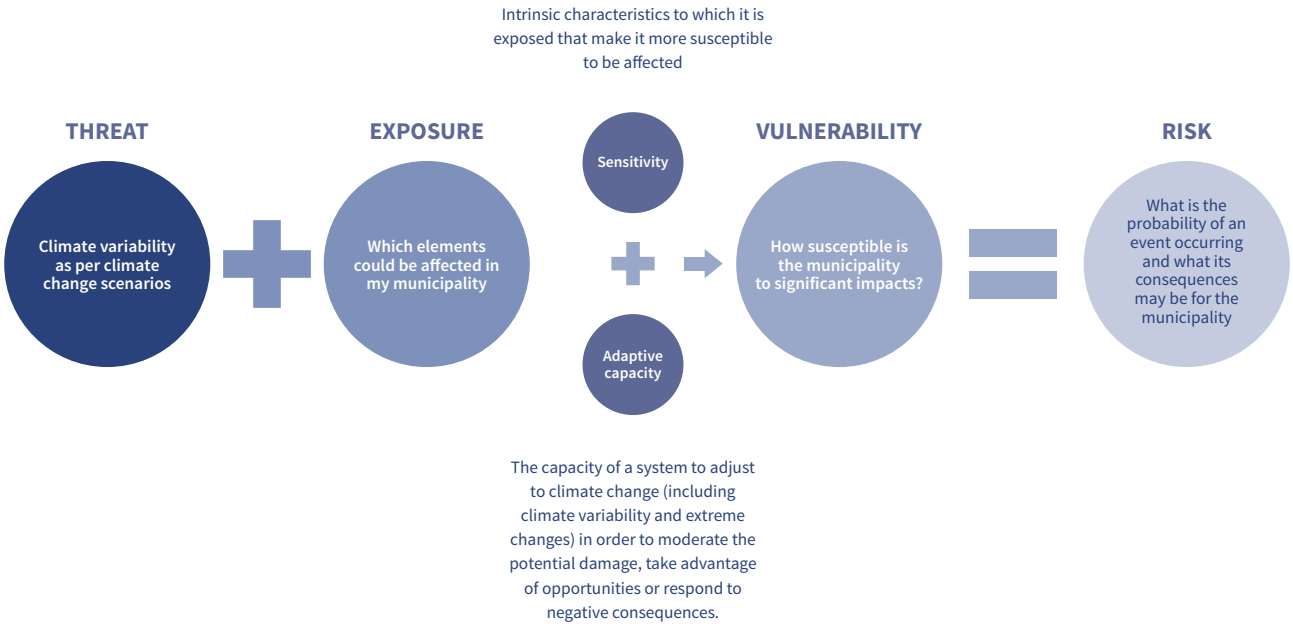


Illustration 7. Climate change adaptation process at local level.

The Kostaegoki project is part of the Environmental Promotion Plan (PIMA) - Coastal Adaptation 2017 (Spanish Ministry for the Ecological Transition and the Demographic Challenge), to develop the Spanish National Climate Change Adaptation Plan (PNACC). The main aim of the Kostaegoki project is to provide relevant information and tools to the competent bodies relating to the effects of the rise in average sea level caused by climate change (CC) and the impact of waves on the Basque coast, with a view to using them to plan and manage coastal areas in order to meet the challenges posed by this global phenomenon.

3.1.1 What is the key information of the Kostaegoki project?

Kostaegoki provides information on the impact and the risk of coastal flooding and erosion along the Basque coast, considering climate scenarios assessed by the Intergovernmental Panel on Climate Change (IPCC). The climate scenarios considered at the RCP 4.5 and the RCP 8.5 (RCP - Representative Concentration Pathway), projections of the evolution of greenhouse gas concentration. Rises of the average sea levels of 26 cm and 51 cm by 2050, and 70 cm and 1 m by 2100 have been estimated for the coastline of the Basque Country. The tables below contain the list of the information generated that characterise the impact and risk in each of the assessed scenarios.

- **IMPACTS**
- **COASTAL FLOODING**
  - ***Affected surface area in the Basque Country***
  - ***Affected surface area by municipality***
  - ***Georeferenced information:***
    - *Areas affected by risk of coastal flooding.*
    - *Thickness of the sheet of water in the flooded areas.*
    - *Flood mark on the coastline.*
- **BEACH EROSION**
  - ***Affected surface area by beach***
  - ***Georeferenced information***
    - *Beach regression*
    - *Loss of surface area by beach*
    - *Volume of sand affected by beach*
- **MORPHOLOGICAL CHANGES TO ESTUARIES**
- **RISKS**
- **SOCIO-ECONOMIC SYSTEM**
  - ***Population potentially affected in the Basque Country***
  - ***Population affected by municipality***
  - ***Employees by activity sector by municipality***
  - ***Industrial (economic activities) and residential land area affected in the Basque Country***
  - ***Industrial (economic activities) and residential land area affected by municipality***
  - ***Loss of residential and industrial capital stock by province of the Basque Country***
  - ***Loss of services and industrial Gross Value Added by province of the Basque Country***
  - ***Identifying critical infrastructures affected***
  - ***Loss of recreational use on beaches***
  - ***Georeferenced information:***
    - *Population affected*
    - *Thickness of the sheet of water in residential and industrial (economic activities) land areas.*
    - *Identifying critical infrastructures affected*
- **NATURAL SYSTEM**
  - ***Distribution of the protected species of fauna affected in areas with some type of environmental protection****
  - ***Distribution of the protected species of flora with approved management plan and affected in areas with some type of environmental protection****
  - ***Surface area of Habitats of Community Interest (HCIs) and EUNIS Habitat affected in areas with some type of environmental protection****
  - ***Georeferenced information***

Thickness of the sheet of water in areas with some type of environmental protection with protected fauna affected, flora with approved management plan affected, HCIs and EUNIS Habitat affected.*

****Protected Natural Spaces, Natura 2000 areas, Urdaibai Biosphere Reserve, RAMSAR areas and Transitional Water Bodies of the Water Framework Directive.***

By way of example, Illustration 8 shows the impossible impact of coastal flooding in 3 of the analysed climate scenarios in the Deba urban setting.

