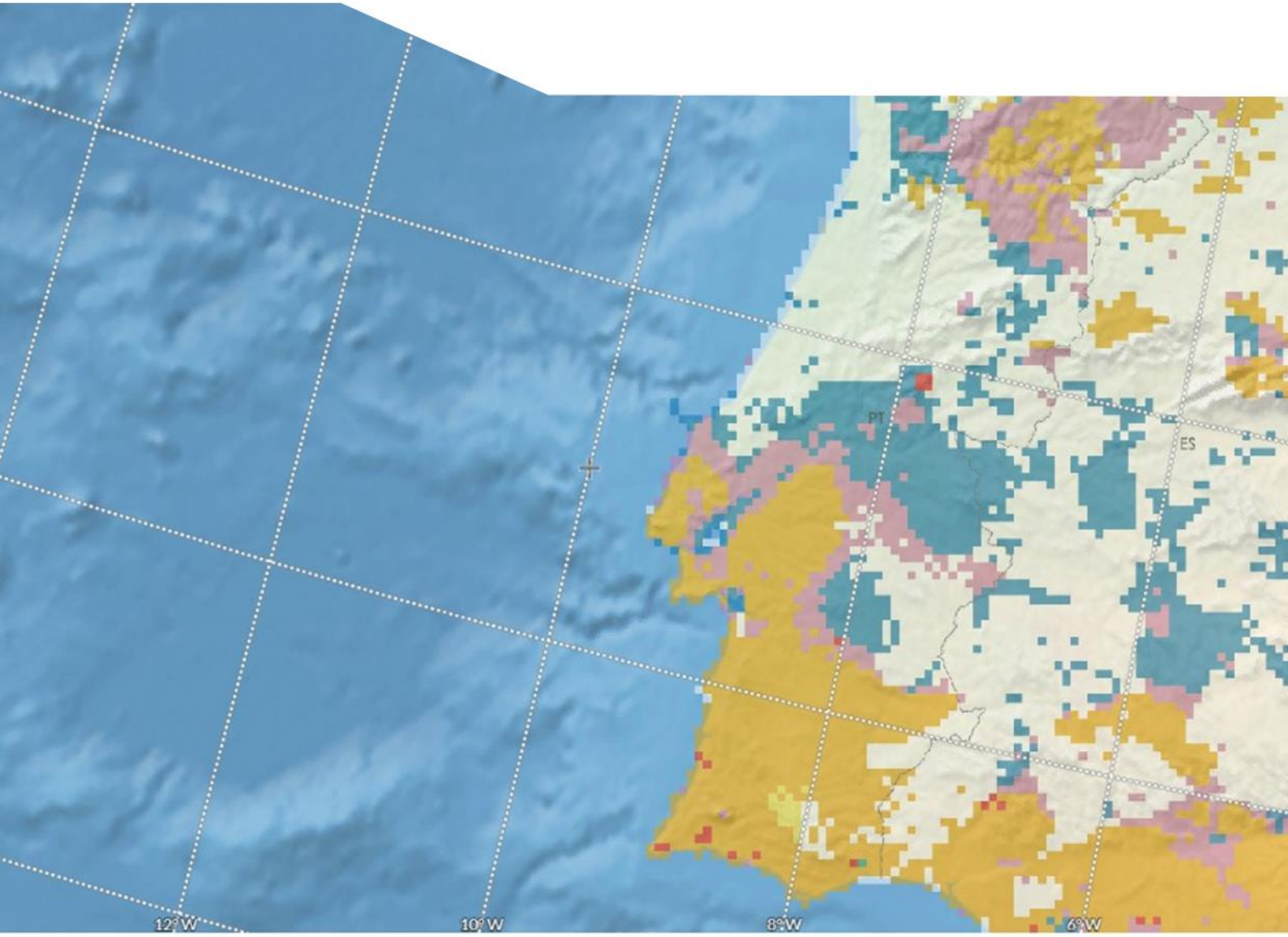
National Roadmap for Adaptation 2100

Portuguese Territorial Climate Change Vulnerability Assessment for XXI Century

WP7B - Review of guidelines on climate change adaptation in spatial plans and programmes

October 2023



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Acronyms

SEA	Strategic Environmental Assessment
AML	Lisbon Metropolitan Area
APA	Portuguese Environment Agency
CCDR	Regional Coordination and Development Commission
CCDRLVT	Lisbon and Tagus Valley Regional Coordination and Development Commission
EC	European Commission
CEDRU	Centre for Regional Studies and Development, Lda.
DGT	General Directorate of Territory
EMAAC	Municipal Climate Change Adaptation Strategy
ENAAC	National Strategy for Adaptation to Climate Change
IGT	Land management instrument
INE	National Institute of Statistics
IPCC	*Intergovernmental Panel on Climate Change*
IC	Grey infrastructure
IV	Green infrastructure
NUTS	Nomenclature of territorial units for statistical purposes
P-3AC	Action Programme for Adaptation to Climate Change
PDM	Municipal Masterplan
PEAP	Protected Areas Special Programmes
PGRI	Flood Risk Management Plan
PIAAC	Intermunicipal Climate Change Adaptation Plan
PMAAC-AML	Metropolitan Plan for Adaptation to Climate Change in the Lisbon Metropolitan Area
PMAAC-AMP	Metropolitan Plan for Adaptation to Climate Change in the Porto Metropolitan Area
PMOT	Municipal Spatial Plan
PNPOT	National Spatial Planning Policy Programme
PRGP	Landscape Redevelopment Programmes
PTP	Landscape Transformation Programme
POC	Special Coastal Programmes
POSEUR	Sustainability and Efficiency in the Use of Resources Operational Programme
REN	National Ecological Reserve
RNA 2100	National Adaptation Roadmap 2100
SIAM	*Scenarios, Impacts and Adaptation Measures*
EU	European Union

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Summary

This document systematises the results of the survey and analysis of the adaptation measures recommended in the leading national, regional, inter-municipal and local instruments for promoting climate adaptation and the survey and analysis of the adaptation measures enshrined in the Municipal Master Plans approved after 2015, while also offering a critical analysis of the experience of implementing climate adaptation in municipal-scale Territorial Management Instruments, namely Municipal Master Plans. It was coordinated by the Directorate-General for Territory within the scope of the National Roadmap for Adaptation 2100 - RNA2100 project and developed by the technical team at the Centre for Regional and Urban Studies and Development (CEDRU).

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1. Introduction

The **issue of climate change has become increasingly visible due to the growing impacts and consequences of extreme weather events on people and property**. In addition, changes in the occurrence and pattern of climatic variables, such as precipitation and temperature, are already effects of climate change, with notable impacts on the national territory.

Portugal has been identified as one of the countries most vulnerable to climate change on the European scene as a result of its more southerly location, sharing with the countries of Southern Europe and the Mediterranean basin the trends of reduced rainfall, rising temperatures, worsening heatwaves and increased fire risk, and with the countries of the Atlantic seaboard the combined effects of increasing mean sea levels, with regressive dynamics resulting from a coastline characterised by a growing sediment deficit and particularly energetic sea waves.

Over the last two decades, in line with the guidelines of the Intergovernmental Panel on Climate Change (IPCC) and the European Union (EU), Portugal has pursued a policy of adaptation to climate change at national, regional and local levels, supported by the best scientific evidence. The project "Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures" (SIAM, 2002 and 2006), the National Strategies for Adaptation to Climate Change (2009 and 2014), the Action Programme for Adaptation to Climate Change (P-3AC, 2019), and the ClimAdaPT project - Municipal Strategies for Adaptation to Climate Change (2014).

The growing importance of climate adaptation has also been reflected in spatial planning policy and territorial plans and programmes. Although the existence of a preventive culture about hydrological risks, soil desertification and coastal occupation has long been present in national legislation and Territorial Management Instruments (IGT), climate adaptation in its diversity and breadth has been given an increasingly effective response, with particular emphasis on the importance given to it in the first revision of the National Spatial Planning Policy Programme (PNPOT), published in Law no. 99/2019 of 5 September.

The project pre-defined by the EEA Grants funding mechanism, "National Roadmap for Adaptation 2100 - Assessment of the vulnerability of the Portuguese territory to climate change in the 21st century (RNA 2100)", **aims to give new impetus to knowledge of the impacts of climate change and to the planning process**, defining narratives of the evolution of vulnerabilities and effects of climate change, as well as assessing investment needs for adaptation and the socio-economic costs of inaction. RNA 2100 thus supports and responds to public policy exercises on climate change adaptation at the various territorial intervention levels.

In this context, this document aims to review the guidelines on adaptation to climate change in land use plans and programmes, presenting the following contents:

- **contextualisation of the role of spatial planning in climate adaptation and how territorial plans and programmes can contribute to** adaptation;
- **a characterisation of the measures included in local adaptive planning instruments** in **Portugal in** response to the climate hazards covered by the Roadmap, namely drought, water scarcity, rural fires, coastal erosion, coastal erosion and flooding;
- **analyse climate adaptation integration into Municipal Master Plans (PDM)** based on a systematic survey of adaptation measures to climate hazards, which are the subject of the Roadmap. The plans drawn up in Portugal after 2015 were considered, i.e. those that came into force after the approval of the National Strategy for Adaptation to Climate Change 2020, which gives a central role to Municipal Land Management Plans (PMOT) in climate adaptation;

- **an assessment of practices for integrating adaptation into the PDMs,** based on consultations with the municipalities (the body responsible for drawing them up), the Regional Coordination and Development Commissions (the body that monitors their preparation), and consultants specialised in spatial planning who have been supporting the municipalities in this mission.

The document is **complemented by three databases,** which systematise all the information gathered during this work, namely **1) a survey of the adaptation measures provided for in the adaptation instruments consulted, 2) a survey of the adaptation measures contained in the PDMs consulted, and 3) the responses received from the municipalities following the survey carried out to listen to them.** These databases supported the analyses for each of the contents mentioned above.

There is also a set of annexes, which include the bibliography used, the reference legislation, the identification of the plans, programmes and strategies consulted in the course of the work, complementary information on the integration of adaptation into the PDMs, the survey of local authorities and, finally, the list of consultants and Regional Coordination and Development Commissions consulted.

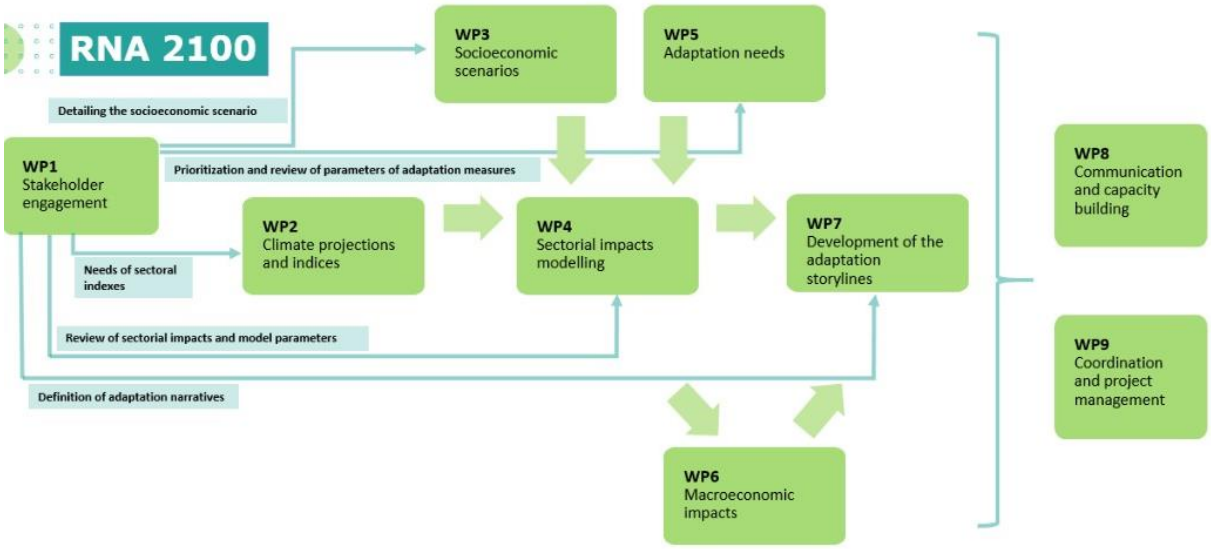
2. Methodology

2.1 Context

To assess the vulnerability of Portuguese territory to climate change (CA) in the 21st century and promote better integration of public adaptation policy at the various levels of territorial intervention, the National Roadmap for Adaptation 2100 project **aims to define the narratives of evolution of vulnerabilities and impacts of climate change, as well as assessing investment needs for adaptation and estimating the socio-economic costs of inaction**.

The **roadmap was organised into a series of *work packages*** (Figure 1), starting with updating climate projections and indices (WP2) and then modelling sectoral impacts (WP4), defining adaptation needs (WP5), analysing macroeconomic impacts (WP6) and developing adaptation narratives (WP7). In addition, there are other studies and actions related to socio-economic scenarios (WP3), *stakeholder* involvement (WP1) and dissemination of results (WP8).

Figure 1 - National Roadmap for Adaptation 2100 - organisation and contents



Source: Extracted from https://rna2100.apambiente.pt/ (2023)

The review of the current panorama on adaptation to climate change in territorial plans and programmes is part of this process, benefiting from the results of various WP, namely WP4 and WP5, and is integrated into WP7, **contributing to the achievement of various RNA 2100 objectives,** namely:

1. **support for adaptation policies** - supporting the activities of ENAAC 2020, the implementation and monitoring of P-3AC, as well as other strategic and planning instruments for adapting to climate change;
2. **implementation of the PNPOT** - contributing to the implementation of the PNPOT, identifying and mapping territories vulnerable to climate change (extreme events) on a national and regional scale to guarantee the socio-ecological resilience of territories at the different levels of planning and management;
3. **decision support tools** - create tools to identify climate vulnerabilities based on the best available knowledge to support decision-making at the various territorial levels;
4. **reference for communication and** awareness-raising - provide a reference for communication and awareness-raising actions in this area;

5. **integration into project design** - to support the progressive integration of adaptation to climate change into the design of direct and indirect intervention projects in the territory;
6. **promote integration into planning** - know and promote how adaptation is being integrated into the various territorial and sectoral planning instruments and the actors involved.

Concerning the principal climate vulnerabilities and impacts identified in the Action Programme for Adaptation to Climate Change (P-3AC), approved by Council of Ministers Resolution 130/2019 of 2 August 2019, the **priority of** RNA 2100 **is to promote adaptation to the dangers of drought, water scarcity, rural fires, coastal erosion and coastal overtopping and flooding**.

2.2. Objectives and methodological flowchart

The methodological process adopted to review the panorama of adaptation to climate change in territorial plans and programmes, systematised in Figure 2, was structured in an articulated sequence of tasks.

The first task was to define **the relationship between climate adaptation and spatial planning**, both in theoretical terms and in terms of policies and instruments.

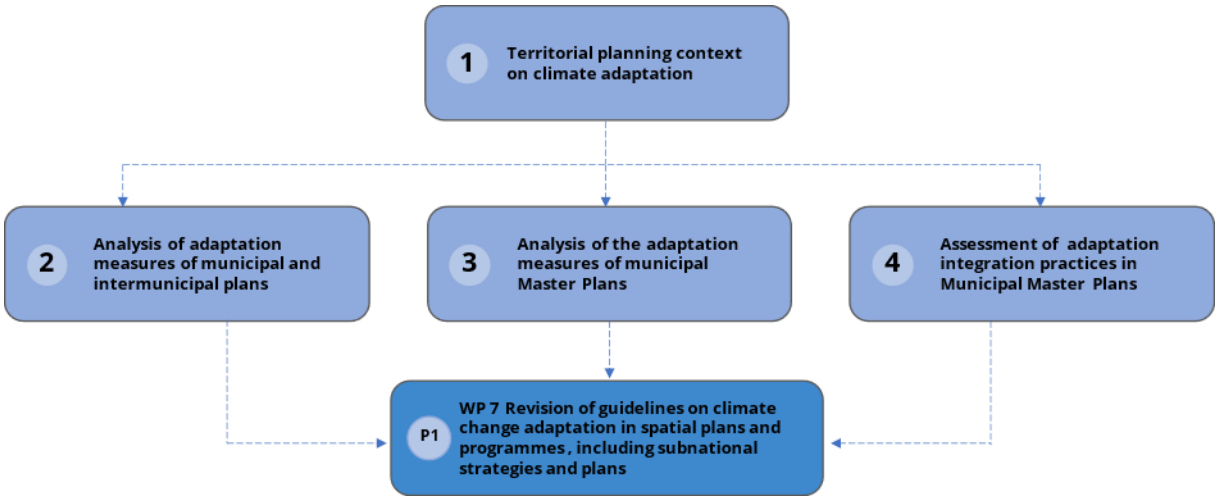
Subsequently, **a cross-analysis of the experience of implementing adaptation and its relationship with Municipal Master Plans was conducted from three angles**:

- surveying the adaptation measures relating to the climate hazards covered by the RNA 2100, provided for in the municipal and inter-municipal climate adaptation planning instruments approved by the municipalities as of June 2023, **assessing not only the characteristics of these measures but also their potential to be operationalised through the PDMs** (task 2)**;**
- surveying the adaptation measures contained in the PDMs revised or amended after the approval of ENAAC 2020**, assessing how these measures are aligned with the municipalities' adaptation plans and strategies** (task 3)**;**
- by consulting local authorities, Regional Coordination and Development Commissions (CCDRs) and specialised consultants on the experience of integrating **adaptation into PDM revision processes to identify bottlenecks, weaknesses and good practices** (Task 4)**.**

During the analysis process, it was found that it was impossible to carry out analyses in isolation in the case of drought water scarcity, coastal erosion, and overtopping**.** This is because municipal and inter-municipal climate change adaptation plans and strategies, as well as territorial management instruments, address these hazards in an integrated manner.

The dangers of drought and water scarcity are addressed in response to the threat of drought and are related to the ENAAC sectors of agriculture, forestry, and water resources. In the case of coastal erosion and overtopping, the approach is centred on the response to the rise in mean sea level, which falls under the Coastal Zones sector. Therefore, **the analysis of adaptation measures for these hazards, carried out in tasks 2 and 3, is grouped by these two sets of climate hazards**.

Figure 2 - Methodological flowchart of the review of the current panorama on adaptation



Source: CEDRU (2023)

On the other hand, the **decision was made exclusively to use the municipal scale as a reference for the entire analysis** and not to assess how adaptation is considered in the Territorial Programmes. Three factors determined the methodological premise:

- by the fact that both ENAAC 2020 and successive Government Programmes since 2015 point to the municipal scale and/or municipal master plans as central vehicles for climate adaptation;
- because under the terms of the Law on the General Basis of Public Land, Spatial Planning and Urban Planning Policy (LBGPPSOTU, Law no. 31/2014, of 30 May) and the Legal Framework for Territorial Management Instruments (RJIGT, Decree-Law no. 80/2015, of 14 May), local government interventions, which are dispositive and binding on individuals, are only in territorial plans.º 80/2015, of 14 May), the interventions of the local administration, which are of a dispositive nature and binding on private individuals, are only in territorial plans, and the content of the unique territorial planning plans in force and the territorial programmes carried out after the publication of the Law have been transposed into municipal master plans.
- because municipal-scale instruments cover the entire municipal territory, this is the scale at which the process of planning adaptation to climate change has evolved the most.

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3. Climate adaptation and land use planning

3.1 The role of spatial planning in adaptation

Spatial planning is recognised as an indispensable means of adapting to climate change. For this reason, not only have climate issues been gaining significant importance in the analyses and proposals of territorial planning instruments at the most diverse levels, but adaptation strategies and plans at regional, inter-municipal and local levels give significant importance to IGTs as vehicles for promoting adaptation.

This reality is **particularly evident in various guiding documents for drawing up PDMs**, such as "Spatial planning in response to climate change: contribution to PDMs" (CCDRLVT; 2019) or "PDM GO - Good Practices for Municipal Master Plans" (DGT; 2020), **as well as in the methodological guides for local adaptation documents to climate change in Portugal**, such as "ClimAdaPT.Local - Manual for Integrating Adaptation Options into Municipal Territorial Management Instruments" (Barroso, S., Gomes, H. et al.; 2016) or the "Specific Guide for Implementing the Integration of Climate Change into the Strategies of Territorial Management Instruments" (Barroso, S., Gomes, H. Telha, J., Porteiro, J; 2022).

Achieving climate adaptation, among other aspects, depends on how land is used and occupied, namely the arrangement and organisation of human, natural and technological resources throughout the territory, highlighting the link between land **use** planning and adaptation. Land use planning plays a fundamental role in realising adaptation to climate change since it is here that the options that determine the adaptive capacity of the territory and society to the effects of climate change are defined.

Land use **planning** makes an exception**al contribution to increasing resilience to extreme climate events**, namely by identifying areas that are particularly vulnerable to events such as floods, coastal gales, heat waves or forest fires, making it possible to plan land use and occupation and infrastructure development strategically and in advance, mitigating impacts and increasing the capacity of communities and ecosystems to deal with these phenomena.

At the coastal level, with the rise in the average sea level and the increase in coastal erosion due to climate change, the **territorial planning of the coastline, namely through the Coastal Zone Management Plans (POOC) and Coastal Zone Programmes (POC), is essential to protect these areas,** allowing for the implementation of sustainable coastal defence strategies, the early relocation of vulnerable assets and the protection of natural habitats. Similarly, for **flood risk management, the PDM and the National Ecological Reserve (REN), in conjunction with the Flood Risk Management Plans (PGRI), are instruments of great importance** which not only prevent the occupation of areas prone to flooding but also provide for the establishment of flood areas, wetlands and green spaces that can absorb excess water during heavy rainfall events, or limit the extent of impervious areas in particularly critical river basins.

Planning also **plays an essential role in adapting biodiversity to climate change, both in the PDM by safeguarding ecological corridors and through the Special Programmes for Protected Areas (PEAP)**, which identify and protect biodiversity hotspots and primarily safeguard corridors that facilitate the migration of species as climate conditions change.

In the context of **promoting the adaptation and resilience of** human and natural systems to climate change, the **Landscape Reordering and Management Programmes** (PRGP), a measure enshrined in the Landscape Transformation Programme (PTP), is aimed at **planning, programming and transforming the landscape** in vulnerable forest territories, seeking to **guide public policies and private interventions** towards the consolidation

of a more resilient and biologically and ecologically valued landscape. To this end, a strategic vision identifies the most appropriate landscape model for the territory.

This interdependence between policies is also fundamental to realising adaptation to climate change. Adaptation is a territorially specific response, adjusted to exposure to a given climate and territory's social, ecological, and social characteristics that determine its vulnerability. **An approach recognising diversity and assuming local specificity is indispensable for good adaptation**. In this context, the territorial planning instruments that define land use planning have a specific spatial focus and make it possible to address the different particularities of that territory **by proposing measures, rules and interventions adjusted to that reality, constituting an effective vehicle for promoting climate adaptation**.

In this sense, an approach that integrates adaptation to climate change and land-use and urban planning policies is possible:

- **Identify and take care of the particularities of each territory**, framing them within the dynamics related to climate change;
- **preventing land uses and occupations that may prove problematic in the context of climate change**, promoting more sustainable use of the territory, as well as adaptive capacity and taking advantage of potential opportunities that may be identified;
- **accommodate and integrate climate change mitigation and adaptation components**, promoting synergies and complementarities;
- **observing the needs and expectations of territorial actors at distinct levels** due to the integration of consultation, involvement and participation mechanisms.

This highlights the importance of spatial planning as a mechanism for promoting adaptation to the current and future climate by integrating climate policy into its objectives and its provisions, guidelines and actions, responding to the need to mitigate the current impacts of extreme events and anticipate future challenges.

3.2 Ways of integrating adaptation into land management instruments

The broad themes and scale of the IGTs, set out in the LBGPPOTU mentioned above and RJIGT legislation, mean that **several ways of integrating adaptation to climate change into their provisions** have to be **defined.**

The fact that the IGTs are made up of different documentary contents (reports, regulations, maps), although complementary, also affects how the **adaptation is integrated.**

Nevertheless**, four main dimensions of integration in the IGTs have been identified,** as shown in Table 1.

Table 1 - Dimensions of adaptation integration in territorial management instruments

Form of integration	Stages and parts with the most significant potential for reception
Strategic Dimension	
• Defining predictable territorial development scenarios; • Establishing medium- and long-term sustainable development visions integrating the climate change component; • Defining new principles of land use and occupation; • Developing best practice benchmarking; • Implementing territorial organisation guidelines that take into account the location of buildings, infrastructures and elements of the ecological network; • Consecrating guidelines for organising urban spaces, considering the uses and morphologies of urban complexes, buildings and public spaces.	• The reports define climate adaptation strategies, measures and actions as strategic options assumed in the land-use planning model. Reports evaluating the implementation of PDMs are also included; • Within the scope of **fundamental studies**, developing specific assessments for the territory covered by the IGTs, contributing to the definition of adaptation options (bioclimatic assessments, climate hazard modelling, climate vulnerability assessment); • In **environmental reports**, weighing up the importance and impact of climate change as a criterion associated with the critical factors for the decision; • In **environmental reports**, assessing the significant effects (positive, negative or neutral) on the environment caused by adaptation actions; • E**nvironmental reports** provide for adaptation actions as planning and management measures to mitigate adverse environmental effects or accentuate positive effects.
Regulatory Dimension	
• Defining legal and regulatory provisions regarding land use and occupation; • Deepening the building regulatory framework (fostering building resilience and energy efficiency).	• In the **regulations**, altering indices and/or indicators and/or reference, urban planning and/or zoning parameters following strategic options, measures and climate adaptation actions; • Transposing the principles and/or rules of the Territorial Management System instruments at the national (including sectoral and special programmes), regional and inter-municipal levels into **regulations;** • In **regulations**, identifying areas of public interest for expropriation based on the spatialisation of danger or the need to relocate equipment; • In the **graphics** (**planning/zoning/planning plans**), reclassifying the land according to the modelling of the evolution of climate hazards, strategic options, climate adaptation measures and actions, as well as considering the exceptional processes of reclassification from rural to urban land with associated economic potential, and vice versa.
Operational Dimension	
• Identifying provisions for the implementation of priority interventions; • Ensuring that projects are appropriate in the context of climate change; • Identifying the public investments needed to valorise, qualify and protect the territory; • Realising public policies and economic and financial regimes.	• In the **implementation programmes**, the municipality or central government projects that implement the strategic options, measures and climate adaptation actions set out in the planning model, as well as involving private investment in urban infrastructure, are highlighted as priorities; • In the **financing plans**, providing for the investments associated with the projects that implement the strategic options, measures and climate adaptation actions, promoting their effective implementation; • In the **models for redistributing** benefits and burdens, providing for the realisation of investments associated with projects that implement climate adaptation strategic options, measures and actions; • The written and graphic documents supporting land transformation operations identify the operations implementing strategic options, measures, and climate adaptation actions.
Territorial Governance Dimension	
• Stimulating *awareness*, empowerment and generalised participation of citizens and relevant services at the various levels of administration (local, regional and national) and other interested *stakeholders;* • Integrating the various fields of knowledge, experience and practice;	• During the **drafting/revision of** the IGTs, developing public participation and consultation processes that guarantee the monitoring, articulation and incorporation of contributions from the public administration, regional and local development agents and the population in general; • During the **drafting and implementation/monitoring of** the IGTs, developing actions to raise awareness among the public administration, regional and local development agents and the population in general of the climate adaptation strategies adopted and their implications (potential or actual) for land use planning;

Form of integration	Stages and parts with the most significant potential for reception
• Promoting the articulation and coordination of policies.	• During the **drafting/revision** and **implementation/monitoring of** the IGTs, promoting multi-level coordination of climate adaptation strategies with an impact on land use planning.

Source: CEDRU (2023)

3.3 Guidelines for integrating adaptation into spatial planning

3.3.1 National Spatial Planning Policy Programme (PNPOT)

The **National Spatial Planning Policy Programme (PNPOT)** is the top element in the hierarchy of the territorial management system. The current version, approved by Law no. 99/2019, of 5 September, is the result of a revision of the initial version, dated 2007, which was updated for the 2030 horizon. In addition to revising the structural objectives to deal with the economic and social changes that have taken place, the PNPOT update considered the challenges associated with climate change.

In this context, **measure 1.7** stands out, **related to the prevention of hazards and the adaptation of the territory to climate change,** complemented by other measures, in the natural domain, such as improving the management of water resources (measure 1.1) and the valorisation and resilience of the coast (measure 1.8).

It should also be noted that, despite the PNPOT's scale of intervention being at the national level, **this Programme points out the need to integrate risk assessment into territorial plans and programmes,** as shown in Table 2, which presents the operational objectives and expected effects most relevant to climate adaptation.

Table 2 - PNPOT guidelines for integrating adaptation into spatial planning

Measure	Forms of realisation / Operationalisation
Measure 1.7. Preventing risks and adapting the territory to climate change	**Operational objectives** • Encourage greater coordination and articulation between the organisations involved and sectoral, territorial and funding policies and plans. • Produce and update mapping for risk prevention and reduction based on the vulnerabilities of the territories, taking climate scenarios into account where appropriate. • Drawing up and disseminating technical guidelines on risks and climate change for territorial programmes and plans to converge principles, understandings and solutions, drawing on the experience of projects funded by the AdaPT programme, such as the Climate Portal and ClimAdaPT.Local, among others. • Implementing a culture of risk awareness, promoting access to information, exchanging experiences, and disseminating good practices for preventing and reducing risk and adapting to climate change. • Fostering a culture of territorial resilience through the collaboration of public and private organisations and the involvement of communities. • Promoting actions to prevent and reduce risks and adapt territories to climate change, favouring participatory and nature-based solutions as the most appropriate. • Implement the National Strategy for Adaptation to Climate Change in its territorial dimension. **Expected Effects** • Strengthening governance in risk management to reduce risk and increase the resilience of communities. • Adapting land use and occupation to territorial vulnerabilities. • Increase in the number of municipalities with updated risk maps. • Integrating risk assessment and the definition of measures to prevent and reduce its effects into drawing up territorial programmes and plans. • Implementing a culture of risk awareness and increasing adherence to attitudes and behaviours of suitable prevention and risk reduction practices.

Measure	Forms of realisation / Operationalisation
Complementary PNPOT measures in the context of adaptation to climate change	
Measure 1.1 Managing water resources in a changing climate	**Operational objectives** • Ensure that land use planning and the management of activities in the territory consider the water available through good practices (efficient use of water and fertilisers and phytosanitary products) for the quality and quantity of water resources. • To promote an increase in water availability in the river basins, particularly in the Tagus basin, counteracting the vulnerabilities resulting from the irregularity of flows aggravated by the increased occurrence of droughts. • Ensure that, in strategic areas for recharging aquifers, uses are planned and adapted to the nature of these territories by ensuring their permeability and infiltration capacity based on the strategic guidelines and the cartographic delimitation of the REN. • Make a decisive contribution to reducing and eliminating point and diffuse pressures on water resources to achieve and maintain the good status of water bodies, including water losses in systems. • Increasing the resilience of territories and the viability of production functions (agriculture, forests and associated ecosystems) within a framework of adaptation to climate change, guaranteeing the sustainability of water and land use, particularly in areas susceptible to desertification processes. • Generalise the efficient use of water resources throughout the territory and economic sectors and create conditions for reusing treated wastewater whenever appropriate. • Promote the economic sustainability of water management. • Improving territorial connectivity based on areas associated with water resources, including the naturalisation of water lines • Increase resilience to flooding in urban and rural areas and contain built-up occupation in the areas most susceptible to flooding; • Valuing territories with the presence of lakes, lagoons, rivers, streams, reservoirs and thermal waters/resorts within a framework of recognising the provision of environmental services and their relevance to economic activities; • Guaranteeing public ownership of water, valuing the role of local authorities, and respecting municipal competencies, particularly concerning Urban Water Services. **Expected Effects** • Land uses and functions compatible with water availability. • Safeguarding the large strategic reserves of surface water and groundwater and ensuring the excellent status of water bodies. • The water efficiency of irrigated land is based on the National Irrigation Programme, increasing the efficient use of water in areas that have already been infrastructured or are to be infrastructured. • Permeability of strategic areas for recharging aquifers and reducing sources of groundwater contamination. • Reduction of nitrates of agricultural origin in vulnerable zones. • Increasing environmentally sustainable forestry activity in strategic territories for the water cycle. • Containment of built occupation in flood zones. • Valuing the services provided by ecosystems associated with inland and transitional water bodies. • Improving water availability in areas most vulnerable to droughts for multiple purposes.
Size 1.8 Valuing the coast and increasing its resilience	**Operational objectives** • Implementing the Litoral XXI Action Plan to ensure that the programme of physical actions and the associated financial programme are implemented; • Developing adaptive planning logics and models for the coastal zone capable of responding to environmental, social and economic demands, adopting an anticipatory attitude towards risks (installed and those that will increase in a climate change scenario) that includes Prevention, Protection, Accommodation and Withdrawal strategies, developed in a coherent and articulated manner at different levels. • Promote the implementation of local adaptation measures, particularly in urban management, integrating them with coastal defence and local monitoring. • Rehabilitation and enhancement of coastal territories to protect and enhance natural resources and systems, contributing to the preservation of landscape and cultural values, and ecological restoration of areas that ensure the biophysical stability of the coastline, such as those that form part of the REN, • Reduce the pressure factors on the coastal zone by banning new buildings on the coast, outside urban areas, that are not directly related to the enjoyment of the sea and restricting buildings in the rest of the coastal zone, including the containment of building occupations in risk zones, prioritising the removal of buildings of illegal origin that are in the most vulnerable parts of the coast, sandy and cliffs, and requalifying and containing urban areas;

Measure	Forms of realisation / Operationalisation
	• Considering the cultural and economic value of the coastal zone due to its capacity to support coastal and riverside communities that depend on it for the development of traditional activities, namely fishing, coastal tourism, recreation and leisure, and navigation; • Ensuring the articulation and compatibility of territorial programmes and plans with maritime spatial instruments when they affect the same area or areas that, due to the structural or functional interdependence of their elements, require integrated coordination; • Ensuring the co-responsibility of the various levels and deepening the articulation of the multiple actors with competences to act on the coastline, especially in areas at risk, in the maritime and inland water resources sectors, in a partnership of wills adjusted to the problems and solutions that arise today • Ensure the production of knowledge, information sharing, the articulation of public administration decisions, promoting access to information and public participation. • Prohibit activities that increase risks to the coastline. **Expected Effects** • Reducing and controlling the vulnerability of the coastline to hazards. • More resilient occupation of the coastal zone. • Containment of construction in the coastal zone and reduction in risk areas. • Enhancing and maintaining the natural conditions that support the specific activities of the Coastal Zone (fishing, tourism, leisure, harbours, etc.). • Strengthening co-operation and institutional coordination. • Increased social awareness of the risks to the coastal zone.

Source: Adapted from PNPOT (2019)

3.3.2 Climate change adaptation planning tools

3.3.2.1 National Strategy for Adaptation to Climate Change (ENAAC 2020)

In line with the international commitments made under the United Nations Framework Convention on Climate Change and with the European Union (EU), **Portugal drew up the first National Strategy for Adaptation to Climate Change** (ENAAC) in **2009** to provide the country with an instrument that would promote the identification of lines of action and adaptation measures to be applied through sectoral instruments, bearing in mind that adaptation to climate change is an eminently transversal challenge that requires the involvement of a wide range of sectors and an integrated approach.

Based on the evaluation of the implementation of the first ENAAC and the need to make the national adaptation policy more effective and energetic, as a result of the conclusions of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2014), **Portugal approved the ENAAC 2020 in 2015** (Council of Ministers Resolution 56/2015 of 30 July), which not only continued the experience of implementing the first ENAAC but also updated and extended its strategic ambition.

ENAAC 2020, extended until 31 December 2025, established the objectives and model for implementing the national adaptation policy. Promoting the integration of adaptation into sectoral policies is one of these objectives, and spatial planning and sustainable urban development is one of the critical sectors, emphasising the importance of territorial planning and management instruments. To realise these objectives, the ENAAC sets out guidelines for integrating adaptation into spatial planning (Table 3).

Table 3 - ENAAC 2020 guidelines for integrating adaptation into spatial planning

Area of intervention / Design / Orientation	Forms of realisation / Operationalisation
The thematic area dedicated to integrating adaptation into spatial planning should promote the introduction of the adaptation component into policy and territorial management instruments at all relevant scales for the coherent implementation of ENAAC 2020. To this end, it should include capacity-building for sectoral agents concerning the territorial integration of specific adaptation measures, considering the threats and opportunities associated with the effects of climate change. This area should also promote intersectoral coordination by identifying the main constraints and opportunities for adaptation to ensure compatibility between the different sectoral measures.	• The dissemination of information and other resources to guide the various sectoral agents in the active management of adaptation to climate change in their activities in a way that considers local and regional specificities; • The analysis and mapping of climate-related hazards, as well as the consequent modification and adaptation of the principal territorial policy and management instruments; • Drawing up technical guidelines to ensure that adaptation to climate change is integrated into territorial management instruments; • The integration of adaptation to climate change in the PNPOT Action Programme; • Integrating adaptation to climate change into Sustainable Urban Development Agendas.