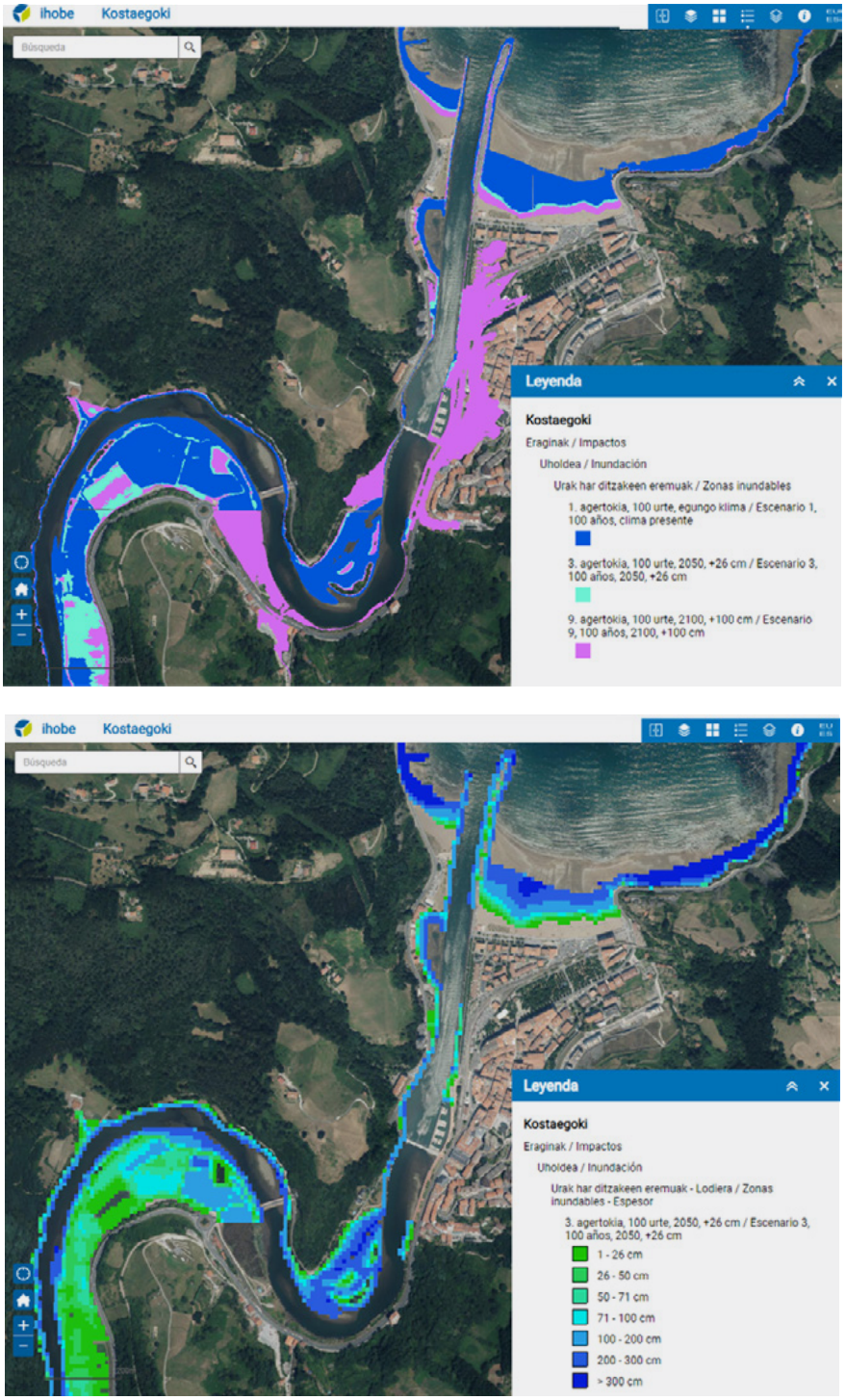


Illustration 8. [Top] Areas potentially affected by coastal flooding in the urban environment of Deba in three climate scenarios: Scenario 1, present climate and 100-year return period; Scenario 2, future climate for 2050 with 100-year return period and rise of the average sea level of 26 cm; Scenario 3, future climate for 2100 with 100-year return period and rise of the average sea level of 1 m. [Bottom] Water thickness in the area potentially affected by the coastal flooding in the Deba urban environment in the current climate scenario considering an event with a 100-year return period. Source: https://gis.ihobe.eus/kostaegoki/.

Furthermore, Illustration 9 shows an example of the socio-economic risk in residential areas in the same setting.

Illustration 9. Water thickness in the area potentially affected by the coastal flooding in the Deba urban environment in the 2100 climate scenario considering an event with a 100-year return period. Source: https://gis.ihobe.eus/kostaegoki/.

3.1.2 Short browsing and downloading manual - Coast visor

Information at territorial (Basque Country) and municipal level is available in the report published online by IHOBE[4], the environmental agency of the Basque Government's Ministry of Economic Development and the Environment, entitled '**Kostaegoki. Climate Change Vulnerability, Risk and Adaptation of the Basque Coast I. Vulnerability and Risk Assessment**'. It can also be accessed through the Basque Government's website[5].

The **georeferenced information** can be viewed using the KOSTAEGOKI (https://gis.ihobe.eus/kostaegoki/) and the GeoEuskadi (https://www.geo.euskadi.eus/geobisorea) visors. The layers can only be directly downloaded using the GeoEuskadi visor. Users have to select the layer that they wish to view and it will appear in the visor map. Illustration 10 shows the steps to follow.

[4] https://www.ihobe.eus/publicaciones/kostaegoki-i-analisis-vulnerabilidad-y-riesgo

[5] https://www.euskadi.eus/documentacion/2022/kostaegoki-vulnerabilidad-riesgo-y-adaptacion-de-la-costa-del-pais-vasco-frente-al-cambio-climatico/web01-a2inguru/es/

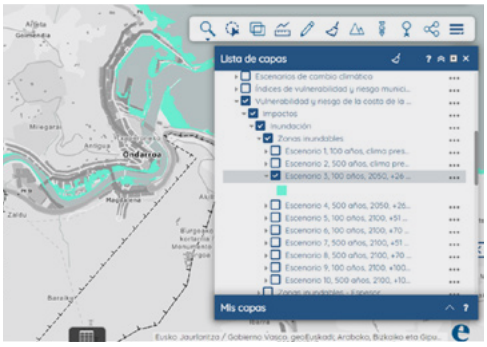
The georeferenced layers or files are grouped in a geodatabase (GDB), which can be edited using Geographic Information Systems such as QGIS and ArcGIS.

1 **Access GeoEuskadi visor (https://www.geo.euskadi.eus/geobisorea)**

2 **Select "Environment" layer**

3 **Select "Vulnerability and risk of the BAC coast to climate change" layer**

4 **Select layer of interest (e.g., Flooding up to 2050)**



5 **Access to "Metadata and Downloads" in the dropdown menu of the layer**

Illustration 10. Steps to view and download the Kostaegoki georeferenced information using GeoEuskadi.

3.2 Urban planning adaptation options

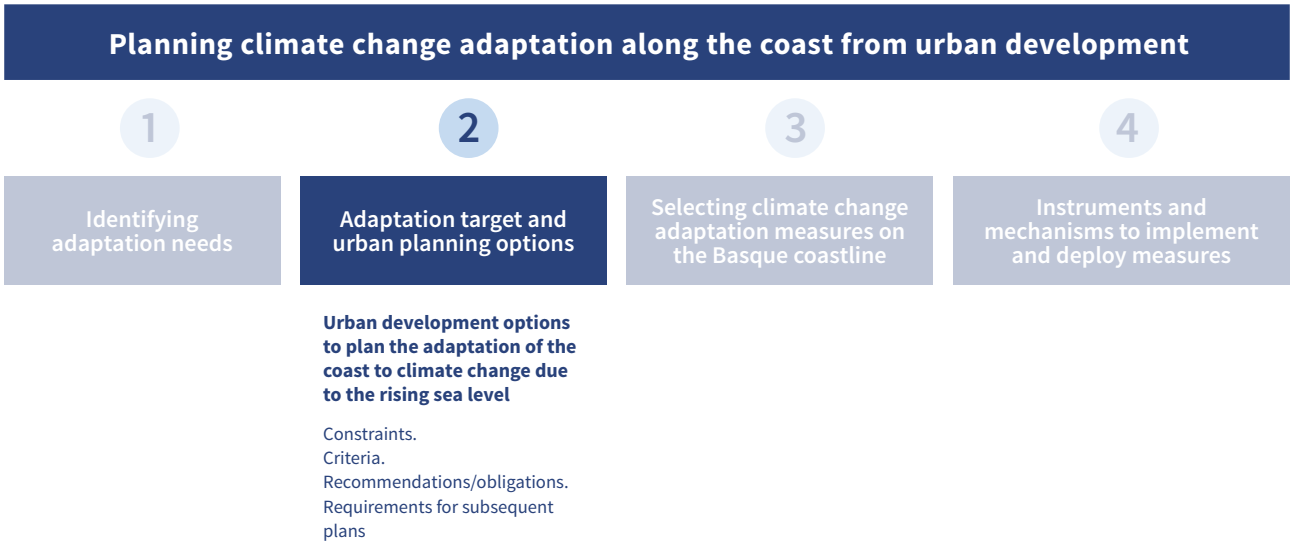


Illustration 11. Adaptation target and urban planning options.