Source: Adapted from ENAAC 2020 (2015)

3.3.2.2 Climate Change Adaptation Action Programme (P-3AC)

Approved by Council of Ministers Resolution 130/2019 of 2 August, **the Action Programme for Adaptation to Climate Change (P-3AC) aims to achieve the second objective of ENAAC 2020, namely, the implementation of adaptation measures,** establishing lines of action and priority measures for this purpose.

In this context, the **P-3AC is an element that promotes the implementation of adaptation measures through the creation of sectoral plans**, seeking to enhance and adapt the territory to climate change. To this end, it is established that, among other actions, it is up to the APA, in conjunction with the entities that make up the ENAAC 2020 Coordination Group, to promote the integration of the lines of action and climate change adaptation measures set out in the P-3AC into sectoral policies and planning.

On the other hand, Action Line #9, dedicated to the "Development of decision support tools, training and awareness-raising actions", seeks to improve knowledge about climate change and raise awareness among the various relevant groups, with the aim of realising, among other things, the development of decision support tools, risk area identification systems and adaptation plans.

However, no provisions or guidelines are **specifically dedicated to integrating adaptation into spatial planning**. This is due to the operational nature of the P-3AC objectives and the fact that they focus on the upstream phase of integration, so there are no concrete actions or provisions for integrating adaptation into spatial planning.

3.3.2.3 Inter-municipal climate change adaptation plans

In the last eight years, **local climate adaptation planning in Portugal** has **undergone a profound development, with a** vast number of strategies or plans having been drawn up under different names to define the adaptation action measures appropriate to each municipality, inter-municipal community or region.

In this context, the survey carried out in July 2023 **identified 22 inter-municipal climate change adaptation plans, including two metropolitan plans (AMP and AML)** (Table 4). To these can be added, at regional level, the Climate Change Adaptation Strategy for the Autonomous Region of Madeira - CLIMA-Madeira Strategy (approved by Government Council Resolution no. 1062/2015, of 26 November), the Regional Climate Change Programme for the

Autonomous Region of the Azores (Regional Legislative Decree no. 30/2019/A, of 28 November) and the Alentejo Regional Climate Change Adaptation Strategy (2023).

Table 4 - Intermunicipal climate change adaptation plans identified

Framework region (NUTS II)	Intermunicipal Community (NUTS III)	Plan / Strategy
Norte	Alto Minho	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Alto Minho (PIAAC-AM)
	Alto Tâmega e Barroso	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Alto Tâmega (PIAAC_AT)
	Área Metropolitana do Porto	• Plano Metropolitano de Adaptação às Alterações Climáticas da Área Metropolitana do Porto (PMAAC-AMP)
	Ave	• Plano Intermunicipal de Adaptação às Alterações Climáticas e Prevenção e Gestão de Riscos do Ave (PIAAC do Ave)
	Cávado	• Estratégia Intermunicipal de Adaptação às Alterações Climáticas no território da NUTS III Cávado (EIAAC NUT III Cávado)
	Douro	• Plano de Ação Intermunicipal para as Alterações Climáticas do Douro (PAIAC Douro)
	Tâmega e Sousa	• Plano Intermunicipal de Adaptação às Alterações Climáticas no Tâmega e Sousa (PIAAC-TS)
	Terras Trás-os-Montes	• Plano Intermunicipal de Adaptação às Alterações Climáticas da Terra Fria do Nordeste Transmontano (PIAAC TNT)
		• Plano Intermunicipal de Adaptação às Alterações Climáticas da Terra Quente Transmontana (PIAAC TQT)
Área Metropolitana de Lisboa		• Plano Metropolitano de Adaptação às Alterações Climáticas da Área Metropolitana de Lisboa (PMAAC-AML)
Centro	Beira Baixa	• Plano Intermunicipal de Adaptação às Alterações Climáticas da Beira Baixa (PIAAC-BB)
	Beiras e Serra da Estrela	• Plano Intermunicipal e Planos Municipais para as Alterações Climáticas das Beiras e Serra da Estrela (PIAAC-BSE)
	Médio Tejo	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Médio Tejo (PIAAC-MT)
	Oeste	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Oeste (Oeste PIAAC)
	Região de Coimbra	• Plano Intermunicipal de Adaptação às Alterações Climáticas da Comunidade Intermunicipal da Região de Coimbra (PIAAC-CIM-RC)
	Região de Leiria	• Estratégia Intermunicipal de Adaptação às Alterações Climáticas da Região de Leiria (EIAAC-RL)
	Viseu Dão Lafões	• Plano Intermunicipal de Adaptação às Alterações Climáticas de Viseu Dão Lafões (PIACC-VDL)
Alentejo	Alto Alentejo	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Alto Alentejo (PIAAC-AA)
	Alentejo Central	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Alentejo Central (PIAAC-AC)
	Baixo Alentejo	• Plano Intermunicipal de Adaptação às Alterações Climáticas do Baixo Alentejo (PIAAC-BA)

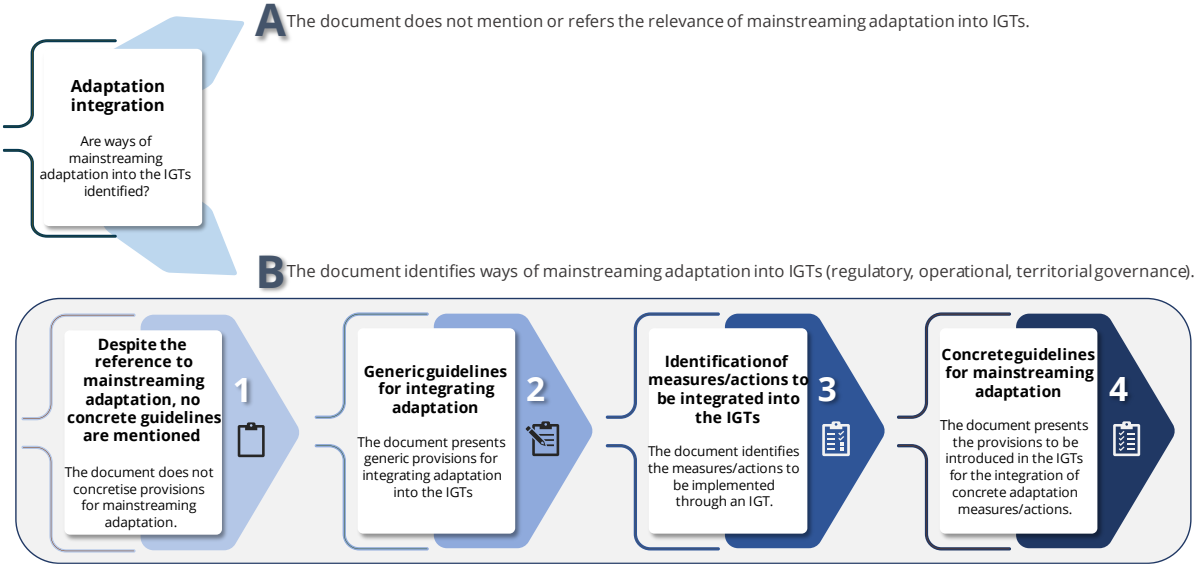
Framework region (NUTS II)	Intermunicipal Community (NUTS III)	Plan / Strategy
	Lezíria do Tejo	• Plano Intermunicipal de Adaptação às Alterações Climáticas da Lezíria do Tejo (PIAAC-LT)
Algarve	Algarve	• Plano Intermunicipal de Adaptação às Alterações Climáticas da Comunidade Intermunicipal do Algarve (PIAAC-AMAL)

Source: CEDRU (2023)

Although almost all of these plans have been funded by the Operational Programme for Sustainability and Efficiency in the Use of Resources (POSEUR), the Call for Tenders stipulates the methodology defined in the ClimAdaPT.Local projects must be followed; **these plans present a specific diversity of approaches in terms of the depth of territorial analysis of the impacts, the detail of the measures and how they address the integration of climate adaptation into the IGTs**, namely the PDMs of the municipalities covered.

To synthesise the analysis and provide a comparative perspective, the provisions of each document were classified into broad types of analysis. As a first step**, specific content in the papers** was checked to see if **it signalled the importance of integrating adaptation into spatial planning**. Subsequently, and in cases where they existed, how these provisions contribute to the effective implementation of climate adaptation mainstreaming was analysed by analysing the nature and depth of these provisions. The rationale for developing this approach is illustrated in the following figure.

Figure 3 -Key to analysing the integration of adaptation into regional and inter-municipal climate change adaptation plans



Source: CEDRU (2023)

Based on this approach, **all the plans and documents identified in Table 4 were analysed concerning their guidelines for integrating adaptation into spatial planning** (Table 5).

Table 5 - Integration guidelines for inter-municipal climate change adaptation plans

NUTS II	Plan / Strategy	Adaptation mainstreaming provisions					
		Reference to the integration of adaptation in the IGTs		Contribution to mainstreaming adaptation			
		No (A)	Yes (B)	No concrete guidelines (1)	General guidelines (2)	Identification of the measures to be integrated (3)	Specific guidelines (4)
Norte	PIAAC - Alto Minho [1]		▪				
	PIAAC - Alto Tâmega		▪			▪	▪
	PMAAC – AMP	▪					
	PIAAC – Ave		▪		▪		
	EIAAC -Cávado		▪			▪	▪
	PAIAC – Douro		▪		▪		
	PIAAC Terra Fria do Nordeste Transmontano		▪		▪		
	PIAAC Terra Quente Transmontana		▪		▪		
	PIAAC - Tâmega e Sousa		▪		▪		
Centro	PIAAC - Beira Baixa		▪		▪		
	PIAAC - Beiras e Serra da Estrela		▪			▪	▪
	PIAAC - Médio Tejo		▪		▪		
	Oeste PIAAC		▪			▪	▪
	PIAAC - Região de Coimbra	▪					
	EIAAC Região de Leiria [2]		▪				
	PIAAC - Viseu Dão Lafões		▪			▪	▪
AML	PMAAC - AML		▪			▪	▪
Alentejo	PIAAC - Alto Alentejo		▪			▪	▪
	PIAAC - Alentejo Central		▪		▪	▪	
	PIAAC - Baixo Alentejo		▪		▪		
	PIAAC - Lezíria do Tejo		▪		▪	▪	
Algarve	PIAAC - Algarve		▪	▪			

Fonte: CEDRU (2023)

[1].Only a summary presentation of this document was analyzed, and the full version is not publicly available. However, the contents analyzed allow us to identify that the document analyzed issues related to the integration of adaptation into spatial planning. However, it was not possible to assess how this analysis was developed.
[2] Only the summary version of this document was analyzed, and the full version is not publicly available. Even though in the summary version the topic relating to integration is not addressed, one of the objectives of the strategy is to "Speed up the integration of adaptation to climate change in the planning and decision-making processes of inter-municipal, municipal and sectoral agents", which is why admits the reference to the need to integrate adaptation into territorial planning. However, it was not possible to assess how this objective was pursued.

The data collected shows that the **vast majority of documents at the inter-municipal level emphasise the importance of integrating adaptation into spatial planning**, with only the PMAAC-AMP and the PIAAC Região de Coimbra not expressly mentioning this issue. On the other hand, the EIAAC Região de Leiria does not contain any specific provisions on this matter, despite its importance being emphasised throughout the document.

It should also be noted that how these documents promote and support the realisation of integration varies somewhat in terms of their level of depth.

The formulation of generic guidelines (which identify, for example, the IGTs in force in the sub-region that may include adaptation measures or actions) occurs in 10 of the documents analysed. **This approach signals the universe of instruments which, in their design, revision or amendment process, must consider the measures whose full implementation depends on their transposition into strategic, regulatory, operational or governance provisions**.

It's worth noting that **9 of the analysed documents expressly state which measures must be covered by LGGIs to be fully effective**. This allows developing, revising or amending these instruments to be more closely linked to the adaptation options, contributing to greater clarity about the universe of adaptation options that must be transposed into territorial management mechanisms.

In the context of greater depth and development, **seven documents identify the measures and propose how they will be transposed and incorporated into the various IGTs eligible for this purpose**. In this case, a dynamic of integrating more excellent relational evidence between the specific adaptation measure and the object of its transposition is promoted. **In cases of greater depth of analysis, there is even an express indication of the transposition guideline and the constituent element of the IGT that should accommodate it**. These cases correspond to the excellent articulation between the inter-municipal climate change adaptation plans and the IGTs.

In this context**,** it is essential to highlight the experience of the **Azores PRAC as a good practice, which, despite not detailing the adaptation measures that should be integrated into the IGTs, was succeeded by the development of a specific manual to support this process, namely the** "Specific Guide for Implementing the Integration of Climate Change into the Strategies of Territorial Management Instruments" (2022). This practice was also adopted by PMAAC-AML, which contains an autonomous document for general dissemination dedicated to integrating adaptation into the IGTs.

3.3.2.5 Municipal climate change adaptation strategies and plans

Since the first version of ENAAC, local authorities' importance in adapting to climate change has been recognised. Consequently, over the last decade, efforts have been made to ensure that all Portuguese municipalities have an adaptive planning tool. The ClimAdaPT project - Municipal Strategies for Adaptation to Climate Change (2014) enormously boosted this process.

The **survey of municipal instruments in force in July 2023 identified 70 climate change adaptation documents at the municipal level**. These include a strategic plan, the oldest instrument in force (Sintra, dating from 2009), and 54 municipal adaptation strategies, which follow the methodology defined by the ClimAdaPT.Local project, 13 climate change adaptation plans and two climate action plans (Loulé and Lisbon), which were the forerunners of a new generation of plans that simultaneously integrate adaptation and mitigation measures and which result from the provisions of the Basic Climate Law (Law no. 98/2021 of 31 December). The municipalities that have these adaptation benchmarks are identified in Table 6.

Table 6 - Municipal climate change adaptation strategies and plans identified

Municipality	Plan / Strategy	Type
Águeda	Plano de Adaptação às Alterações Climáticas do Município de Águeda	• Plano de Adaptação às Alterações Climáticas
Alfândega da Fé	Plano de Adaptação às Alterações Climática de Alfândega da Fé	• ClimAdaPT.Local
Almodôvar	Estratégia Municipal de Adaptação às Alterações Climáticas de Almodôvar	• Seguindo orientação ClimAdaPT.Local
Arruda dos Vinhos	Plano Municipal de Adaptação	• Plano de Adaptação às Alterações Climáticas
Almeirim	Estratégia Municipal de Adaptação às Alterações Climáticas de Almeirim	• Seguindo orientação ClimAdaPT.Local
Alpiarça	Estratégia Municipal de Adaptação às Alterações Climáticas de Alpiarça	• Seguindo orientação ClimAdaPT.Local
Amarante	Estratégia Municipal de Adaptação às Alterações Climáticas de Amarante	• ClimAdaPT.Local
Arouca	Estratégia Municipal de Adaptação às Alterações Climáticas de Arouca	• Seguindo orientação ClimAdaPT.Local (parcial)
Aveiro	Estratégia Municipal de Adaptação às Alterações Climáticas de Aveiro	• Seguindo orientação ClimAdaPT.Local
Azambuja	Estratégia Municipal de Adaptação às Alterações Climáticas da Azambuja	• Seguindo orientação ClimAdaPT.Local
Barreiro	Estratégia Municipal de Adaptação às Alterações Climáticas do Barreiro	• ClimAdaPT.Local
Benavente	Estratégia Municipal de Adaptação às Alterações Climáticas de Benavente	• Seguindo orientação ClimAdaPT.Local
Braga	Estratégia Municipal de Adaptação às Alterações Climáticas de Braga	• ClimAdaPT.Local
Bragança	Estratégia Municipal de Adaptação às Alterações Climáticas de Bragança	• ClimAdaPT.Local
Cartaxo	Estratégia Municipal de Adaptação às Alterações Climáticas do Cartaxo	• Seguindo orientação ClimAdaPT.Local
Cascais	Plano de Ação para a Adaptação às Alterações Climáticas de Cascais	• Plano de Adaptação às Alterações Climáticas
Castelo Branco	Estratégia Municipal de Adaptação às Alterações Climáticas de Castelo Branco	• ClimAdaPT.Local
Castelo de Vide	Estratégia Municipal de Adaptação às Alterações Climáticas de Castelo de Vide	• ClimAdaPT.Local
Chamusca	Estratégia Municipal de Adaptação às Alterações Climáticas da Chamusca	• Seguindo orientação ClimAdaPT.Local
Coruche	Estratégia Municipal de Adaptação às Alterações Climáticas de Coruche	• ClimAdaPT.Local
Espinho	Estratégia Municipal de Adaptação às Alterações Climáticas de Espinho	• Seguindo orientação ClimAdaPT.Local (parcial)
Évora	Estratégia Municipal de Adaptação às Alterações Climáticas de Évora	• ClimAdaPT.Local

Municipality	Plan / Strategy	Type
Faro	Estratégia Municipal de Adaptação às Alterações Climáticas de Faro	• Estratégia Municipal de Adaptação às Alterações Climáticas
Ferreira do Alentejo	Estratégia Municipal de Adaptação às Alterações Climáticas de Ferreira do Alentejo	• ClimAdaPT.Local
Figueira da Foz	Estratégia Municipal de Adaptação às Alterações Climáticas da Figueira da Foz	• ClimAdaPT.Local
Funchal	Estratégia Municipal de Adaptação às Alterações Climáticas do Funchal	• ClimAdaPT.Local
Golegã	Estratégia Municipal de Adaptação às Alterações Climáticas da Golegã	• Seguindo orientação ClimAdaPT.Local
Gondomar	Estratégia Municipal de Adaptação às Alterações Climáticas de Gondomar	• Seguindo orientação ClimAdaPT.Local (parcial)
Guarda	Estratégia Municipal de Adaptação às Alterações Climáticas da Guarda	• Seguindo orientação ClimAdaPT.Local (parcial)
Guimarães	Estratégia Municipal de Adaptação às Alterações Climáticas de Guimarães	• ClimAdaPT.Local
Ílhavo	Plano Municipal de Adaptação às Alterações Climáticas de Ílhavo	• Plano de Adaptação às Alterações Climáticas
Lagos	Plano Municipal de Adaptação às Alterações Climáticas de Lagos	• Plano de Adaptação às Alterações Climáticas
Leiria	Plano Municipal de Adaptação às Alterações Climáticas de Leiria	• Plano de Adaptação às Alterações Climáticas
Lisboa	Estratégia Municipal de Adaptação às Alterações Climáticas de Lisboa [3]	• ClimAdaPT.Local
Loulé	Plano Municipal de Ação Climática de Loulé	• Plano Municipal de Ação Climática
Loures	Plano Municipal de Adaptação às Alterações Climáticas de Loures	• Plano de Adaptação às Alterações Climáticas
Mafra	Estratégia Municipal de Adaptação às Alterações Climáticas de Loulé	• ClimAdaPT.Local
Maia	Estratégia Municipal de Adaptação às Alterações Climáticas da Maia	• Seguindo orientação ClimAdaPT.Local (parcial)
Matosinhos	Estratégia Municipal de Adaptação às Alterações Climáticas de Matosinhos	• Seguindo orientação ClimAdaPT.Local (parcial)
Montalegre	Estratégia Municipal de Adaptação às Alterações Climáticas de Montalegre	• ClimAdaPT.Local
Odemira	Estratégia Municipal de Adaptação às Alterações Climáticas de Odemira	• ClimAdaPT.Local
Oliveira de Azeméis	Estratégia Municipal de Adaptação às Alterações Climáticas de Oliveira da Azeméis	• Seguindo orientação ClimAdaPT.Local (parcial)
Palmela	Plano Local de Adaptação às Alterações Climáticas de Palmela	• Plano de Adaptação às Alterações Climáticas

[3] O Município de Lisboa aprovou em 2022 o Plano de Ação Climática Lisboa 2030, todavia no âmbito deste estudo foi considerada a EMAAC Lisboa, aprovada em 2017 por apresentar uma lista mais detalhada de medidas de adaptação.