A second step in planning climate change adaptation consists of defining the adaptation target, in other words, in which specific areas and risks we want to work, along with the options available from the discipline, administrative procedure, and tools offered by urban planning, which also include those inherent to urban management.

At structural planning scale

Zoning and use regulation

One of the main urban planning options is zoning, by classifying land uses, where the input includes information on impacts and risks associated to the rising sea level and coastal erosion. Some potential urban planning tools would be:

- Declassifying non-consolidated urban land, in those areas not suitable for urban development, where there is a significant risk due to the rising sea level.
- Discontinued units or development potential exchanges on non-consolidated urban land, transferring the development potential to other areas of the municipality.
- Transformational adaptation actions on consolidated urban land with very significant risks, which will imply drastic changes in use in areas with very high exposure to the rising sea level and that is incompatible with urban activity.
- Overlapping constraints due to the risk of coastal flooding caused by the rising sea level and erosion, applied to certain land uses and activities, affecting urban zoning.

Planning amenities and infrastructures

Adapting the coast to climate change involves improving the resilience of the protection infrastructures and managing the flood risk.

Accordingly, climate change scenarios need to be considered when planning hard and nature-based defences and infrastructures to protect the coast. The different available measures are described in more detail in Section 3.3.

However, it is also crucial to address the infrastructures in a broader and multidimensional sense, dealing with port, transport, health, water and energy aspects, inter alia. Special attention must focus on the critical infrastructures, which include facilities, networks, services and technological and physical equipment, whose disruption or destruction can have significant consequences on the health, safety and the economic wellbeing of the population.

That implies:

- Protecting the infrastructures by strengthening their response capacity to adverse and extreme events, along with reducing the exposure to hazards by means of nature-based solutions.
- Implementing measures aimed at improving the design of infrastructures considering the climate change perspective; increasing the understanding of impacts and risks for their integrity and operability by means of early warning systems; integrating them in planning and management, and consolidating their responsiveness to climate change.
- Adaptation of the linear transport infrastructures for more permeable urban drainage. Building roads affects the natural surface and subsurface drainage pattern. Providing adequate drainage is important to avoid humidity or excess water accumulating on roads that can negatively impact material properties, compromise the general stability and affect safety when driving. Drainage should deal with water on the roads, cycle lanes, curbs and adjacent areas where water collects.
- Promoting a sustainable drainage system to improve the permeability of the city to improve the road water harvesting and its seepage:
    - Adapting sewers to the possibility of suffering torrents and flooding (both marine and river and the combined effect of both), and to potential evacuation problems due to seawater intrusion. The most traditional: increasing the side of the sewer pipes; separating sewage (waste and rain water).
    - Encourage the use of porous and permeable surfaces such as paving. It is a simple technology with a great scope that if widely implemented in urban setting can considerably help the runoff to be better absorbed and help to adapt to periods of extreme rain and their immediate impact of flooding.
    - Give impetus to urban woodland. Trees, when using native species and better adapted to local conditions, also help to regulate run off, as they regulate the precipitation, which reduces the amount of water proceed by the sewer systems. The surrounding area can have greater seepage and rain storage capacities.

Sharing information with other local plans

Planning the climate change adaptation of the coastline from urban development has to necessarily involve sharing information with other local plans and strategies, for more effective and coordinated action; they include:

- The Plans of Action for the Climate and Sustainable Energy (PACES) that include risk and vulnerability assessments of coastal threats and propose adaptation measures, as an appraisal to report to the municipal PGOUs.
- The Strategic Environmental Assessment (SEA): highlight the role of the SEA as a procedure to incorporate climate change and environmental considerations in the policies and planes with territorial reach.
- The Mobility Plans that incorporate adaptation measures of the infrastructures and the mobility systems.
- The Municipal Emergency Plans; Early-warning and evacuation protocols; Protocols to report to the Municipal Emergency Plans.
- Green infrastructure plans that foster the rewilding of the coast.

At development planning level

Requirement for specific studies from development planning

The PGOUs can involve risk and vulnerability studies that allow areas of the municipal district with significant risks associated with different climate change threats to be pinpointed. The PGOUs can require specific studies in greater detail on those areas with significant risks, as information documents for the special urban development plans.

Design and management criteria

At the development planning scale, the special plans or urban development projects can include urban management and design criteria that enable the climate change adaptation of urban development and building.

Some urban development recommendation for climate change adaptation on the coast would be:

- An urban design better adapted to the envisaged impacts of climate change and to the local environmental conditions.
- Give impetus to public spaces being multifunctional and committing to green infrastructure and nature-based solutions as posited by the DOTs.
- Compare different design alternatives under different rising sea level scenarios, avoiding the exposure of uses, services and activities in flood risk areas and residential uses on the ground floor or below ground, underground car parks, commercial premises, susceptible public amenities, etc.

- Consider combined threats of rising sea level and rainwater flooding in urban planning. Clearing riverbeds and floodplains for their controlled flooding as a strategy to moderate water flows in periods of extreme precipitation. Conscious design of permeable green areas and recreational areas on floodplains as temporary flooding spaces to regulate the excess flows and their access to the drainage network, to avoid the water treatment and sewer networks being overwhelmed. Their role as a measure to mitigate the impact of the flooding is clear, but beyond that, the controlled flooding areas have an environmental function as the riverbank vegetation improves local biodiversity, and they are also zones for the use and enjoyment of the general public and they therefore have a clear social function.
- From an economic perspective, the controlled flooding areas reduce the energy and water treatment costs, as they foster the natural seepage of the water and they likewise reduce the costs associated with flooding due to losses or material damages, and increase the value of the land in the adjacent urban areas that become safer areas and with a quality urban landscape.
- Opt for interventions that allow the excess water during hight intensity events to be collected and stored, when the drainage system is temporally overwhelmed. At the same time, they encourage rainwater to be used beneficially for the city, such as cleaning streets, watering plants, industrial processes or to replenish aquifers.
- Street furniture that is better adapted to risk situations, such as using anchoring systems, water-resistant materials, etc.

Some building recommendations for climate change adaptation on the coast would be:

- Raising the height of the buildings to reduce their exposure.
- Damp protection measures, such as waterproofing damp setting or submersible infrastructures. They generally include structural measures, such as appropriate fastening against flood flows, the resistant materials to lower that the expected flood depth protection of the mechanical equipment and public services; and the use of openings and adjustments measures to prevent the sewer network becoming overwhelmed.
- Limited uses on the ground floor or below ground such as commercial premises, garages, lockups or any other activity that can be affected by possible flooding, along with setting up the appropriate protection measures.
- Early warning systems, evacuation protocols and personal protection barriers in each building.

3.3 Selecting climate change adaptation measures due to the rising sea level along the Basque coastline

There is a wide range of **adaptation measures** to reduce coastal risks in cities and urban settlements. Selecting the most appropriate measures is complex due to the high uncertainty existing in the evolution and accumulation of impacts associated with climate change on the coast. Therefore, when identifying measures, priority will be given to those that show flexibility to deal with a wide range of future scenarios and offer additional benefits, beyond mere climate change adaptation. The most important criteria when selecting measures are:

- Their **relevance** for the municipality to handle the risk.
- The action **priority** according to the significance of current and future risks, mainly when estimating the impact on the population and critical infrastructures.
- The **action possibilities**, according to the distribution of powers.
- Their **economic** feasibility.