Municipality	Plan / Strategy	Type
Paredes	Estratégia Municipal de Adaptação às Alterações Climáticas de Paredes	• Seguindo orientação ClimAdaPT.Local (parcial)
Porto	Estratégia Municipal de Adaptação às Alterações Climáticas do Porto	• Seguindo orientação ClimAdaPT.Local (parcial)
Póvoa de Varzim	Estratégia Municipal de Adaptação às Alterações Climáticas da Póvoa de Varzim	• Seguindo orientação ClimAdaPT.Local (parcial)
Rio Maior	Estratégia Municipal de Adaptação às Alterações Climáticas de Rio Maior	• Seguindo orientação ClimAdaPT.Local
Salvaterra de Magos	Estratégia Municipal de Adaptação às Alterações Climáticas de Salvaterra de Magos	• Seguindo orientação ClimAdaPT.Local
Santa Maria da Feira	Estratégia Municipal de Adaptação às Alterações Climáticas de Santa Maria da Feira	• Seguindo orientação ClimAdaPT.Local (parcial)
Santarém	Estratégia Municipal de Adaptação às Alterações Climáticas de Santarém	• Seguindo orientação ClimAdaPT.Local
Santo Tirso	Estratégia Municipal de Adaptação às Alterações Climáticas de Santo Tirso	• Seguindo orientação ClimAdaPT.Local (parcial)
São João da Madeira	Estratégia Municipal de Adaptação às Alterações Climáticas de São João da Madeira	• Seguindo orientação ClimAdaPT.Local (parcial)
São João da Pesqueira	Estratégia Municipal de Adaptação às Alterações Climáticas de São João da Pesqueira	• ClimAdaPT.Local
Seia	Estratégia Municipal de Adaptação às Alterações Climáticas de Seia	• ClimAdaPT.Local
Sesimbra	Plano Local de Adaptação às Alterações Climáticas de Sesimbra	• Plano de Adaptação às Alterações Climáticas
Setúbal	Plano Local de Adaptação às Alterações Climáticas de Setúbal	• Plano de Adaptação às Alterações Climáticas
Sintra	Plano Estratégico do Concelho de Sintra Face às Alterações Climáticas	• Plano estratégico de Adaptação às Alterações Climáticas
Tomar	Estratégia Municipal de Adaptação às Alterações Climáticas de Tomar	• ClimAdaPT.Local
Tondela	Estratégia Municipal de Adaptação às Alterações Climáticas de Tondela	• ClimAdaPT.Local
Torres Vedras	Estratégia Municipal de Adaptação às Alterações Climáticas de Torres Vedras	• ClimAdaPT.Local
Trofa	Estratégia Municipal de Adaptação às Alterações Climáticas da Trofa	• Seguindo orientação ClimAdaPT.Local (parcial)
Vale de Cambra	Estratégia Municipal de Adaptação às Alterações Climáticas de Vale de Cambra	• Seguindo orientação ClimAdaPT.Local (parcial)
Viana do Castelo	Estratégia Municipal de Adaptação às Alterações Climáticas de Viana do Castelo	• ClimAdaPT.Local
Vila do Conde	Estratégia Municipal de Adaptação às Alterações Climáticas de Vila do Conde	• Seguindo orientação ClimAdaPT.Local (parcial)
Vila Franca de Xira	Plano Municipal de Adaptação às Alterações Climáticas de Vila Franca de Xira	• Plano de Adaptação às Alterações Climáticas

Municipality	Plan / Strategy	Type
Vila Franca do Campo	Estratégia Municipal de Adaptação às Alterações Climáticas de Vila Franca do Campo	• ClimAdaPT.Local
Vila de Rei	Estratégia Municipal de Adaptação às Alterações Climáticas de Vila de Rei	• Seguindo orientação ClimAdaPT.Local
Vila Nova de Gaia	Estratégia Municipal de Adaptação às Alterações Climáticas de Vila Nova de Gaia	• Seguindo orientação ClimAdaPT.Local (parcial)
Vila Nova de Poiares	Plano de Adaptação às Alterações Climáticas de Vila Nova de Poiares	• Seguindo orientação ClimAdaPT.Local (parcial)
Viseu	Estratégia Municipal de Adaptação às Alterações Climáticas de Viseu	• Estratégia Municipal com metodologia específica

Fonte: CEDRU (2023)

This group of municipalities is expected to expand soon, given that **at the time of writing this study, 25 municipal climate change adaptation plans,** co-financed by the EEA Grants, were **being finalised,** namely in the Oeste and Alentejo Central sub-regions.

There are some methodological nuances in the instruments in force due to the breadth of time that comprises this universe (the oldest being from 2009 and the most recent from 2023), as well as the technical and scientific advances that have taken place in recent years. However, it is **worth highlighting the homogeneity of these documents in terms of content and approach. This is because many strategies were realised during the ClimAdaPT.Local project, whose methodology was a reference** for municipalities and consultants and for defining funding rules.

Although the ClimAdaPT.Local methodology had limitations when it came to mapping climate risks**. It signalled the need to integrate adaptation options into land-use planning**, encouraging the identification of the type of PMOT that should accommodate them and the forms of integration and implementation. **This approach, with a very variable level of development, has been adopted by the majority of plans and strategies realised since then,** forming part of the basic structure of local climate adaptation planning.

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4. Analysis of planned adaptation measures

4.1 Introduction

4.1.1 Objectives of the analysis

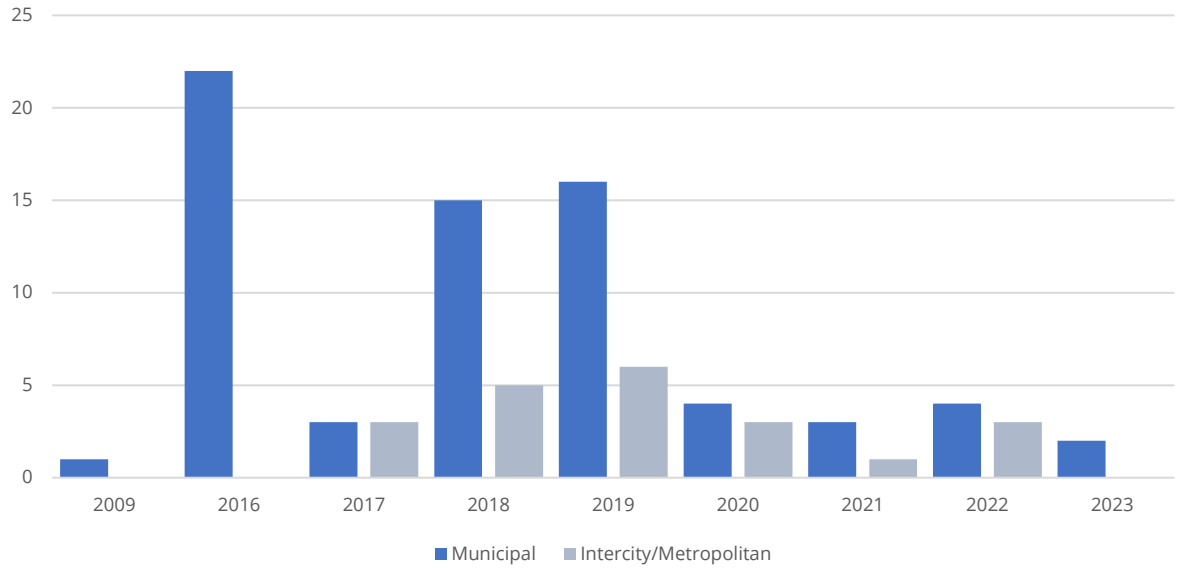
Based on the various municipal and inter-municipal climate adaptation planning instruments in force in Portugal, a systematic survey was carried out of the measures included in these instruments aimed at adapting to the climate hazards highlighted in the National Adaptation Roadmap 2100, namely drought and water scarcity, rural fires and coastal erosion, overtopping and flooding.

This survey aimed to identify how these instruments advocate adaptation to these climate hazards and how a **framework of guidelines** can be **defined to facilitate their operationalisation through land-use planning instruments**.

4.1.2. Objects of analysis

Over the last decade, Portugal has undergone a structural transformation **in developing municipal and inter-municipal climate change adaptation planning instruments (Figure 4)**.

Figure 4 - Distribution of the adaptation instruments analysed by date of preparation



Source: CEDRU (2023)

It should be noted that 82.3 per cent of the 92 adaptation instruments in force in July 2023 were drawn up between 2016 and 2019. The explanation for this dynamic is fundamentally based on the temporal combination of two vectors. Firstly, **a clear consensus and political orientation, both international and national, regarding the centrality of the local scale in adapting to climate change**. This has been recognised in Portugal since the first version of ENAAC, which acknowledged the "*enormous importance local authorities will have in adapting to climate change. (...) At this level, many of the main adaptation measures will finally be implemented.*" Likewise, with this

orientation, ENAAC 2020 emphasised the "*importance of promoting the integration of adaptation to climate change into territorial management instruments at local level*".

Secondly, there is **a clear link between the funding frameworks and the production of most of the adaptation instruments**:

- the first period of expansion was based on funding from the EEA Grants and was operationalised by the ClimAdaPT.Local project, which was reflected in the volume of instruments registered in 2016 (Table 6);
- a **second period, supported by EU funding through POSEUR**, which informs the increase in 2018 and 2019, substantially leveraging the production of adaptation instruments on an inter-municipal scale;
- finally, **a new wave of adaptation instruments is anticipated for 2024, the preparation of which is being funded by the EEA Grants 2014-2021 cycle** under the "Environment, Climate Change and Low Carbon Economy" Programme (as they are in the finalisation or approval phase by the municipal councils, they are not included in this analysis).

However, these periods do not cover all the instruments analysed. The remaining cases result from initiatives supported exclusively by municipal funding or reflect other sources of financing (e.g. INTERREG, etc.) used on a more ad hoc basis.

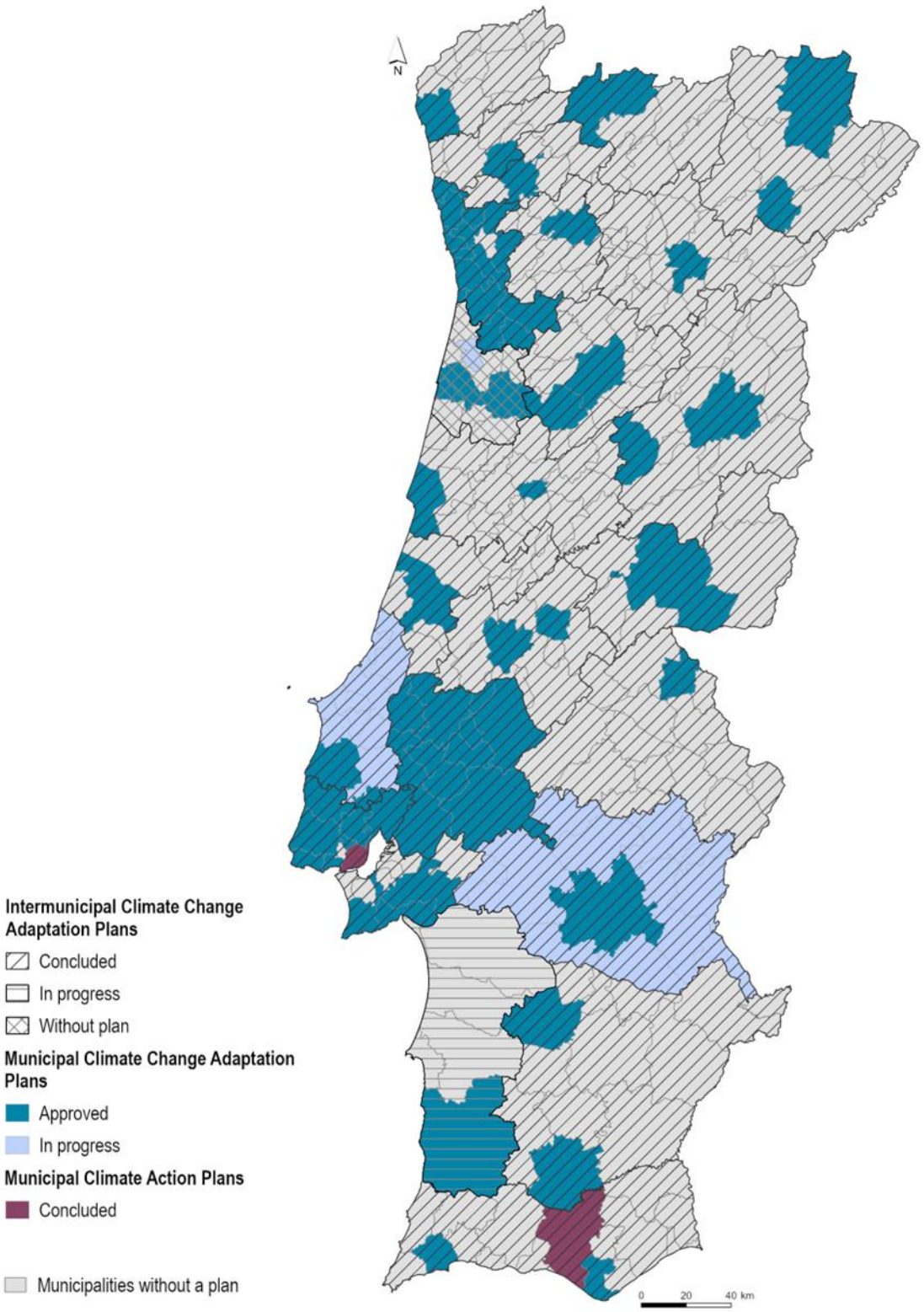
However, it should be noted that **the chronology of local adaptive planning in Portugal is slightly different from what can be seen in Figure 4 since, in some cases, the instruments currently in force have replaced/revised strategies or plans** considered obsolete by the municipalities. These are the cases of the municipalities of Cascais, Ílhavo, Leiria, Lisbon and Loulé, which already have second-generation instruments. This scenario may increase in the coming years due to the publication of the Basic Climate Law, which makes it compulsory for Portuguese municipalities to draw up Local Climate Action Plans.

In short, in July 2023, the territory of mainland Portugal was practically covered by municipal or inter-municipal planning instruments, the exceptions being NUT III Alentejo Litoral (plan in preparation) and NUT III Região de Aveiro (no plan).

At the municipal level, the situation is not so positive, as only the situations of the Porto Metropolitan Area, Lezíria do Tejo and the Lisbon Metropolitan Area stand out, where all or most municipalities have an adaptation instrument. This outlook should improve significantly in Oeste, Alentejo Central, Beiras e Serra da Estrela and Alto Tâmega e Barroso, as municipal-level instruments covering the whole of the respective NUTS III are in the process of being approved or drafted (Figure 5).

These adaptation instruments take on different names, depending on their scale, timing and scope in terms of climate action: Municipal Climate Change Adaptation Strategies, Municipal (or Local) Climate Change Adaptation Plans, Intermunicipal Climate Change Adaptation Strategies, Intermunicipal (or Metropolitan) Climate Change Adaptation Plans, Climate Action Plans or Climate Change Strategic Plans.

Figure 5 - Status of the development of adaptation tools (by type of tool)



Source: CEDRU (July 2023)

4.1.3 Methodology

As a first step, and based on the instruments identified and collected, **a database was built with the measures proposed in each instrument**. To systematise the measures and due to the variability of names, details and hierarchical structures between what are considered adaptation measures or options, they were harmonised into three types of intervention, established according to their materialisation in the territory:

- Grey Infrastructure (CI - e.g. coastal protection works, water retention systems, maintenance of the forest road network, etc;)
- Green Infrastructure (IV - e.g. conservation of forest areas of outstanding natural value, rehabilitation of riparian galleries, etc.);
- Non-infrastructural (Soft - e.g. drawing up development or management plans, promoting good practice, monitoring, etc.).

Of the total of 3,615 measures identified in the 92 instruments analysed (Table 7), **1,023 (28.2%) concern measures to adapt to the climate hazards covered by the RNA 2100**: droughts, water scarcity, rural fires, coastal erosion, and coastal erosion and flooding (Tables 9, 10 and 11).

Table 7 - Climate change adaptation measures by scope of adaptation instrument.

Scope	Instruments (no.)	Adaptation measures (no.)	Average number of measurements
Municipal	70	2.510	36
Intercity	22	1.105	53

Source: CEDRU (2023)

In the second phase, **the most recurrent adaptation measures for adapting to the hazards covered by the RNA 2100 were analysed and classified into 29 categories. These categories were grouped into three groups**: (i) droughts and water scarcity, (ii) rural fires, (iii) coastal erosion, overtopping and flooding (Table 8). As explained above, this grouping resulted from the fact that the plans in force deal with the danger of drought, water scarcity, and the various types of coastal threats.

This approach was partly based on the categorisation of adaptation options provided by the European Climate Adaptation Platform Climate-ADAPT (https://climate-adapt.eea.europa.eu/) and is based on a common European denominator, which was later adapted to the specificities of Portugal, given that forest fires are not recognised as a climate hazard at European level.

Finally, due to the diversity of adaptation measures envisaged, the significant range in the level of detail with which they are presented in the adaptation instruments and the fact that, in some cases, their relationship with the IGTs is minimal, **cross-cutting measures not explicitly covered by the hazards mentioned were excluded from this analysis.**

Table 8 - Classification categories for adaptation measures in adaptation instruments local and inter-municipal

Drought and water scarcity	Rural fires	Erosion, overtopping and coastal flooding
Urban design and *water-sensitive* construction	Adaptation or protection of infrastructure	Adaptation of structures
Strengthening the availability and alternative sources of water resources	Control and utilisation of forest biomass	Beach nourishment or dune reinforcement
Efficiency in urban irrigation	Surveillance or fire-fighting equipment	Delimitation or extension of risk zones
Water distribution and storage systems	Fuel management strips	Cliff stabilisation
Aquifer management	Emergency plans	Integrating climate adaptation into coastal management plans
Urban green infrastructure and nature-based solutions	Forest planning and management plans	Coastal protection works
Integrating climate adaptation into drought and water management plans	Promoting agroforestry activities	Renaturalisation or ecological regeneration of coastal areas
Rehabilitation, renaturalisation or conservation of watercourses and riparian galleries	Promoting the forest mosaic	
Reuse of water resources	Reforestation	
Restrictions, monitoring or incentives for the appropriate use of water resources	Use of native or adapted forest species	
Water retention for agricultural uses and adapted agricultural practices		
Use of indigenous or adapted agricultural species		

Source: CEDRU (2023)

4.2. Analysis of planned adaptation measures

4.2.1 Drought and water scarcity

Based on the survey and categorisation of the measures provided for in current municipal and inter-municipal plans and strategies that contribute to adaptation to the dangers of drought and water scarcity (Table 9), the **following main conclusions** were identified:

- of the various hazards analysed, **drought and water scarcity are the one that brings together the most significant number of adaptation measures**;
- the **obsolescence of** water **supply networks and the high volume of real losses currently occurring in low-level networks** (ERSAR, 2023) explains the emphasis on interventions in "water distribution and storage systems";

- the promotion of **water efficiency has been gaining expression in the most recent adaptation instruments**, with a substantial focus on the reuse of rainwater and wastewater, encouraged by the publication of Decree-Law no. 119/2019 of 21 August, which defined the Legal Regime for the Production of Water for Reuse, as well as the improvement or construction of water retention and distribution efficiency infrastructures;
- the **preservation and recovery of ecosystems associated with water resources**, such as riparian galleries and other green structures in an urban context, is also emphasised, in an evident appreciation of the regularisation services provided by ecosystems;
- **the overwhelming majority of the measures can be operationally integrated into the IGT, i.e. by defining actions included in the Implementation Programmes,** as they are physical interventions of either the grey (36%) or green (15%) type;
- many soft (non-infrastructural) measures in the Other category reflect a broad but heterogeneous universe that includes awareness-raising actions, promoting good practices in civil society, etc.

Table 9 - Adaptation measures to the dangers of drought and water scarcity by category and type of intervention

Category	No. of measures	IC	IV	Soft
Water distribution and storage systems	93	65	4	24
Water retention for agricultural uses and adapted agricultural practices	61	25	6	30
Reuse of water resources	60	36	4	20
Rehabilitation, renaturalisation or conservation of watercourses and riparian galleries	54	3	45	6
Restrictions, monitoring or incentives for the appropriate use of water resources	46	6	0	40
Aquifer management	42	9	5	28
Efficiency in urban irrigation	41	22	5	14
Integrating climate adaptation into drought and water management plans	31	1	2	28
Strengthening the availability and alternative sources of water resources	15	10	1	4
Urban design and *water-sensitive* construction	14	13	0	1
Use of indigenous or adapted agricultural species	11	1	8	2
Urban green infrastructure and nature-based solutions	6	0	3	3
Other	111	20	7	84
Total	**585**	**211**	**90**	**284**

Source: CEDRU (2023)

4.2.2 Rural fires

Although negligent use and arson are the leading causes of fires in Portugal, and the vulnerability of rural and forest areas is highly aggravated by depopulation and lack of landscape planning, it is widely recognised that climate

change, by increasing dryness and the occurrence of extreme heat events, creates highly favourable conditions for the outbreak and rapid spread of fires.

The survey and classification of adaptation measures to this climate hazard, provided for in local and inter-municipal planning instruments (Table 10), allows us to highlight trends **and the over-representation of some forms of response**:

- There is an **emphasis on measures aimed at fighting and responding to fires,** expressed by the two largest categories of measures, "means of monitoring or fighting fires" and "emergency plans", which cover around 25 per cent of the total;
- "Forest planning and management", "promotion of the forest mosaic", or "use of native or adapted forest species" also account for 25% of the total number of measures, revealing **new ways of responding to the problem of fires,** not least the impact of the Landscape Reordering and Management Programmes (PRGP) and all the measures approved after the 2017 fires;
- there is a **significant representation of *soft* measures**, mainly related to emergency plans or forest management, as well as the promotion of forestry practices adapted to climate change;
- the focus of the measures is on **grey infrastructure, and these are fundamentally related to the means of surveillance and firefighting**, including the maintenance of roads for the movement of fire**fighting resources;**
- the green infrastructure measures include **IV management measures** such as fuel management strips, forest mosaics, reforestation and the use of native species;
- **many measures could be included in the PDM regulations relating to the definition of buffer strips and the management of forest areas (although municipal limitations exist whe**n applying this rule)**.**

Table 10 - Rural fire hazard adaptation measures by category and type of intervention

Category	No. of measures	IC	IV	Soft
Surveillance or fire-fighting equipment	44	22	4	18
Emergency plans	28	0	3	25
Forest planning and management plans	27	0	4	23
Adaptation or protection of infrastructure	26	7	5	14
Promoting the forest mosaic	24	0	14	10
Control and utilisation of forest biomass	22	2	12	8
Fuel management strips	20	0	17	3
Reforestation	19	0	14	5
Use of native or adapted forest species	19	0	15	4
Promoting agroforestry activities	18	0	4	14
Other	36	2	6	28
Total	**283**	**33**	**98**	**152**

Source: CEDRU (2023)

4.2.3 Coastal erosion, overtopping and flooding

The expanse of low, sandy coastline, the highly energetic characteristics of coastal dynamics and the sedimentary deficit that characterises the entire coast of mainland Portugal mean that **this territory is currently marked by significant impacts resulting from extreme events**.

The survey and classification of measures to promote the adaptation of coastal territories to the dangers of coastal erosion, overtopping and flooding (Table 11) shows that there is **a growing consensus on measures to reduce exposure and that protection structures continue to be given great importance. The main conclusions were**:

- **there is a strong focus on infrastructure measures, particularly coastal protection works** and beach nourishment and dune reinforcement, already in line with the guidelines of the Coastal Working Group Report (GTL, 2014);
- However, measures that will be operationally integrated into the IGTs prevail**, i.e. regulatory integration measures** such as the delimitation of risk bands, which are primarily the result of the POCs and correspond to around 26 per cent of all measures;
- in many instruments, **measures are beginning to emerge relating to the retreat of occupation in danger zones, fundamentally at the level of studies;**
- there is **limited mobilisation of nature-based measures such as the renaturation/ecological regeneration of coastal areas** or those aimed at landscape resilience.

Table 11 - Adaptation measures to the dangers of erosion and coastal overtopping and flooding by category and type of intervention

Category	No. of measures	IC	IV	Soft
Delimitation or retreat of risk zones	40	11	4	25
Coastal protection works	26	26	0	0
Adaptation of structures	25	20	4	1
Beach nourishment or dune reinforcement	25	5	20	0
Renaturalisation or ecological regeneration of coastal areas	17	3	13	1
Integrating climate adaptation into coastal management plans	12	2	1	9
Cliff stabilisation	8	7	1	0
Total	**153**	**74**	**43**	**36**

Source: CEDRU (2023)

4.3 Forms of integration into the IGTs provided for in the adaptation measures

Concerning the conceptual framework for integrating adaptation to climate change into the IGTs presented in point 3.2, **the adaptation measures identified in the municipal and inter-municipal adaptation planning instruments were categorised, and** the potential conditions for the PDMs to promote their implementation were assessed.

This exercise, which is systematised in Table 12, shows from the outset that the response to the various climate hazards covered by the RNA 2100 through the PDMs requires a diverse range of approaches, mainly operational (Implementation Programme) and strategic (Territorial Development Strategy), but also regulatory (Regulations and Plans).

Table 12 - Distribution of adaptation measures envisaged in municipal and inter-municipal adaptation instruments by dimensions of integration of adaptation in territorial management instruments

Climate danger	Operational	Regulate	Strategy	Territorial Governance
Drought and water scarcity	484	26	59	18
Rural fires	189	23	59	12
Coastal erosion and overtopping	120	19	14	0
Total	**793**	**68**	**132**	**30**

Source: CEDRU (2023)

It can be seen that in all the hazards analysed, there is a **predominance of measures with operational integration potential** (77.5%), and this situation is particularly significant when it comes to adapting to the hazards of drought and water scarcity (which account for 82.4% of all the measures identified), which results from the fact that these are essentially infrastructural measures related to supply systems. This is consistent with the Annual Report on Water and Waste Services in Portugal 2022 (RASARP 2022), which signalled the need for the sector to devote special attention to the rehabilitation of pipelines and consequently to water losses and unbilled water.

Strategic (12.9%) and regulatory (6.6%) measures are identifiable in all the hazards analysed on a much smaller scale than the operational dimension.

Finally, it is essential to highlight the **near absence (2.9 per cent) of measures explicitly focused on territorial governance** associated with integrating adaptation in the PDMs, regardless of the hazard under analysis.

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5. Analysing the integration of adaptation into Municipal Master Plans

5.1 Introduction

5.1.1 Objectives of the analysis

This chapter aims to **analyse how climate change adaptation measures have been transposed into the PDMs,** thus materialising the process of integrating adaptation as recommended in climate change adaptation plans and strategies. This analysis follows the approach adopted in the previous chapter, seeking to **identify the categories of adaptation measures that municipalities have been introducing into their PDMs** for the climate hazards of the RNA 2100.

5.1.2. Objects of analysis

Considering the purpose of this exercise, **the PDMs** approved after 2015 **were analysed**, i.e. **after the publication of** the Legal Regime for Territorial Management Instruments on 14 May 2015 and after the publication of ENAAC 2020 on 30 July 2015. This cut-off period was chosen for two reasons: (i) because the PDMs now contain the provisions of the Special Plans and Programmes, and since then they have been the repository of all the rules binding on private individuals, which is extremely important when it comes to, for example, integrating the rules for safeguarding coastal risks defined in the POCs; (ii) because since ENAAC 2020 the centrality of the PDMs in the pursuit of this national policy has been made clear. Furthermore, since 2015, successive government programmes have attached great importance to incorporating the rules of municipal adaptation strategies and plans into the territorial planning instruments that fall within the competence of municipalities.

The dynamics considered were the revision and **alteration by adaptation of PDMs to Special Territorial Planning Plans and Programmes,** namely **Coastal Zone Programmes**[4] (with emphasis on the most recent ones: POC Caminha - Espinho, POC Ovar - Marinha Grande, POC Alcobaça - Cabo Espichel and POC Espichel-Odeceixe).

The **analysis universe covered 125 PDMs**, and the respective Regulations (published in the Diário da República) and Implementation Programmes (available on deposit at the DGT) were analysed. Adaptation measures integrated into the PDMs in a strategic or governance manner were not studied as collecting and analysing all the Plan Reports in good time was impossible.

5.1.3 Methodology

Analysis of the PDM regulations and implementation programmes **identified 1,941 climate change adaptation measures that directly or indirectly address the climate hazards covered by the RNA 2100**. Table 13 shows, by municipality, the existence of measures for each of the RNA 2100 climate hazards, grouped into drought and water scarcity, rural fires, coastal erosion and overtopping, to ensure consistency with the previous chapter.

[4] Given the limited time frame of the mapping process, adaptations to the Coastal Zone Management Plans (POOC) were not considered.

Table 13 - PDMs analysed and the existence of measures per climate hazard

NUTS II	NUTS III	County	Dangers		
			Drought and water scarcity	Rural fires	Erosion and coastal overtopping and flooding
Alentejo	Alentejo Central	Alandroal	▪	▪	(x)
		Estremoz	▪	▪	(x)
		Montemor-o-Novo	▪	▪	(x)
		Mora	▪	▪	(x)
		Viana do Alentejo	▪	▪	(x)
	Alentejo Litoral	Alcácer do Sal	▪	▪	▪
		Grândola	▪	▪	▪
		Santiago do Cacém		▪	▪
	Alto Alentejo	Campo Maior		▪	(x)
		Castelo de Vide	▪	▪	(x)
		Marvão	▪	▪	(x)
		Monforte	▪	▪	(x)
		Nisa	▪	▪	(x)
	Baixo Alentejo	Alvito	▪	▪	(x)
		Ourique	▪	▪	(x)
		Vidigueira	▪	▪	(x)
Algarve	Algarve	Albufeira	▪		▪
		Aljezur	▪		▪
		Faro			▪
		Lagoa	▪	▪	▪
		Lagos	▪		▪
		Loulé	▪		▪
		Portimão			▪
		Olhão			▪
		Silves	▪	▪	▪
		Tavira			▪
		Vila do Bispo		▪	▪
Centro	Beira Baixa	Oleiros	▪	▪	(x)
		Penamacor	▪	▪	(x)
		Proença-a-Nova	▪	▪	(x)

NUTS II	NUTS III	County	Dangers		
			Drought and water scarcity	Rural fires	Erosion and coastal overtopping and flooding
		Vila Velha de Ródão	▪	▪	(x)
	Beiras e Serra da Estrela	Celorico da Beira	▪	▪	(x)
		Fornos de Algodres	▪	▪	(x)
		Manteigas		▪	(x)
		Mêda	▪		(x)
		Sabugal	▪	▪	(x)
		Seia	▪	▪	(x)
		Trancoso	▪		(x)
	Região de Aveiro	Anadia	▪	▪	(x)
		Aveiro	▪	▪	▪
		Ílhavo	▪	▪	▪
		Murtosa		▪	▪
		Oliveira do Bairro	▪	▪	(x)
		Ovar	▪	▪	▪
		Vagos	▪		▪
	Região de Coimbra	Arganil	▪	▪	(x)
		Cantanhede	▪	▪	▪
		Coimbra		▪	(x)
		Condeixa-a-Nova	▪	▪	(x)
		Figueira da Foz	▪	▪	▪
		Mira			▪
		Montemor-o-Velho	▪	▪	(x)
		Penacova	▪	▪	(x)
	Região de Leiria	Ansião	▪	▪	(x)
		Batalha	▪	▪	(x)
		Castanheira de Pera	▪	▪	(x)
		Figueiró dos Vinhos	▪	▪	(x)
		Leiria	▪	▪	▪
		Marinha Grande	▪		▪

NUTS II	NUTS III	County	Dangers		
			Drought and water scarcity	Rural fires	Erosion and coastal overtopping and flooding
		Pedrógão Grande	■	■	(x)
		Pombal			■
		Porto de Mós	■	■	(x)
	Viseu Dão Lafões	Oliveira de Frades	■	■	(x)
		Penalva do Castelo	■	■	(x)
		Viseu	■	■	(x)
Grande Lisboa e Península de Setúbal	Grande Lisboa	Cascais	■	■	■
		Loures	■	■	(x)
		Mafra	■	■	■
		Oeiras	■	■	■
		Sintra	■	■	■
	Península de Setúbal	Almada			■
		Sesimbra	■		■
		Setúbal	■		■
Norte	Alto Minho	Caminha	■	■	■
		Melgaço	■	■	(x)
		Paredes de Coura		■	(x)
		Viana do Castelo			■
	Área Metropolitana do Porto	Espinho	■	■	■
		Gondomar	■	■	(x)
		Matosinhos	■	■	■
		Porto	■	■	■
		Póvoa de Varzim	■		■
		Santa Maria da Feira	■	■	(x)
		Vila do Conde			■
		Vila Nova de Gaia		■	■
	Ave	Fafe		■	(x)
		Guimarães	■	■	(x)
		Mondim de Basto	■	■	(x)

NUTS II	NUTS III	County	Dangers		
			Drought and water scarcity	Rural fires	Erosion and coastal overtopping and flooding
		Povoa de Lanhoso	▪	▪	(x)
		Vieira do Minho		▪	(x)
		Vila Nova de Famalicão	▪	▪	(x)
	Cávado	Barcelos	▪	▪	(x)
		Braga	▪	▪	(x)
		Esposende	▪	▪	▪
		Terras de Bouro	▪	▪	(x)
	Douro	Armamar	▪	▪	(x)
		Carrazeda de Ansiães	▪	▪	(x)
		Lamego	▪	▪	(x)
		Moimenta da Beira		▪	(x)
		Murça	▪	▪	(x)
		São João da Pesqueira	▪	▪	(x)
		Tarouca	▪	▪	(x)
		Vila Nova de Foz Côa	▪	▪	(x)
	Tâmega e Sousa	Amarante	▪	▪	(x)
		Baião	▪	▪	(x)
		Castelo de Paiva	▪	▪	(x)
		Felgueiras	▪	▪	(x)
		Marco de Canaveses	▪	▪	(x)
	Terras de Trás-os-Montes	Macedo de Cavaleiros	▪	▪	(x)
		Miranda do Douro	▪	▪	(x)
		Mirandela	▪	▪	(x)
		Vila Flor	▪	▪	(x)
		Vimioso	▪	▪	(x)
Oeste e Vale do Tejo	Lezíria do Tejo	Benavente	▪	▪	(x)
	Médio Tejo	Alcanena	▪	▪	(x)

NUTS II	NUTS III	County	Dangers		
			Drought and water scarcity	Rural fires	Erosion and coastal overtopping and flooding
		Constância	▪	▪	(x)
		Ourém	▪	▪	(x)
		Tomar	▪	▪	(x)
	Oeste	Alcobaça	▪		▪
		Caldas da Rainha			▪
		Lourinhã	▪	▪	▪
		Nazaré			▪
		Óbidos	▪	▪	▪
		Peniche			▪
		Torres Vedras		▪	▪

Caption:
▪ PDM includes measures to adapt to climate hazards | (x) Municipality without coastline

Source: CEDRU (2023)

Of the **125 municipalities analysed, 52 are located on the coast and have a coastline,** while the rest have no interface with the ocean.

Once they had been identified, the adaptation measures were analysed and classified (Table 14) about the following parameters:

- **relevance** - defined based on the importance of the measure in adapting to climate change, the measures were prioritised on a scale with three levels: from "1 - not very relevant" to "3 - very relevant";
- **form of integration** - depending on the type of document it was included in, the adaptation measure was classified as: "regulatory" when it was identified in the regulation, "strategic" when it was in the form of an objective in the implementation programme or the regulation, and "operational" when it corresponded to a concrete action provided for in the implementation programme.
- **type of intervention** - as explained in the previous chapter, depending on the type of materialisation in the territory, the measure is classified as: "green" infrastructure (dune recovery, construction of green spaces, reforestation, etc.), "grey" infrastructure (construction of ponds, construction of rainwater retention and treatment infrastructures, etc.) and "*soft" infrastructure* (when the measure constitutes a prohibition, such as the banning of practices that aggravate the danger).