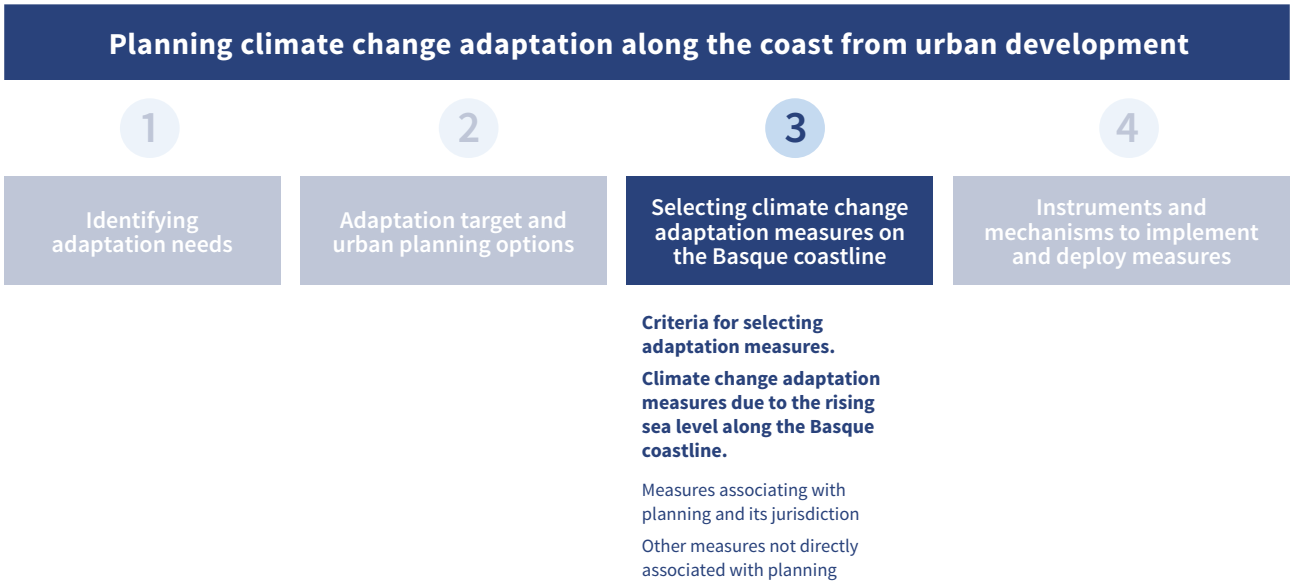


Illustration 12. Selecting climate change adaptation measures on the Basque coastline.

This section contains a non-exhaustive inventory of coastal adaptation strategies to deal with the impacts arising from the rising sea level. According to the IPCC 2014 and 2021[6], the adaptation measures are divided into three categories: structural, institutional and social. The structural measures include engineering

[6] IPCC, 2014. Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
IPCC, 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

measures, nature-based solution, applying discrete technologies, and the use of ecosystems and their services to meet adaptation needs. The institutional measures use economic instruments, laws, regulations and governmental policies and programmes to foster sustainable development. And, finally, social measures entail behavioural, informative and educational strategies in order to develop resilient communities.

- **Structural or physical measures:** They include **engineering** solutions (for example, coastal protection or strengthening buildings), applying **technologies** (for example, early warning systems), using **nature-based options** (for example, environmental restoration of coastal wetlands) and providing **services** (for example, municipal water and sewage services).
- **Institutional measures:** They include **economic** actions (for example, adaptation financial incentives), **legislation and regulations** (for example, regulations for the effective evacuation of citizens, planning and zoning regulations) and **governmental policies and programmes** (for example, sectoral plans).
- **Social measures** (or sociocultural): They are aimed at providing better and greater knowledge to facilitate managing the adaptation. This category includes providing **educational** services (for example, awareness raising and integration in education), improving the **information** strategies (for example, diagrams/maps of hazards and vulnerabilities, early warning services), along with measures that modify habits and **behaviour** (for example, diversifying means of livelihood).

A combination of these measures can better tackle the risks, by reducing exposure and vulnerability and increasing their response capacity. For example, developments in high-risk areas can be deterred and existing social vulnerabilities addressed; engineering works undertaken to protect the urban environment, along with restoring coastal wetlands, among other measures.

Institutional and social measures can be considered as those cross-cutting measures that constitute the mechanisms to implement the structural measures.

3.3.1 Structural: technological and engineering

The structural measures are divided into engineering or hard, technological, green or nature-based solutions and ecosystem-based adaptation.

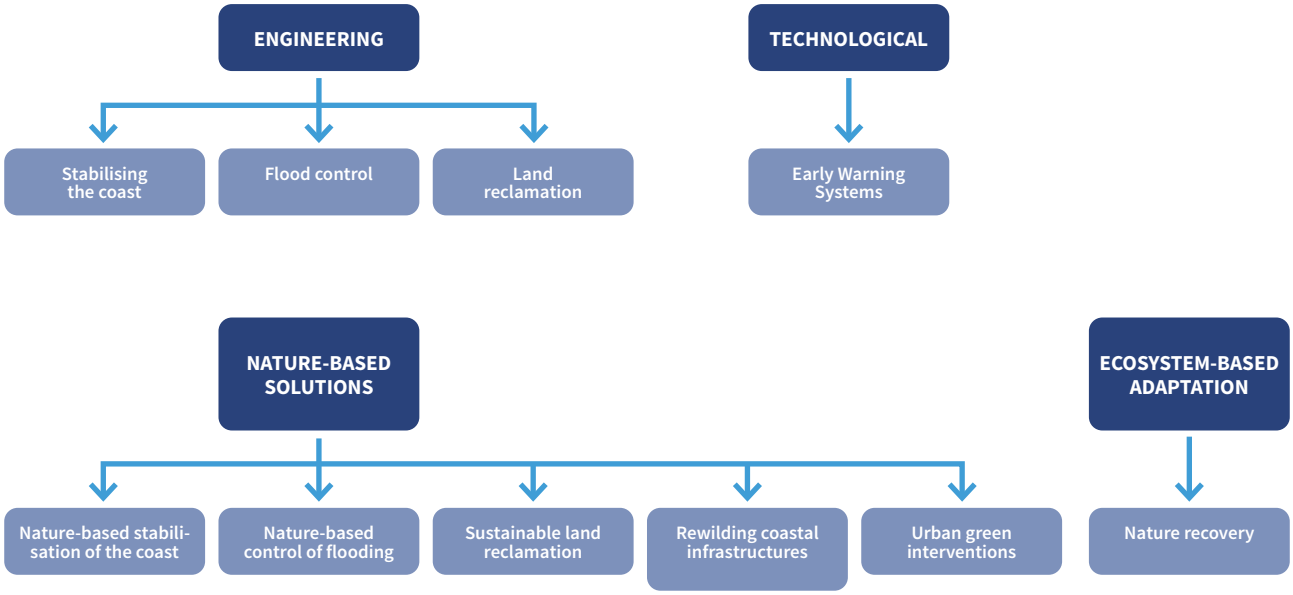


Illustration 13. Structural measures for coastal climate change adaptation.

A non-exhaustive list of coastal adaptation structural measures is below.

The Climate Change Adaptation Strategy for the Spanish Coast divides the structural adaptation measures into three major groups depending on their adaptation response.

- **Protection:** their ultimate purpose is to reducing the hazardousness and/or exposure of the natural or socio-economic system, avoiding that impacts occur from flooding and erosion.
- **Accommodation:** they keep the elements at potential risk in the affected areas with the priority on lessening vulnerability by modifying the land uses and introducing specific legislation, inter alia.
- **Regression:** based on the planned relocation of infrastructures and/or amenities located in susceptible areas to ones with low exposure to flooding and coastal erosion.