Table 14 shows that **most of the adaptation measures recommended in the MDPs (83 per cent) are considered very relevant, with** only 48 cases identified as "not very relevant". Regarding integration, **84% of the measures were included in the Plan's Regulations, and 12% were identified in the Implementation Programme**. This **over-representation of the regulatory dimension is later reflected in the high number of measures falling under the "*soft*" intervention typology** (1,209, or 62 per cent of the measures). Green and grey infrastructures have an identical expression, covering 20% and 18% of the measures, respectively.

Table 14 - Distribution of measures identified in PDMs by analysis parameter

Source		Level of relevance			Form of integration			Type of intervention		
Regulations	Implementation programme	1 - Not very relevant	2 - Intermediately relevant	3 - Very relevant	Strategy	Regulate	Operational	IV	IC	*Soft*
1.651	290	48	284	1.609	78	1.636	227	379	353	1.209

Source: CEDRU (2023)

5.2 Analysing the adaptation measures in the PDMs

Of a total of 1,941 measures identified in the PDMs analysed, 633 (33%) were related to drought and water scarcity, 613 (32%) to rural fires and 679 (35%) to coastal erosion, overtopping and flooding, which **reflects a relatively even distribution across the three climate hazards covered by the RNA 2100**. It should be noted that the total universe included 16 multi-hazard measures, which does not allow them to be individualised into one of the typologies under analysis.

The following sections summarise the characteristics of the categories of adaptation measures planned for each climate hazard. Additional information on these categories of measures is provided in an annexe to this report (Annex A4), namely how the measures will be integrated into the PDM and the type of intervention.

5.2.1 Drought and water scarcity

A survey and analysis of the measures and actions to adapt to drought and water scarcity included in the PDMs approved after 2015 (Table 15) leads to the following conclusion:

- the **633 measures are spread over ten categories**, with a more significant presence of measures related to **wastewater treatment** (172), the **prohibition of uses harmful to the water ecosystem** (164) and water **distribution** and **storage systems** (110);[5]
- the three categories with the highest number of references are the most relevant in the context of PDMs and aim to ensure that **uses are compatible with the sensitivity of water ecosystems and the urban water cycle**;
- issues related to **supply systems** also feature prominently, justified by the **need to extend and intervene in the network**, with an emphasis on building reservoirs or safeguarding uses around water supply and distribution infrastructures;
- a similar approach applies to **wastewater treatment systems, where** there are also concerns about the **treatment of effluents or polluting substances** (wastewater treatment or storage systems);
- also noteworthy are the measures for the **rehabilitation, renaturalisation or conservation of watercourses and riparian galleries**, namely through the development of **environmental and landscape requalification programmes for watercourses** and **safeguarding** the **possibility of carrying out actions to maintain and consolidate** hydrological resources and riparian galleries.

[5] The categories related to the prohibition of uses harmful to the water ecosystem and wastewater treatment systems are not included in the measures recommended by the adaptation planning instruments (tables 8 and 9). In the case of wastewater treatment systems, the frequency of references and their disaggregation from supply and distribution systems justified their individualisation.

Table 15 - Measures identified in the PDMs related to adaptation to the dangers of drought and water scarcity by category

Categories	Number of measures	Forms of realisation
Wastewater treatment systems	172	• In this category, the approach shares some similarities with the category relating to supply systems, although in this particular case, the focus is on effluent treatment systems. • In this context, the PDMs promote the restriction of uses in sensitive areas for these infrastructures and the extension of these systems to new areas, promoting wastewater treatment and thus maintaining the qualitative status of water bodies.
Prohibition of uses that harm the water ecosystem	164	• In this category, the actions identified focus essentially on restricting uses in sensitive areas from the point of view of water resources, seeking to mitigate pressure on water quantity and quality. • This category includes restrictions on the use and occupation of land near watercourses and the obligation for infrastructures with damaging potential (such as eco-centres or industries) to adopt preventive methods to avoid pollution and contamination of water resources.
Water distribution and storage systems	110	• The safeguarding of supply systems, as well as their maintenance and conservation. • In this context, the PDMs and identifying the equipment needs for this infrastructure also define the prohibition of use in sensitive areas, namely construction near reservoirs and tanks. • Some PDMs also address the need to register these networks. • The issues of losses and separate networks are not directly addressed. However, safeguarding the need for intervention to modernise these networks indirectly refers to these aspects.
Rehabilitation, renaturalisation or conservation of watercourses and riparian galleries	84	• Implementing actions to rehabilitate, renaturalise or conserve watercourses and riparian galleries is particularly important in the context of intervention actions to restore these areas. • There are also some cases in which it is permissible to change from forestry to agricultural use, provided that the water lines and respective riparian galleries are safeguarded, thus contributing to their maintenance. • On the other hand, actions were also identified to develop intervention and requalification programmes for watercourses.
Aquifer management	21	• The safeguarding of aquifers is expressed in prohibiting uses that jeopardise their good quantitative and qualitative state. • In this context, restrictions are put in place in strategic areas, namely the opening of groundwater abstractions (except for those for human consumption where there is no supply network) or the delimitation of protection perimeters.
Urban design and *water-sensitive* construction	15	• The urban design approach and *water-sensitive* construction seek to harmonise urbanisation and construction processes in the context of growing uncertainty regarding water availability. • In this context, some measures promote the reduction or restriction of waterproof areas and the obligation for new constructions to reuse wastewater and rainwater (for watering green spaces and gardens). • Techniques to reduce consumption (drip or smart irrigation systems) are also discussed.
Urban green infrastructure and nature-based solutions	12	• Safeguarding green infrastructures in urban areas is accomplished through actions aimed at ensuring infiltration and using resilient species in the design of new urban parks and gardens. • In some cases, using these areas as buffer basins is also possible by modelling the terrain capturing and directing rainwater to underground storage or recharge spaces.
Efficiency in urban irrigation	8	• Concerning efficiency in urban irrigation, the actions identified focus on installing green spaces with plant species that require less water, and there are also cases in which the use of less water-intensive grass species is promoted for particularly water-intensive facilities, such as golf courses.

Categories	Number of measures	Forms of realisation
Strengthening the availability and alternative sources of water resources	6	• The use of alternative water sources is materialised in the actions under this typology, namely the use, where possible, of treated wastewater and the storage of rainwater and its use for irrigation. • The diversification of water sources helps to reduce the pressure on conventional sources.
Other	41	• This typology includes measures of a particular nature and cannot be related to the other typologies. Examples include actions associated with the development of afforestation plans or those about hydro-agricultural developments.

Source: CEDRU (2023)

5.2.2 Rural fires

About the adaptive response to the danger of rural fires, the following can be seen from the survey and analysis of the measures recommended in the PDMs (Table 16):

- 613 measures are planned, spread over **11 categories, with "use of native or adapted forest species" being the category with the greatest expression**, with 163 references, corresponding to 26.6 per cent of the total number of measures;
- there is **a dimension in** the PDMs that is **not present in the adaptation instruments, related to the prohibition of use and occupation of hazardous areas,** with 92 references, making it the second most referenced;
- issues related to the **adaptation or protection of infrastructures** are identified 77 times, and mainly concern the **definition of requirements that buildings** (new or rebuilt) **must fulfil to ensure their resilience and adaptation to the occurrence of fires** and the **containment of** possible **ignition sources**;
- At the same level of importance is the **management of fuel strips,** which, in conjunction with infrastructural adaptation, play an essential role in **mitigating the effects of rural fires**;
- the references to the **promotion of agro-forestry activities** (42), the **control and utilisation of forest biomass (**31), as well as the reference to forest **planning and management plans** (39) have approximate numbers and, between them, contribute to the **dynamisation** of **economic activities** anchored in the forest;
- the most noteworthy is the typology of **surveillance and firefighting resources,** with a total of 38 references, which cover **exceptions for installing firefighting resources or creating water points** at critical and strategic points.

Table 16 - Measures identified in PDMs related to adaptation to rural fire danger by category

Categories	Number of measures/actions	Forms of realisation
Use of native or adapted forest species	163	• The use of autochthonous or adapted forest species is included in several PDMs, and its implementation mainly involves prohibiting the introduction of invasive, weed or fast-growing plant species and promoting the use of autochthonous species or those with greater potential to adapt to climate change scenarios.
Prohibition of use and occupation of dangerous areas	92	• The ban on the use and occupation of areas at risk is materialised through limitations on building in areas where the risk of fire is significant so that

Categories	Number of measures/actions	Forms of realisation
		construction or reconstruction actions (for housing, commerce, services or industry) are restricted. • However, infrastructure construction for firefighting and supporting civil protection operations is accepted.
Adaptation or protection of infrastructure	77	• Adapting or protecting infrastructures to provide them with greater resilience is the primary approach of the PDMs in this typology. To this end, construction techniques and materials are promoted that increase the resistance of built structures to fire and reduce the potential for ignition. • In some cases, buildings must be moved away from critical forest areas.
Fuel management strips	75	• The issues related to fuel management strips involve establishing a certain distance between buildings and forest spaces to ensure their safety by keeping critical areas a reasonable distance away.
Promoting agroforestry activities	42	• The promotion of agroforestry activity appears in the PDMs analysed to clarify actions permitted in the various soil types and classifications, focusing on those related or relevant to agroforestry practices. • Some of the measures materialise this typology by identifying the practices and interventions appropriate to the characteristics and specificities of forest areas.
Forest planning and management plans	39	• Forest planning and management plans, such as the Forest Management Plans (PGF) or PMDFCI, play an essential role in implementing specific fire adaptation measures. For this reason, several PDM refer to the provisions of the PMDFCI or make forest holdings that fall within this scope subject to the PGF.
Surveillance or fire-fighting equipment	38	• This typology includes measures related to the exception to the constructive limitations of structures or buildings when associated with public safety and civil protection. Examples include water points and reservoirs, surveillance posts and equipment, strategic paths and access openings.
Control and utilisation of forest biomass	31	• As part of the control and utilisation of biomass, implementing these methods is based on forest management through deforestation, clearing, and cleaning, including forest paths. • There are also some exceptions to the ban on burning or bonfires, provided that they are in areas with infrastructures designed for this purpose and for controlling forest pests and diseases.
Reforestation	12	• This typology includes reforestation measures, especially those aligned with the provisions of a Regional Forest Management Programme (PROF). On the other hand, some provisions to be observed in reforestation are also established, namely those related to the management of fuel strips, the continuous size of the areas to be reforested, and their relative location of other territorial elements (water lines and buffer strips).
Promoting the forest mosaic	9	• Some PDMs address the promotion of a balanced forest mosaic as a form of forest enhancement and resilience, which in some cases is directly framed as a form of forest defence.
Other	35	• Measures with a broader expression or related to less common typologies have been included here. These include land registry actions, prohibiting specific uses or actions, such as dumping rubbish and debris or authorising interventions to maintain water lines, particularly banks and beds.

Source: CEDRU (2023)

5.2.3 Coastal erosion, overtopping and flooding

About the adaptive response of the PDMs to the climatic hazards of coastal erosion, overtopping and flooding, the tabulation of the measures and actions present in the PDMs (Table 17) led to the conclusion that:

- coastal erosion, overtopping and flooding are **the climate hazards with the highest number of adaptation measures in the PDMs analysed,** which is primarily the result of the drafting of the POCs and the transposition of the respective coastal risk protection regimes into the PDMs;
- a total of 679 measures were identified, spread over seven typologies, with the **delimitation and retreat of risk areas** being the typology in which the most significant part of the measures analysed fall (precisely, half of all measures), especially measures aimed at imposing limits on building, construction, reconstruction, infrastructure installation and access creation (317). This is because the **delimitation of risk areas corresponds to the densification** or **intensification of restrictions** on these territories, which essentially results from the **transposition into the PDM of the provisions contained in a Coastal Zone Plan or Programme**;
- most of the measures are related to the **definition of limitations on building or other forms of construction, reconstruction, installation of infrastructures and the creation** (opening) of **accesses** according to the dangers affecting these areas. Particularly noteworthy is **the ban on the use of basements for residential purposes** or the increase in built-up areas;
- the issue of **renaturalisation or ecological regeneration** of the coastal regions also has a notable presence in the overall context of PDM measures relating to the coastline. This relevance results, on the one hand, from the concern of municipal entities to **guarantee the good ecological and environmental state of** these areas, which implies **freeing them from the pressure of human activity,** and on the other hand, to contribute to the **proper functioning of environmental systems**, safeguarding their **capacity to mitigate the harmful effects of rising sea levels**;
- In this context, a large part of these measures focus on **banning activities that could negatively affect the environmental quality of these territories**, favouring the maintenance of natural landforms and contributing to natural drainage;
- issues related to **beach nourishment and dune reinforcement**, **cliff stabilisation** and **coastal protection works,** given their **more specific** nature, have less expression in the PDMs that formed part of the analysis universe. Nonetheless, some approaches specifically identify the **exception of activities related to this design** (allowing interventions related to sediment reinforcement on beaches and dunes) **from the universe of restrictions imposed on coastal areas**;
- notes should also be made on how to **adapt infrastructure**, mainly through **construction techniques that accommodate the rise in mean sea level** or using **porous materials** (75 measures).

Table 17 - Measures identified in the PDMs related to adaptation to the dangers of erosion and coastal overtopping and flooding by category

Types of Adaptation	Number of measures/actions	Forms of realisation
Delimitation and retreat of risk zones *(including limits on building, construction, reconstruction, infrastructure installation and access)*	342 *(317)*	• The delimitation and widening of the risk zones are mainly carried out by establishing restrictions, constraints and limits on building, construction or reconstruction, the installation of infrastructure and the creation of accesses, with a clear focus on regulations to be observed by the actions to be carried out in these risk areas. • This limitation has strong expression in the mere prohibition of building, installing infrastructure or opening accesses, as well as in the ban, in the case of reconstructions or extensions, of the use of basements below the natural level for residential purposes.

Types of Adaptation	Number of measures/actions	Forms of realisation
		• The definition of measures related to the retreat of risk zones per se is less significant. However, some PDMs mention the need to consider the gradual removal of existing buildings in these areas.
Renaturalisation or ecological regeneration of coastal areas	173	• The component of the renaturalisation or ecological regeneration of coastal areas brings together actions and measures related to the environmental recovery of the coastline. • In this context, the PDMs prohibit actions that harm the ecological quality of coastal zones, namely the dumping of rubble, camping or caravanning, activities that increase erosion or the transport of solid material into the water or alterations to the existing relief.
Adaptation of infrastructures	75	• The realisation of adaptation and infrastructures is mainly centred on promoting constructive solutions to increase infrastructural resilience in the face of the advance of seawater and the use of permeable pavements and solutions to promote rapid water run-off. • It is also worth noting the stabilisation of slopes in areas at risk of erosion and the installation of light and/or removable structures in areas at risk, favouring forms of occupation related to recreation and leisure without resorting to permanent building.
Cliff stabilisation	44	• The PDMs mainly cover stabilising cliffs as a need for intervention. They are, therefore, an exceptional action permitted within the framework of restrictions on uses and activities planned for those areas. • The full implementation of these activities (primarily to safeguard, monitor, and maintain or correct drainage regimes) is often subject to analysis or authorisation by the entities with territorial management responsibilities for the coastline.
Coastal protection works	27	• As with the cliff stabilisation category, coastal protection works are mainly enshrined as exceptions to the restrictions imposed in risk areas. • In this context, the PDMs can carry out coastal protection works, such as spurs or detached breakwaters.
Beach nourishment or dune reinforcement	16	• The measures related explicitly to beach nourishment or dune reinforcement are centred on ecological restoration actions for specific dune systems and the admission of sediment extraction, mobilisation, ripping or deposition activities to protect the coastline and reinforce dune strands. • In some PDMs, issues related to cliff stabilisation are also included in collecting and depositing sediment in critical or strategic areas for this purpose.
Other	2	• This category includes activities enshrined in the PDM that do not fall into the above typologies and are related to prohibiting or blocking public access to water.

Source: CEDRU (2023)

5.3 Conclusive summary

As a **strategic definition instrument for territorial development**, the **PDM plays** a structuring role in how land is organised, occupied and transformed.

The growing visibility of the issue of climate change, as a result of the worsening impacts of extreme weather events and the development of multiple adaptation planning instruments at the national, sub-regional and municipal levels, has reinforced the **need to promote the adaptive capacity of the territory**. This would be achieved by adopting **a significant set of adaptation measures**, many of which have their **effectiveness conditional on inclusion in IGTs**, especially the PDM.

On the other hand, the revision of the RJIGT in 2015 defined the need for **PDMs to incorporate the provisions of Territorial Programmes**. This situation was particularly relevant in the recent amendment of several PDMs to ensure that they aligned with the requirements of national and regional IGTs. In the specific case of climate change, **the Coastal Zone Programmes stand out**.

Generally speaking, the **PDMs analysed include a wide range of adaptation measures in response to the climate hazards covered by the RNA 2100,** which are usually in line with those recommended in adaptation instruments at sub-regional and municipal levels, **contributing to their effectiveness** and, consequently, to **increasing territorial resilience to the effects of climate change**.

However, some particularities in this process of promoting climate adaptation result from the fact that the **PDMs and the adaptation instruments have different natures and provisions**.

Intermunicipal and municipal climate change adaptation plans and strategies, in addition to a diagnosis of the foreseeable impacts and consequences that climate change will have on the territory, adopt strategies, **measures and actions of varying breadth and precision**, often of an **eminently strategic nature, even though their implementation depends on the respective regulation or normative definition**. **PDMs,** on the other hand, **follow a structure and organisation defined in the RJIGT,** with a legal language that materialises the municipality's strategic options for its territory. In this context, the PDM's approach, in **addition to defining the classification and classification of land use, focuses on regulating permitted, prohibited or restricted uses in certain areas**.

For the climate hazards of droughts and water scarcity, rural fires and coastal erosion, overtopping and flooding, the PDMs analysed contain **measures that define uses in strategic spaces for water lines and aquifers, forest areas in danger of fire and the coastline**.

However, **several of the measures identified are also linked to the strategic issues emanating from the adaptation plans**. Examples include using **plant species that are less demanding of water and more resilient to fires (in forest areas), the reuse and diversification of water sources, or the recovery of dune systems and the stabilisation of cliffs**. With a few exceptions, these categories are less significant when compared to the measures that refer to the definition of permitted uses in areas relevant to water resources, forests and the coastline.

Finally, it is essential to emphasise the **virtual absence of measures to regulate agricultural activity,** a decisive aspect of adapting to the danger of water scarcity. This situation results from local authorities' lack of control mechanisms for this type of provision, given that they have no control over the processes for licensing crops.