3.3.1.1 Technological

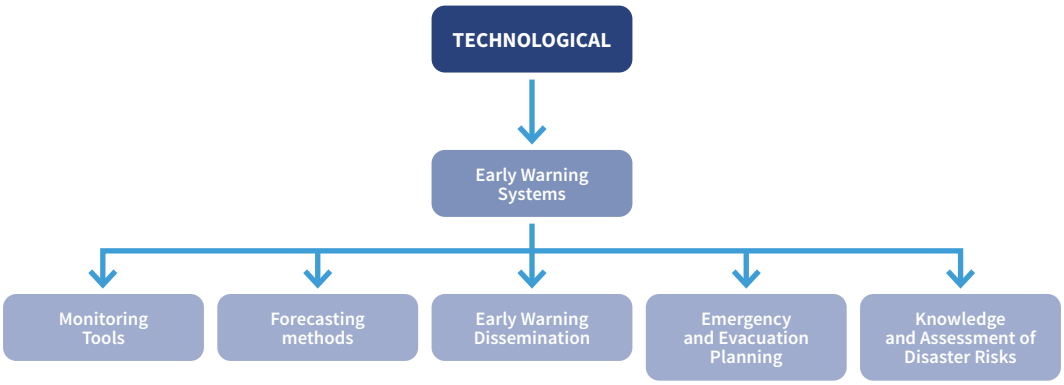


Illustration 14. Technological measures for coastal climate change adaptation.

Early Warning System: An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events (UNDRR)[7].

- Monitoring tools: Different quantitative methods to measure coastal flooding and erosion.
- Forecasting methods: Statistics and operating models to forecast and predict coastal flooding and erosion.
- Real-time Warning Dissemination: technological measures used to alert communities about possible hazards.
- Disaster Risk Knowledge and Assessment: qualitative or quantitative approach to determine the nature and scope of the disaster risk by means of analysing possible hazards and assessment of the existing exposure and vulnerability that could affect people, property, services, livelihoods and the environment on which they depend (UNDRR).
- Emergency and Evacuation Planning: mechanisms that back the planning process in emergency situations for an effective response.

[7] Early warning systems for all | UNDRR

3.3.1.2 Engineering

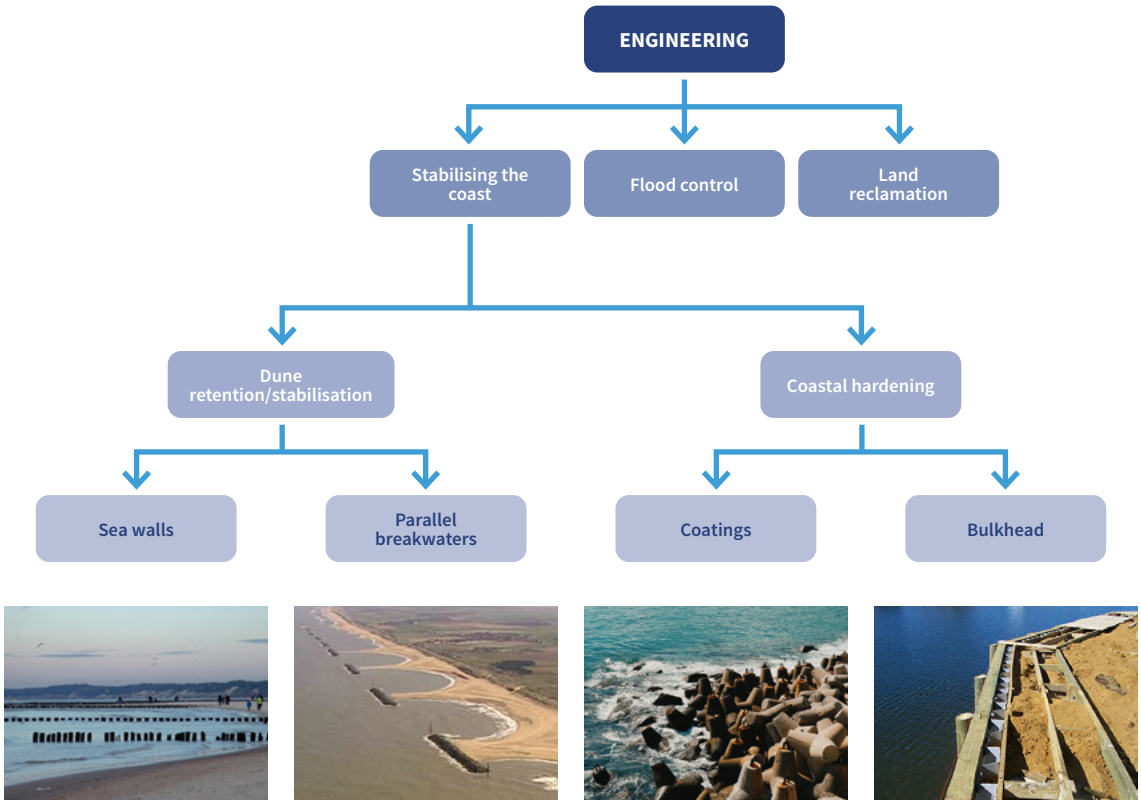


Illustration 15. Engineering measures for coastal climate change adaptation.

3.3.2 Nature-based and ecosystem-based solutions

According to the European Commission (Nature-based Solutions, 2023)[8], nature-based solutions are 'solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience'. Therefore, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services.

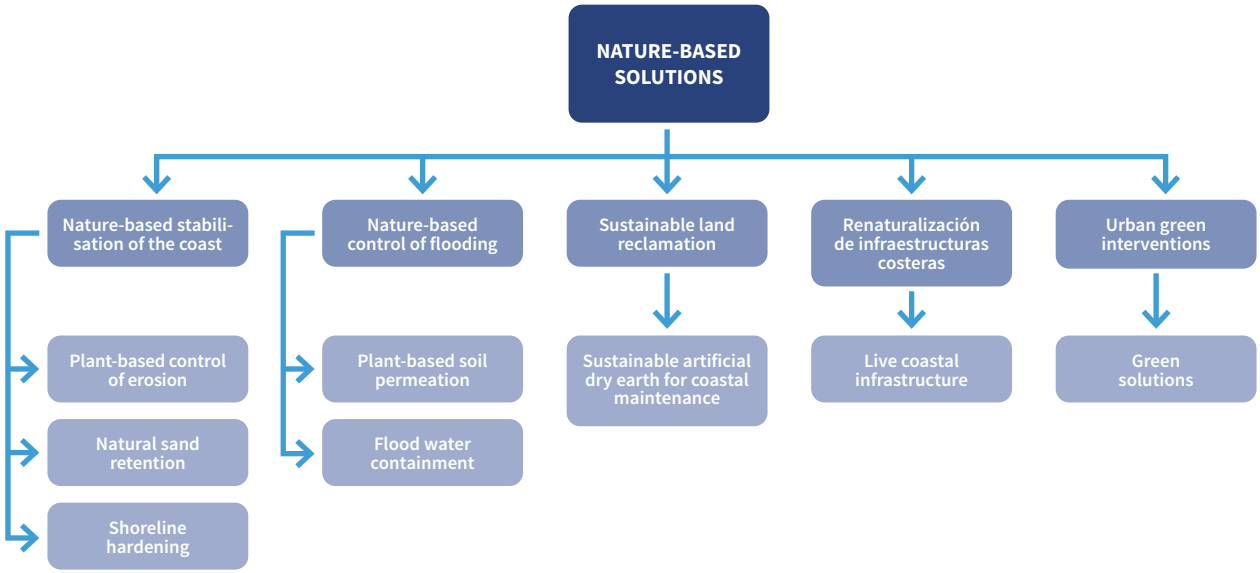


Illustration 16. Nature-based Solutions for coastal climate change adaptation.

Ecosystem-based adaptation is defined as the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (Ecosystem-based Adaptation, 2023). It uses sustainable management, conservation and restoration of ecosystems to provide services to maintain or build resilience and reduce the vulnerability of ecosystems, as well as of communities, to the adverse effects of climate change.

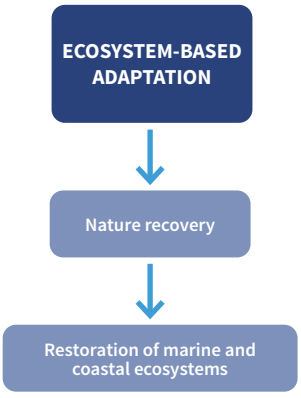


Illustration 17. Ecosystem-based adaptation for coastal climate change adaptation.

[8] Nature-based solutions | NetworkNature

Nature-based solutions, along with ecosystem-based strategies, have attracted attention due to their sustainability, cost-effectiveness, lower disruption to the sediment dynamics and additional ecosystem benefits, including carbon storage. Furthermore, they also have the ability to adapt to the non-seasonality of the natural processes, which increases their ability to adapt to the uncertainties in a changing environment, thus offering a much longer coastal adaptation approach than the conventional solutions. Therefore, the nature-based and ecosystem-based strategies are recognised as multifunctional solutions that provide many more benefits than the traditional structural measures.

3.3.3 Institutional

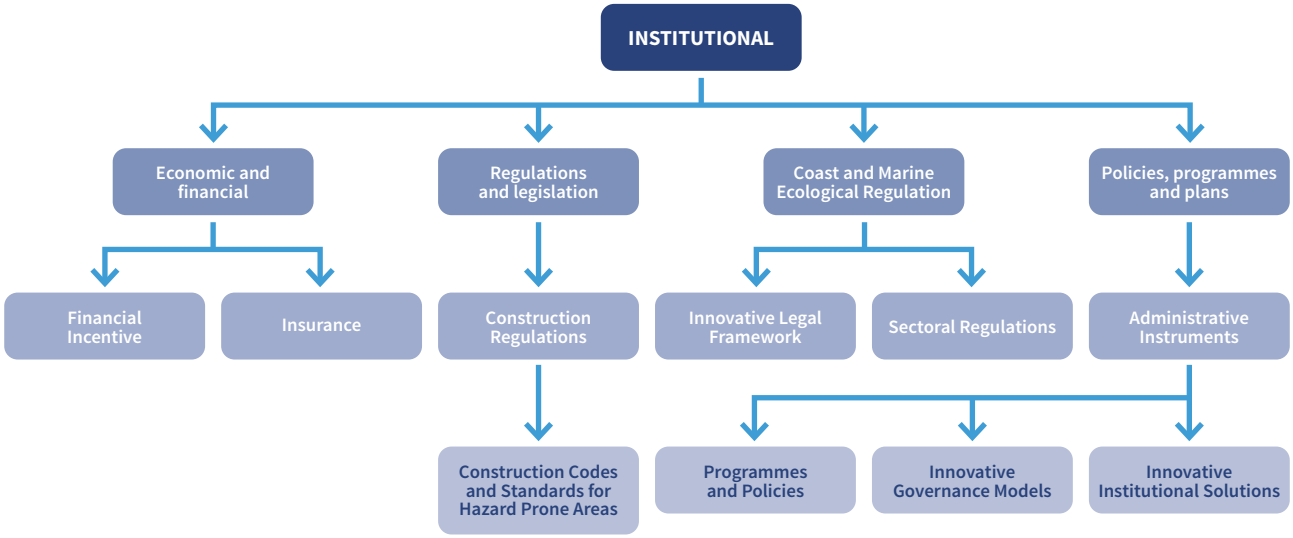


Illustration 18. Institutional measures for coastal climate change adaptation.

3.3.3.1 Economic and financial

Economic Instruments to reduce coastal risks: they are economic tools that allow better coastal management and the handling of the damage related to climate change:

- **Financial Incentives:** cash benefit offered to foster adaptation actions that would otherwise not be carried out.
- **Insurance:** agreement by means of which a company or the state undertake to provide a compensation guarantee for specified losses, damage, illness or death in exchange for the payment of a set premium.

3.3.3.2 Regulations and legislation

Construction Regulations: set of regulations that control the design, construction, amendments, repairs, quality of the materials, use and occupancy of buildings.

- **Construction Codes and Standards** for Hazard Prone Areas: Construction codes and standards for building to be more hazard resistant.

Coast and Marine Ecological Regulation: set of regulations that manage the marine and coastal environments with the aim of achieving resistant, productive and healthy ecosystems, at the same time that they ensure a more sustainable use of marine resources.

- **Innovative Legal Framework:** legislative strategies, such as establishing the Coastal and Marine Protected Areas (CMPA) to conserve the coastal and marine ecosystems.
- **Sectoral Regulations:** set of regulations aimed at managing sectors that can have a harmful impact on the environment, with the goal of conserving coastal and marine ecological health and providing long-term sustainable productivity.

3.3.3.3 Policies, programmes and plans

Administrative Instruments: measures that foster greater resilience by means of implementing governance and policy measures promoted by public institutions.

- **Programmes and Policies:** implementation of a deliberate system of principles (rules, standards, plans, strategies...) to guide decisions and achieve rational results in order to increase the resilience to climate change hazards.
- **Innovative Governance Models, Innovative Institutional Solutions and participation strategies** that allow governments to respond to the risk and damage that climate change hazards may cause.

3.3.4 Social

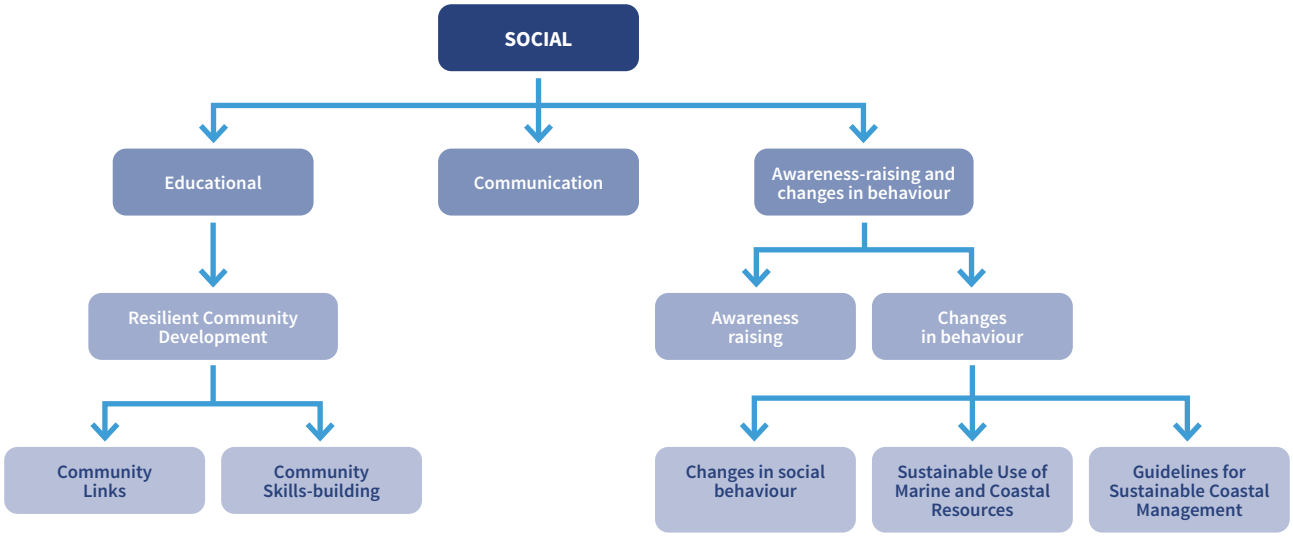


Illustration 19. Social measures for coastal climate change adaptation.