The analysis of the integration of adaptation in the universe of PDMs analysed (Tables 15, 16 and 17) shows that **there is a greater universe of measures related to the coastline, which is due to the transposition of the provisions of the Coastal Plans and Programmes into the PDMs, which intensified the regulations that safeguard risks**, The definition of various areas and types of spaces within the scope of these plans and programmes has also led to the clarification of the different types of use possible in the IGTs, which justifies the **prevalence in the PDMs of adaptation actions related to the delimitation of danger areas, as well as the imposition of restrictions on their use**.

In the case of **drought and water scarcity**, the PDMs focus mainly on **measures related to the need to intervene and improve water supply and treatment systems**, thus seeking to mitigate waste or degradation of the quality of existing water resources. **However, there is also a relevant set of adaptation actions to determine permissible uses for water resources in strategic areas**.

Finally, in the case of **rural fires**, the actions that determine the use of **native species with greater resilience in the event of fires stand** out, followed by the definition of **conditioned or restricted activities in risk areas**.

This distribution leads us to conclude that there **are** no **general gaps in** the PDMs analysed when **integrating adaptation to the hazards covered by the** RNA 2100. Although **it is** im**possible to assess the effectiveness of these measures and actions in promoting the adaptive capacity of territories**, the **PDMs include a significant part of the measures recommended in the adaptation instruments in their provisions**. **The need to adapt the measures to the form and structure of the PDM** is also **evident,** which is why **categories of measures that were not included in the analysis matrices of the adaptation instruments** have **been included in** all the hazards. This reflects the need for a transposition process to ensure that adaptation is framed in the IGTs.

This **normative or regulatory** dimension is **not so present in adaptation planning instruments**, which is why the **mechanisms to support the integration of adaptation into the IGTs**, such as the aforementioned **methodological guides and documents on local adaptation to climate change in Portugal, are** relevant.

6. Evaluation of adaptation practices in PDMs

6.1 Introduction

The assessment of the integration of adaptation to climate change in the PDMs drawn up after 2015 has made it possible to systematically find out how the impacts of climate hazards foreseen in the RNA 2100 have been minimised. However, **it is also essential to carry out a qualitative analysis of the practices of integrating climate adaptation into municipal spatial planning instruments, identifying the main obstacles, weaknesses and good practices**.

This chapter analyses the consultation results on practices for including adaptation to climate hazards in the PDM review processes triggered by the approval of the RJIGT. The choice of this timeframe is because**, since the approval of ENAAC 2020, Portugal's climate change adaptation policy has given PMOTs a central role in *mainstreaming* this policy**.

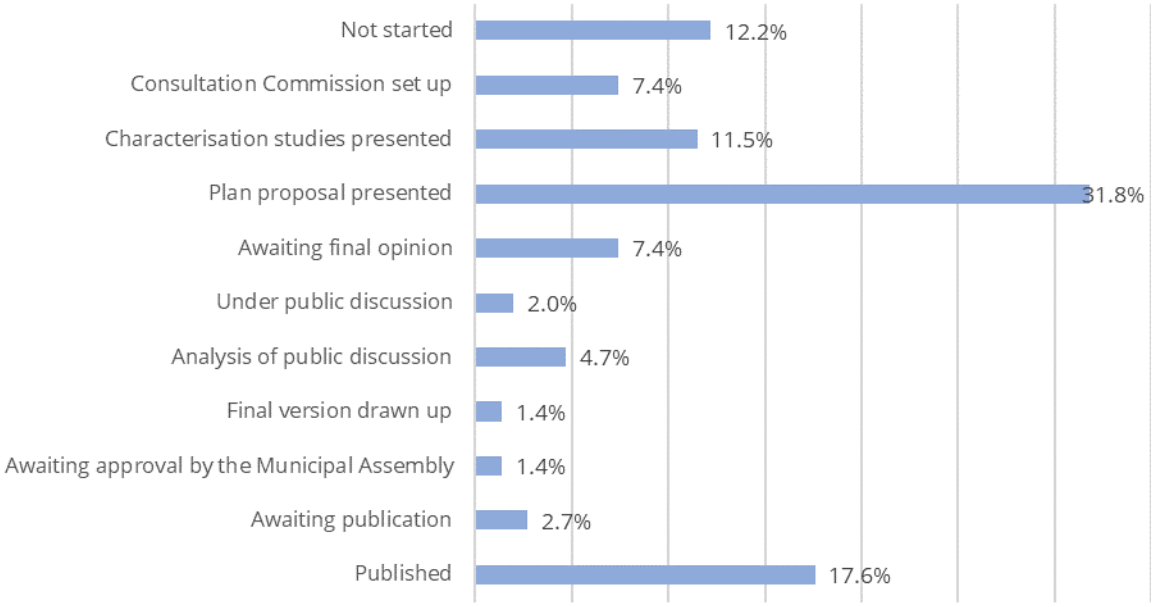
As this is a subjective assessment, it was essential to triangulate points of view. The assessment was therefore based on three different sources, using two methods: an electronic survey was administered to mainland municipalities (form available in Appendix A5), and two *focus group* sessions *were* held involving representatives from the Regional Coordination and Development Commissions (CCDR), and consultants specialised in drawing up territorial plans and who are advising numerous Portuguese municipalities on drawing up their PDMs (List of participants available in Appendix A6). The survey applied to the municipalities was implemented between 20 June and 31 July 2023, and the two *focus group* sessions were held on 12 July (*focus group consultants*) and 13 July (*focus group* CCDR).

In the survey, 148 complete and validated responses were obtained, representing 53.2% of the 278 municipalities in mainland Portugal. In regional terms, 25.0% of the municipalities that responded to the survey were located in the North, 35.1% in the Centre, 23.0% in the Alentejo, 9.5% in the Lisbon Metropolitan Area and 7.4% in the Algarve.

The consultation with **the municipalities individually dealt with each climate hazard in the RNA 2100, which meant that, unlike the previous chapters, we had disaggregated readings for drought, water scarcity, erosion, coastal erosion,** and flooding. However, as can be seen from the results obtained, there are minor differences in how the municipalities approach the hazards listed above.

In **most municipalities surveyed (102), the PDM revision process was sufficiently advanced to assess how climate adaptation to the five climate hazards had been integrated into the PDM.** In other words, 72 municipalities had at least a draft plan at the time of the survey, and the remaining 30 municipalities had already published their PDM or were awaiting publication (Figure 6).

Figure 6 - Status of the revision process of the Municipal Master Plan of the municipalities surveyed



Source: Municipal survey (2023)

It should be emphasised that for the assessment carried out in the following points, **only the responses from municipalities that already had at least the draft plan were taken into account**, as it is understood that only at this stage are the relevant conditions of experience met to be able to assess the practice of integrating climate adaptation into the response to each of the hazards studied.

6.2 Evaluation of adaptation integration practices

6.2.1 The guiding role of policy instruments

Over the last eight years, a wide range of documents and instruments guiding climate adaptation have been drawn up in Portugal, both strategic and methodological. Chapter 3 presents this contextual framework, identifying the various national, regional, inter-municipal and municipal climate adaptation policy documents available at this study's time.

The information obtained from the consultation with local authorities showed that in revising their PDMs, **municipalities used many of these instruments** to guide the integration of climate adaptation into their PDMs. **However, the ones that stood out the most are generic and national in scale,** namely the National Spatial Planning Policy Programme (PNPOT), which was considered by 93.1% of the municipalities, and ENAAC 2020, used by 60.8%.

Intermunicipal climate change adaptation plans or strategies were only considered by 42.2 per cent of councils, which is insufficient, given that almost the entire country is covered by these instruments. At the same time, these plans indeed followed the ClimAdaPT.Local methodology, which included mechanisms for involving stakeholders, the truth is that the scale of the documents, the lack of specific adaptation measures or the existence of a generic approach to integrating adaptation into spatial planning may explain their limited use by local councils when drawing up their PDMs. The fact that these adaptation instruments had not yet been finalised when the PDM was drawn up may also explain this situation, given that an overwhelming proportion of the inter-municipal plans were drawn up between 2017 and 2020.

As far as municipal climate change adaptation plans or strategies are concerned, the figures are more consistent with the number of municipalities equipped with instruments of this nature, with 39.2 per cent of councils having taken them into account.

Less mentioned were **municipal climate action plans or strategies** (8.8 per cent), which can be explained by the fact that traditionally, the two arms of climate policy have been treated as separate instruments. Their emergence has only occurred recently, with only two such plans in the country at the time of the survey (Lisbon and Loulé).

Regarding methodological documents, the "PDM GO" stands out, although it was only considered by 52.0 per cent of the councils. Its more significant publicity and national scope can explain this better performance. The document "Spatial Planning in Response to Climate Change: Contribution to the PDM", drawn up by the CCDR LVT, was mainly used by the municipalities in this region, while the "Manual for Integrating Adaptation Options into Municipal Territorial Management Instruments", drawn up as part of the ClimAdaPT.Local projects were essentially used by the municipalities that took part in this project.

In any case, it seems possible to conclude from these responses that the mere existence of documents is not a sufficient condition for their utilisation. Without prejudice to the need for a more in-depth assessment, **it is clear that the development of guides and manuals must be accompanied by ongoing training, dissemination and awareness-raising processes** involving the CCDRs and the CIM/AM.

Table 18 - In the revision of the PDM, have any of the following studies/plans been considered concerning adaptation to climate change related to the dangers of drought, water scarcity, rural and forest fire, coastal erosion or coastal overtopping and flooding?

	NO.	%
National Spatial Planning Policy Programme (PNPOT)	95	93,1
National Strategy for Adaptation to Climate Change (ENAAC 2020)	62	60,8
PDM GO - Good Practices for Municipal Master Plans (CNT, 2020)	53	52,0
Intermunicipal Climate Change Adaptation Plan or Strategy	43	42,2
Municipal Climate Change Adaptation Plan or Strategy	40	39,2
Action Programme for Adaptation to Climate Change (P-3AC)	39	38,2
Spatial Planning in Response to Climate Change: Contribution to the PDM (CCDRLVT, 2019)	25	24,5
Manual Integrating Adaptation Options into Municipal Territorial Management Instruments (ClimAdaPT.Local, 2015)	25	24,5
Municipal Climate Action Plan or Strategy	9	8,8
Others	16	15,7

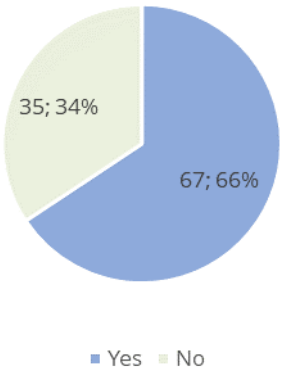
Source: Municipal survey (2023)

6.2.2 Experience in integrating adaptation to the danger of drought and water scarcity

6.2.2.1 Drought

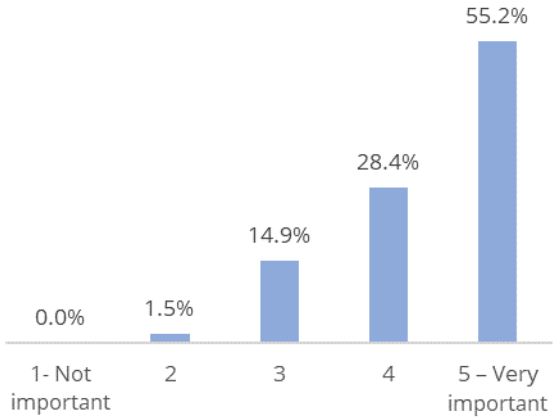
In recent years, droughts have regularly affected mainland Portugal, especially in the southernmost sector. However, **only 66.0% of the municipalities consulted consider it relevant to adapt to this danger** (Figure 7). The limited sensitivity to the existence of droughts and their implications is relatively widespread across the country, with greater expression in the North - a region that has been less affected by this type of situation, particularly in the north-west - where 49.0% of the municipalities surveyed do not consider adaptation to the danger of drought to be relevant. In contrast, **the AML is home to the municipalities most informed about this climate hazard,** with 91.0 per cent of municipalities here indicating that adapting to drought is relevant.

Figure 7 - Is climate change adaptation to drought hazards in your municipality relevant ?



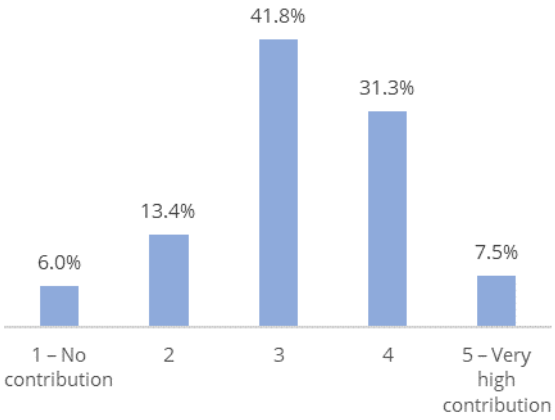
Source: Municipal survey (2023)

Figure 8 - How do you rate the importance of adapting to climate change and the danger of drought in your municipality?



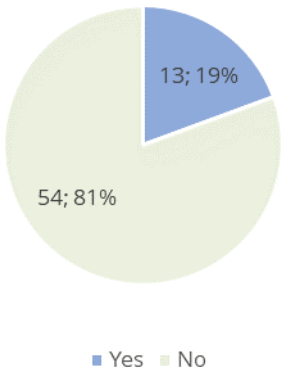
Source: Municipal survey (2023)

Figure 9 - How do you rate the degree of response of the PDM to the adaptation of your municipality to the danger of drought?



Source: Municipal survey (2023)

Figure 10 - Does your PDM foresee ways of adapting to the danger of drought that could be considered good practices to be followed by other municipalities?



Source: Municipal survey (2023)

It should also be noted that **only 65.0 per cent of the municipalities surveyed that have a municipal adaptation plan or strategy consider adaptation to drought relevant, which** means that even drawing up this type of

instrument has not managed to increase sensitivity to this climate hazard. According to the consultants consulted, this situation can be explained by the excessive segregation between the councils' various departments, i.e., the adaptation strategies or plans and the PDMs being promoted by different departments.

Among the municipalities surveyed that consider it relevant to adapt their territory to the danger of drought, 83.4% consider adaptation essential or very important, and 55% think it very important (Figure 8). At the regional level, the Algarve municipalities are most concerned about drought, as 100 per cent of municipalities consider it important or very important to adapt to this climate hazard, consistent with the territorial expression of drought over the last decade. This is followed by municipalities in the Centre (90.5%), Alentejo (85%), AML (80%) and finally the North (71.4%). This assessment, except for Alentejo, is consistent with the worsening occurrence of this type of climatic event in mainland Portugal and the spatialisation of this phenomenon.

However, **the assessment of the PDM's degree of response in adapting to drought is out of step with the concern expressed**, **as only 38.8 per cent of municipalities indicate that their PDM makes a high or very high contribution. T**here are a significant number of plans that are expected to make only a limited contribution (13 per cent) or have no effect at all (6 per cent) (Figure 9). **As this is one of the country's most significant climate vulnerabilities, with a comprehensive territorial expression and scenarios that project it to worsen by the end of the century, the self-assessment made is worrying, and it is** necessary to identify the factors that can contribute to a more effective response from the PDMs.

At the regional level, the municipalities of the Algarve and AML **most value the role their PDM will play in adapting to drought,** with 100 per cent and 70 per cent, respectively, considering that their plan will have a high or very high degree of response. **In Alentejo, where drought is an obvious problem, 25 per cent of municipalities expect a low contribution,** and only 35 per cent expect a high or very high contribution. The **North is the region with the lowest expectations of the PDM's role in adapting to drought,** with only 7% of municipalities expecting a high or very high degree of response, which can be explained by a lower appreciation of the problem, as seen above.

This ineffectiveness of the Plans can also be explained by the difficulties that municipalities have in integrating the response to drought into their PDMs (Table 19). Among the most significant **challenges pointed out by the 67 municipalities are the difficulty in defining rules related to land use and occupation** (38.8 per cent) or **building** (31.3 per cent) **that increase water efficiency** and **the lack of information on the evolution of droughts and rainfall in the municipality up to 2100** (34.4 per cent). Consultation with the CCDRs and land-use planning specialists corroborates these difficulties, which is **why climate change appears in a generic form in Municipal Master Plans**, with a more marked expression in diagnoses and strategies and much less in regulatory or operational measures.

One of the problems most highlighted by both experts and CCDR technicians who oversee the drafting of PDMs is the inability of the plans to include regulatory measures for adaptation on rural land, specifically to restrict or ban crops that use water more intensively or inefficiently. Even if these rules are provided for (for example, in the Beja PDM), local authorities cannot apply them because they are not responsible for licensing crops. On the other hand, as the CCDRs highlight, **adapting agricultural activities to droughts and water scarcity requires a broad and coherent range of policy measures (sectoral, territorial, financing), which may not be achievable through the PDMs alone**.

In the urban context, the CCDRs interviewed emphasise that it is **easier for local councils to establish principles for public interventions (e.g. water efficiency in green spaces). Still, there is a lack of definition of rules for private individuals** in building and urbanisation works.

It's also important to note that the self-assessment of the municipalities regarding the lack of knowledge (20.9 per cent) and the lack of sensitivity to the problem of the technical teams (9.0 per cent) and decision-makers (7.5 per cent) are still more positive than the assessment made by the CCDRs**,** which **point to a long road of training and**

sensitisation of the municipal technical structures until they reach levels of capacity and sensitivity to the climate problem that allows them to pursue municipal land-use planning policies that are consistent and adjusted to the scale of the challenges.

Table 19 - What kind of difficulties have been encountered by the PDM in promoting adaptation to the danger of drought?

	NO.	%
Difficulty in defining rules related to land use and occupation that increase water efficiency	26	38,8
Lack of information on the evolution of droughts and rainfall in your municipality up to 2100	23	34,3
Difficulty in defining building rules that increase water efficiency	21	31,3
Lack of knowledge about drought adaptation measures	14	20,9
Lack of sensitivity of technical teams to the problem	6	9,0
Lack of political sensitivity to the problem	5	7,5
Other	2	3,0
Don't know/Not applicable	19	28,4

Source: Municipal survey (2023)

The reduced sensitivity and the difficulties and limitations presented above are evident in how the PDMs respond to the danger of drought (Table 20). Indeed, **the integration of adaptation to this hazard in the PDMs of the municipalities surveyed occurs in around half of the cases, in the Characterisation Studies (52.2%), the Plan Strategy (52.2%) or the Strategic Environmental Assessment (SEA) (52.2%)**. **It is present to a more limited extent in the Regulations (44.8%)** and has little expression in the Territorial Model (19.4%), the Implementation Programme (13.4%) or the Governance Model (11.9%).