3.3.4.1 Educational

- Development of Resilient Communities: community-based adaptation and preparation as a means to improve the resilience of the community to climate change hazards.
- Community Links: measures aimed at constructing social connections in order to strength community resilience.
- Community Training: tools that educate communities on being prepared for disasters and climate change adaptation.

3.3.4.2 Communication

Warning Communication and Dissemination: measures aimed at encouraging information sharing and circulating warnings.

3.3.4.3 Awareness-raising and changes in behaviour

Awareness-raising: coordinate information measures that allow communities to be prepared for and respond to climate change hazards, while likewise improving awareness of the need for disaster preparedness and climate change adaptation.

Changes in behaviour: community-based changes in behaviour that improve coastal health and, therefore, resilience.

- Changes in social behaviour: community behaviour measures that improve coastal resilience, including: marine clean ups, not walking on the dunes, changing to salt-tolerant crops.
- Sustainable Use of Marine and Coastal Resources: measures that ensure sustainable use of coastal resources and, therefore, long-term productivity, including reducing destructive fishing methods.
- Guidelines for Sustainable Coastal Management: behaviour guidelines for sustainable coastal management, including: plan to improve the coastal and marine ecosystems for adaptation.

3.4 Instruments and mechanisms to implement and deploy measures

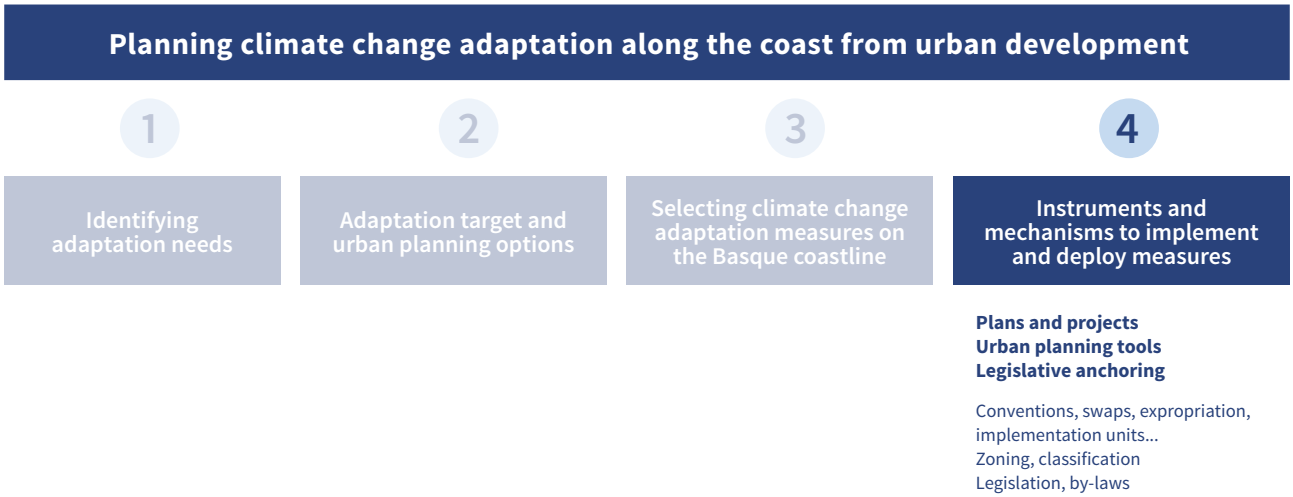


Illustration 20. Instruments and mechanisms to implement and deploy adaptation measures.

The field of urban planning and urban development practice have optimum tools for effective and operational incorporation of the climate change perspective of its legislative instruments. In short, as has been argued throughout the document, adaptation needs urban planning, and urban planning cannot turn its back on climate change adaptation.

3.4.1 Regulatory instruments

Adaptation measures are implemented from the very start of the planning process and cover all planning instruments:

a) General Urban Land-Use Plan

- General Urban Planning Regulations
- Specific Urban Planning Regulations
- Building bylaw
- Urban Development bylaw

b) Development planning: Partial Plan and Special Plan

c) Planning implementation: Urban Development Project

Given the climate change uncertainty, on the one hand, and the lack of experience in implementing effective corrective measures, on the other hand, we should act according to the principle of prudence when establishing or imposing limitations.

Determinants at different levels should be established when drafting the plan:

- **Mandatory determinants:** legislative determinants.
- **Determinants that justify:** measures that require greater analysis or study to establish whether they apply to a specific area.
- **Exceptional determinants:** justified for being climate change adaptation measures and which, in certain circumstances, cause a contrary effect with respect to adaptation or there are circumstances that advise against their application. In the light of new studies or information, those measures may be contrary to climate change as they generate indirect secondary impacts. Failure to apply these determinants will require the express filing of a technical justification that must be approved by the Local Council.
- **Recommendations:** adaptation measures that are not mandatory due to initially being considered as too aggressive and requiring great analysis before being regulatory or because their climate change relevance is low. These recommendations are made with the intention that they be applied and it will be up to the Local Council to decide to make them mandatory.
- **Contradiction between determinants**: as a general criterion in the case of contradictions between different determinants, those associated to climate change adaptation will have overriding priority.

3.4.2 Urban planning tools

Section 3.2. considered the urban planning adaptation options and stressed, at structural planning level:

- Zoning and use regulation
- Planning amenities and infrastructures
- Information to other local plans

At development planning level:

- Requirement for specific studies from development planning
- Design and management criteria

3.4.3 Aspects to be taken into account when executing adaptation measures

The success of coastal climate change adaptation down to the following aspects:

✔ **Combination of urban planning mechanisms and tools**

- Possibility to work with recommendations and decisive content.
- Potential of the bylaws to integrate adaptation criteria and provide flexibility with potential updating of requirements and criteria.
- Setting up a system to monitor and assess the planning and adaptation, a key aspect to refocus the planning according to the adaptation needs as per the evolution of the climate and rise in sea level and of the measures that are protecting against and managing the risk as they are being implemented, in line with the adaptative management and planning principles.

✔ **Governance:** collaboration, support and participation of all the competent administrative authorities.

✔ **Participatory planning to elicit consensus and voluntary agreements**

- Need for interinstitutional panels and dialogue.
- Territory contracts as formal agreements between different stakeholders, such as local communities, local governments, companies and non-governmental organisations. Such agreements may address issues such as land use, conserving natural resources, sustainable development or community participation in decision making.
- Stewarding mechanisms and compensation mechanisms.

- Territorial stewarding mechanisms are strategies and agreements aimed at the conservation and sustainable management to natural areas, farming land or other territories of cultural or ecological value. Such mechanisms will involve different stakeholders, such as landowners, local communities, non-governmental organisations and governmental entities. The main goal is to protect and conserve the biodiversity, ecosystems, landscapes and the cultural values associated with the territory in question. Some of the most common territorial stewardship mechanisms include:

    - Earth Conservation Agreements: Formal agreements are entered into between landowners and conservation organisations to protect specific areas.

    - Community or Private Reserves: Landowners or communities may designate certain areas as private or community conservation areas.

    - Conservation Easements Landowners may assign certain rights regarding the use of the land to conservation organisations without losing their ownership; thus, guaranteeing long-term protection.

    - Payments for Environmental Services: Landowners can receive financial compensation for following practices that benefit the environment, such as conserving woodland or sustainable management of natural resources.

    - Sustainable Certification and Labelling: Certifications are issued to land that meets specific sustainable management standards, which may foster responsible practices.

    - Community Stewardship: Local communities actively take part in the management and conservation of their own territories, often by means of setting up communal reserves or protected areas.

    - Conservation Trusts: Trusts are created to administer land and natural resources for the specific purpose of conservation.

- Awareness raising of local stakeholders and citizens.

- Training, skills-building; further efforts regarding dissemination, communication and training local councils. The resources and efforts of the municipal technicians are up-to-date as regards urban management, not in planning. Management must be taken to be the application of the plan.

✔ Local resources and financing, given the uncertainty

Local authorities do not always have the necessary resources to make the necessary investments for the adaptation of their coastline. Coordination is required between administrations at different levels, or local authority associations, in order to be able to undertake those investments, along with participation and negotiation mechanisms with the people and entities in question.

Insurance companies and insurance compensation consortiums play a key role in this point, along with personal protection and the joint liability of owners.

✔ **Channel investment in adaptation and financial provision**

Implementing adaptation actions involves investing in plans, projects and works, even if the action has to be on private land and the investments have to go come under public spending. The municipalities are not going to be able to face such investments. Need for supramunicipal financing mechanisms. Next Generation funds, along with other financing sources for urban regeneration may be useful when implementing adaptation projects.

✔ **Innovative public procurement.**

Explore the potential of this mechanism, with adaptation criteria incorporated in the tendering processes, innovative solutions implemented in strategic areas of the country, and actions driven by the private sector.

✔ **Strategic Environmental Assessment**

Highlight the role of the Strategic Environment Assessment as a procedure accompanying the approval of plans and programmes with territorial reach, in order to incorporate climate change and environmental considerations in the policies and planes with territorial reach.

✔ **Establish synergies between the coals adaptation actions with greenhouse gas reduction targets (mitigation)**

As far as possible, design adaptation measures that provide mitigation benefits, for example, by opting for nature-based solutions or based on ecosystem services in order to boost the carbon sequestration ability.

ANNEX I

COASTAL CARBON CHANGE ADAPTATION MEASURES

Name of the adaptation measure	Classification: IPCC, 2014	Climate Change Adaptation Strategy of the Spanish Coast
SCOPE OF ACTION: COASTAL AREA		
Recovery and restoration of dune systems	Nature-based solution	Protection
Beaconing of paths to protect the dune systems	Nature-based solution	Protection
Beach regeneration by means of local sediment bypassing	Nature-based solution	Protection
Construction of coastal protection structures (breakwater, levees, walls, artificial reefs) to break waves and protect the coastline	Physical or structural	Protection
Planting underwater to reduce the wave energy	Nature-based solution	Protection
Stabilising cliffs by making shallower gradients, establishing plant cover, draining underground water, etc.)	Physical or structural	Protection
Adapting existing infrastructures and buildings to the new climate conditions. For example, by relocating susceptible facilities to upper storeys or roof	Physical or structural	Protection
Relocation of infrastructures and/or amenities located in susceptible areas to ones with low exposure	Physical or structural	Regression
Protecting facilities that are inevitably under the flood level (flood resistant electric cables, drainage wells, bilge pumps)	Physical or structural	Protection

Name of the adaptation measure	Classification: IPCC, 2014	Climate Change Adaptation Strategy of the Spanish Coast
Increasing the urban development height	Physical or structural	Protection, Accommodation and Regression
Generating knowledge about the risk from the rise in temperature on the coastal and marine ecosystems	Information	Protection, Accommodation
SCOPE OF ACTION: ESTUARIES		
Recovering and stimulating the natural dynamics of the estuary by demolishing levees or seawalls and creating small streams to boost the effect of the tides	Nature-based solution	Protection
Creating buffer zones in order to foster the migration of the natural system, generate new floodable areas and allowing extreme maritime events to be buffered	Nature-based solution	Protection
Protecting and restoring the channel banks by planting marshland vegetation and introducing natural materials, such as trunks, oyster or mussel artificial reefs, etc.	Nature-based solution	Protection
Raising the high marshland by applying fine layers of sediments	Nature-based solution	Protection
Recovery of the spaces with backfills to transform the surface into marshland	Nature-based solution	Protection
Demolishing infrastructures and amenities in disuse, mainly located in high-risk flooding areas	Nature-based solution, Protection	Protection
Improving knowledge about the behaviour of marshland species in order to know which species are expected to migrate upstream and maintain the wetland functions	Information	Protection, Accommodation and Regression
Producing a long-term plan for the wetlands in order to protect and increase the resistance and adaptability of the wetland ecosystems to climate change	Laws and regulation	Protection, Accommodation and Regression
SCOPE OF ACTION: RIVER ESTUARIES		
Restoration/rewilding of degraded river bank spaces and stabilising the banks	Nature-based solution	Protection
Eliminating lengthwise physical barriers to the biological and water flow to improve the continuity of the watercourse	Nature-based solution	Protection

Name of the adaptation measure	Classification: IPCC, 2014	Climate Change Adaptation Strategy of the Spanish Coast
Improving and recovering the composition and structure of the river bed by means of the morphological study of the water course, the sieve analysis of the bed, performing bathymetry, removing sediment from the areas where there is a risk to the drainage capacity, etc.	Nature-based solution	Protection
Creating controlled flood areas by means of the partial abatement of flooding, lowering the height of the sheet of water, removal of floaters	Nature-based solution	Protection
Protecting using temporary anti-flood barriers (e.g. inflatable levees, modular barriers and water or sandbags)	Physical or structural	Protection
Protection using permanent anti-flood barriers (e.g. retaining walls, gabions or stone walls)	Physical or structural	Protection
Non-return valves for drainage networks that can be placed under the total sea level	Physical or structural	Protection
Raising buildings and facilities over the flood mark, provided when possible due to the type of facility and municipal regulations	Physical or structural	Protection
Adapting existing infrastructures and buildings to the new climate conditions. For example, by relocating susceptible facilities to upper storeys or roof	Physical or structural	Protection
Relocation of infrastructures and/or amenities located in areas susceptible to flooding	Physical or structural	Protection
Implementation of sustainable drainage systems (SuDs) in order to control the flood runoff	Nature-based solution	Protection
Protecting facilities that are inevitably under the flood level (flood resistant electric cables drainage wells, bilge pumps)	Physical or structural	Protection
Waterproofing the lower parts of buildings and facilities in case they are under the flood mark and are exposed to flooding	Physical or structural	Protection

Name of the adaptation measure	Classification: IPCC, 2014	Climate Change Adaptation Strategy of the Spanish Coast
SCOPE OF ACTION: ANY		
Monitoring the evolution of the coast line	Information	Protection, Accommodation and Regression
Improving the climate scenarios for the Basque coast by incorporating updated bathymetry and topography information, particularly in intertidal strips, residential and industrial areas, etc.	Information	Protection, Accommodation and Regression
Regular updating of the vulnerability and risk scenarios of the Basque coast taking the improved climate scenarios into account	Information	Protection, Accommodation and Regression
Early warning systems, and information communication and action protocols	Information	Accommodation
Preparing emergency plans including the climate change variable	Information	Accommodation
Incorporating insurance for extreme climate phenomena	Economic	Accommodation
Coastal zoning: modifying and/or aligning land uses and activities with the BAC climate, cultural and environmental attributes	Laws and regulation	Accommodation
Terminating concessions for works or facilities at certain risk of being reached by the sea	Laws and regulation	Protection, Accommodation and Regression
Acquiring coastal land exposed to high levels of flood and exposure risk	Behaviour Regression	Regression
Inclusion of the climate perspective in the coastal General Municipal Plans	Governance, policies and programmes	Accommodation
Preparing coastal adaptation plan that include risk and vulnerability assessments of coastal threats and propose adaptation measures for their mitigation	Governance, policies and programmes	Accommodation

Illustrations

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