The data on the role of the Implementation Programme is at odds with the analysis carried out in the previous chapter, which found the relevance of the operational dimension in the adaptive response of the PDMs analysed since a significant number of drought adaptation measures were identified in the Implementation Program**mes.** This potential inconsistency could be explained by the fact that investments in water supply systems could be potential adaptation actions when, in practice, municipalities do not promote them for this purpose but only because of the obsolescence of the infrastructure or its absence. This situation makes it clear **that it is not always correct to associate a given type of intervention with climate adaptation, even though the context of that action and how it is carried out determine that result**. However, in the context of the analysis carried out in Chapter 5 on the measures included in the Implementation Programmes, it was impossible to know the context of the investments to distinguish ordinary infrastructure actions from those aimed at effectively reducing climate vulnerability.

Table 20 - How does the PDM consider the municipality's adaptation to the danger of drought?

	NO.	%
In characterisation studies (climate scenarios, drought susceptibility and hazard mapping, ...)	35	52,2
In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)	35	52,2
In the regulations (prohibitions or restrictions on land use, building, or artificialisation related to the drought have been defined)	30	44,8
In the territorial model (risk areas have been defined in the zoning plan)	13	19,4
In the implementation programme (interventions and measures to adapt to the risk of drought are planned)	9	13,4
Governance (workshops were held or working groups set up on the subject)	8	11,9
In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)	35	52,2
Other	9	13,4

Source: Municipal survey (2023)

Finally, of the 67 municipalities that considered it pertinent to adapt their territory to this climatic hazard, 19 per cent pointed to a set of **good practices** for adapting to drought in their PDM (Figure 10):

- **the establishment of rules for the protection of native vegetation** (regulatory);
- the **delimitation of critical areas for groundwater extraction or the densification of protection perimeters for** existing **abstractions** (regulatory);
- promoting the **collection and storage of rainwater and its reuse in irrigation systems for green spaces**, whether public or private and other uses considered relevant for this purpose (regulatory/operational);
- **incentives for planting native vegetation, or vegetation adapted to the Mediterranean climate,** with reduced water consumption, namely the creation of dry meadows (regulatory/operational);
- the **creation of retention basins upstream of urban centres that** do not jeopardise the functioning of the water system and the conservation of natural values (operational);
- the promotion of the rational and efficient use of water through the **replacement of the water supply network, the implementation of control zones, and the replacement of meters** (operational).

6.2.2.2 Water scarcity

Only 63.0 per cent of the municipalities surveyed consider adaptation to the danger of water scarcity to be pertinent in their municipality, a figure one per cent lower than that for drought, and which **consolidates the need to increase the sensitivity of municipal technical and political structures to the challenges that climate change poses for the management of water resources** (Figure 11).

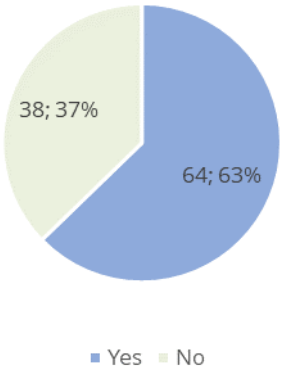
In regional terms, **the municipalities of AML are the most sensitive to this challenge, with 81.8% considering it pertinent to adapt, followed by those of Alentejo (79.2%)**. In contrast, only 45.2 per cent of municipalities in the North think it relevant to adapt to water scarcity, which, as with drought, is explained by the fact that this is a territory that is generally less affected by this danger and where part of the territory continues to have positive water balances.

Among the group of local authorities surveyed that think it's essential to adapt to water scarcity, a large majority consider it necessary (42.2%) or significant (43.8%) that this adaptation takes place in their municipality (Figure 12).

At the regional level, **it is the municipalities of the Algarve (100%), Alentejo (94.7%) and AML (88.9) that attach the most significant importance to this adaptation, recognising it as essential or very important.**

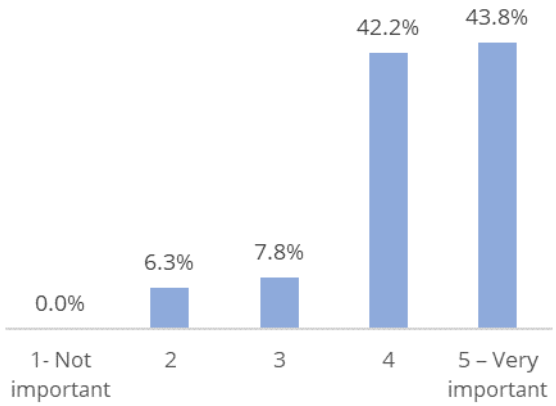
However, like the drought, the assessment of the degree of adaptive response of the MIPs underperforms the severity of the problem (Figure 13). **Only 40.6 per cent believe that there is a high or very high contribution; conversely, 25.1 per cent identify a weak or nil contribution. The municipalities in the Algarve expect the most significant impact**, with 100% of the municipalities surveyed **expecting** a high or very high contribution from their PDM. The municipalities in the AML (55.6%) and the Centre (40.0%) follow some distance behind.

Figure 11 - Is adaptation to climate change relevant to the danger of water scarcity in your municipality?



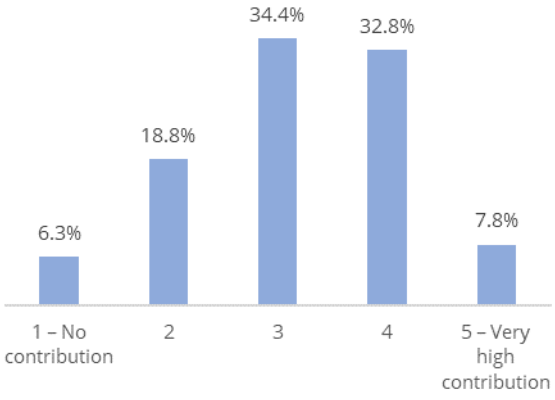
Source: Municipal survey (2023)

Figure 12 -How do you rate the importance of adapting to climate change and the danger of water scarcity in your municipality?



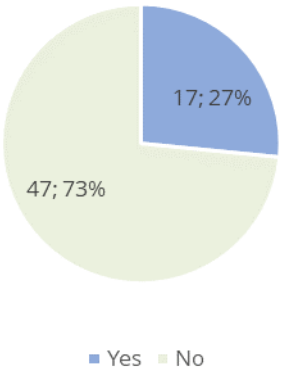
Source: Municipal survey (2023)

Figure 13 - How do you rate the degree of response of the PDM to the adaptation of your municipality to the danger of water scarcity?



Source: Municipal survey (2023)

Figure 14 - Does your PDM foresee ways of adapting to the danger of water scarcity that could be considered good practices to be followed by other municipalities?



Source: Municipal survey (2023)

The difficulties can explain the lower capacity of the PDMs to impact adaptation, as **pointed out by the municipalities** (Table 21). Of **particular note is the lack of information on the evolution of water scarcity in the municipality up to 2100** (40.6%) and the difficulties in defining rules related to land use and occupation (32.8%) or building (32.8%) that promote increased water efficiency. Lack of knowledge (28.1 per cent) and lack of sensitivity to the problem on the part of technical teams (9.4 per cent) and decision-makers (6.3 per cent) are other relevant constraints.

It should be noted that the **municipalities with an adaptation strategy or plan do not perform very differently from the others regarding lack of information or difficulty establishing concrete measures,** which can be explained by the superficiality of the climate diagnoses made in the EMAACs. On the other hand, the CCDRs consulted said that **one of the limitations to integrating adaptation measures from municipal climate change adaptation plans and strategies into PDMs is the lack of monitoring of these processes** (neither the CCDRs nor other organisations). **The experts added that technicians from the municipal planning and land use departments rarely took part in drawing up local adaptation strategies,** which the environment departments mainly led, and that it is, therefore, necessary to broaden awareness and knowledge of the impacts of climate change and adaptation measures within the municipalities.

Table 21 - What kind of difficulties have been encountered by the PDM in promoting adaptation to the danger of water scarcity?

	NO.	%
Lack of information on the evolution of water scarcity in your municipality up to 2100	26	40,6
Difficulty in defining rules related to land use and occupation that increase water efficiency	21	32,8
Difficulty in defining building rules that increase water efficiency	21	32,8
Lack of knowledge about adaptation measures to water scarcity	18	28,1
Lack of sensitivity of technical teams to the problem	6	9,4
Lack of political sensitivity to the problem	4	6,3
Opposition to the measures proposed in the Public Discussion	1	1,6
Other	2	3,1
Don't know/Not applicable	19	29,7

Source: Municipal survey (2023)

How adaptation to this climate hazard has been considered in the PDM's content aligns with the difficulties encountered. Overall, it can be seen that the **adaptive response of the PDMs is limited, with the most relevant integration of this problem in the Characterisation Studies (60.9%) and Plan Strategy (54.7%). It is present to a more limited extent in the Regulations (43.8%) and SEA (42.2%) and has little expression** in the Territorial Model (25.0%), the Implementation Programme (17.2%) or the Governance Model (10.9%) (Table 22).

Concerning the 42.2 per cent of cases in which the SEA considered this climate hazard, the CCDRs consulted warned that sometimes **the SEAs limit themselves to assessing the issue of climate hazards at the level of principles without scrutinising whether the PDMs have adequate strategic responses to their vulnerability**.

It should also be noted that using the solutions listed may be conditioned by the stage at which the PDM is being drawn up. For example, the use of regulations is more significant in municipalities that are drafting the final version of the PDM (50.0%) or when it is awaiting approval by the Municipal Assembly (100%).

Table 22 - How does the PDM consider the municipality's adaptation to the danger of water scarcity?

	NO.	%
In characterisation studies (climate scenarios, water scarcity susceptibility, hazard mapping, etc.)	39	60,9
In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)	35	54,7
In the regulations (prohibitions or restrictions on land use , building or artificialisation related to water scarcity have been defined)	28	43,8
In the SEA (this climate hazard was considered in the assessment, of the critical factors scenarios. or indicators)	27	42,2
In the territorial model (risk areas have been defined in the zoning plan)	16	25,0
In the implementation programme (interventions and measures to adapt to the danger of water scarcity are planned)	11	17,2
Governance (workshops were held or working groups set up on the subject)	7	10,9
Other	7	10,9

Source: Municipal survey (2023)

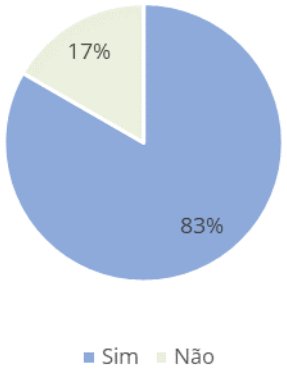
Of the 64 municipalities that considered it relevant to adapt their territory to this climate hazard, 27 per cent (Figure 14) highlighted their PDM as containing **good practices** to be followed by other municipalities, namely the following examples:

- the **reduction of soil sealing** (regulatory);
- **encouraging the existence of retention wells to utilise rainwater** (regulatory);
- **making new urban development operations subject to the guarantee of access to infrastructures and the sustainability of the system, a necessary condition for the realisation of** the (regulatory) urban development operation;
- the creation of **standards or recommendations to educate *vs.* encourage sustainable building practices** (regulatory);
- **promoting the reuse of rainwater** in irrigation systems for green spaces, whether public or private and other uses considered relevant for this purpose (regulatory)/operational);
- **encouraging the planting of native vegetation or vegetation adapted to the Mediterranean climate** with reduced water consumption, namely the creation of rainfed meadows (regulatory/operational);
- the **creation of retention basins upstream of urban centres that** do not jeopardise the functioning of the water system and the conservation of natural values (operational);
- the **release of areas surrounding water lines**, flood beds and risk areas (operational);
- the **installation of rainwater storage devices** at the school level (operational);
- **the adoption of the principle of restraining isolated buildings** and the subdivision of property by rationalising infrastructures, always favouring the adoption of independent, autonomous, rational and environmentally sustainable systems, particularly in terms of water supply, sanitation and energy (regulatory);
- the **installation of rainwater harvesting equipment** (operational).

6.2.3 Experience in integrating adaptation to rural fire danger

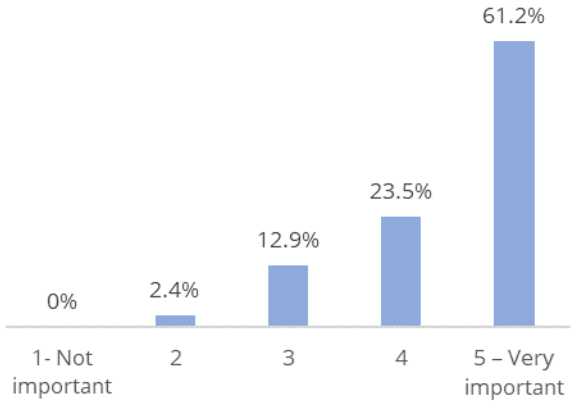
Among the various climate hazards covered by the RNA 2100, rural fire is the most valued by the municipalities surveyed (Figure 15), consistent with the broad territorial expression of the area burnt in recent decades in mainland Portugal. **Most of the municipalities surveyed (83%) consider adaptation to the danger of rural fire to be relevant in their municipality,** and it is in the regions of Alentejo (91.7%), AML (90.9%) and Centro (81.8%) that this relevance is most recognised.

Figure 15 - Is adaptation to climate change relevant to rural fire danger in your municipality?



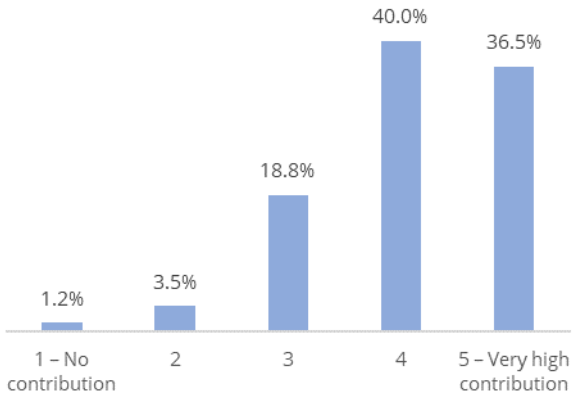
Source: Municipal survey (2023)

Figure 16 - How do you rate the importance of climate change adaptation to rural fire danger in your municipality?



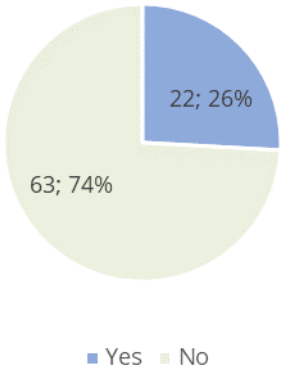
Source: Municipal survey (2023)

Figure 17 - How do you rate the degree of response of the PDM to the adaptation of your municipality to the danger of rural fire?



Source: Municipal survey (2023)

Figure 18 - Does your PDM foresee ways of adapting to the danger of rural fire that could be considered good practices to be followed by other municipalities?



Source: Municipal survey (2023)

Given the severe consequences that rural fires have had in Portugal, municipalities consider **this adaptation to be very important (61.2%) or important (23.5%)** (Figure 16), with the Algarve (100%), Centre (88.9%) and North (87.5%) regions valuing it most highly.

When assessing the degree of response of their PDM to adaptation to this hazard, **40.0% believe there is a high contribution, 36.5% a very high contribution,** and only 4.7% say that their IGT has a limited or non-existent contribution (Figure 17). This **is a much more favourable level of performance than the previous ones, which**

can be explained by the range of legal and planning instruments that shape this adaptive approach, namely rural fire hazard maps, Municipal Forest Fire Defence Plans (PMDFCI) or Landscape Reordering and Management Plans. The municipalities of AML (100%), the North (83.3%) and the Centre (74.1%) are those where the PDMs are expected to contribute most to adapting to this climate hazard.

The adaptive approach of the PDMs to the danger of rural fire has the highest representation of all the climate hazards analysed (Table 23). It is **intensely present in the Characterisation Studies (72.9%) and in the Regulations (71.8%)** and has a relevant expression in the Territorial Model (52.9%), the SEA (51.8%) and the Strategy (50.6%). Although the adaptive approach is relatively homogeneous at the regional level, 71.4 per cent of the AML's PDMs contain a regulatory response to this climate hazard.

On the other hand, the **municipalities that say they have considered the municipal adaptation strategy or plan in their PDMs are less likely to include adaptation to this danger in the regulation or territorial model.** This again suggests that these adaptive planning instruments do not have the expected impact on drawing up PDMs.

Table 23 - How did the PDM consider the municipality's adaptation to the danger of rural fire ?

	NO.	%
In characterisation studies (climate scenarios, susceptibility and fire hazard mapping, etc.)	62	72,9
In the regulation (prohibitions or restrictions on land use, building or artificialisation related to fires have been defined)	61	71,8
In the territorial model (risk areas have been defined in the zoning plan)	45	52,9
In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)	44	51,8
In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)	43	50,6
In the implementation programme (interventions and measures to adapt to fire danger are planned)	21	24,7
Governance (workshops were held or working groups set up on the subject)	13	15,3
Other	8	9,4

Source: Municipal survey (2023)

The main difficulties in integrating adaptation to rural fire danger into the PDM **are related to the difficulty in establishing a discipline that increases resilience and reduces exposure (Table 24),** namely rules about land use and occupation that minimise exposure to rural and forest fire danger (36.5 per cent), the lack of information on the evolution of fire susceptibility up to 2100 (34.1 per cent) and the difficulty in defining rules related to land use and occupation that regulate forest areas (32.9 per cent).

Lack of knowledge about measures to adapt to the danger of rural fire (16.5 per cent) and lack of sensitivity to the problem on the part of technical teams (4.7 per cent) and decision-makers (3.5 per cent) are other difficulties identified, although to a lesser extent. Finally, no regional disparities were identified in these difficulties, reinforcing their structural nature.

Table 24 - What kind of difficulties have been encountered so that the PDM promotes adaptation to rural fire danger?

	NO.	%
Difficulty in defining rules related to land use and occupation that reduce exposure to the risk of rural and forest fires	31	36,5
Lack of information on the evolution of fire susceptibility up to 2100	29	34,1
Difficulty in defining rules related to land use and occupation that regulate forest areas	28	32,9
Lack of knowledge about rural fire risk adaptation measures	14	16,5
Lack of sensitivity of technical teams to the problem	4	4,7
Lack of political sensitivity to the problem	3	3,5
Opposition to the measures proposed in the Public Discussion	3	3,5
Other	8	9,4
Doesn't know/ Doesn't apply	25	29,4

Source: Municipal survey (2023)

Of the 85 municipalities that considered it relevant to adapt their territory to rural fires, 26 per cent (Figure 18) emphasised that their PDM included **good practices** to be followed by other municipalities:

- **land use and occupation regulations and risk mapping** (regulatory);
- the guarantee of **land clearing and/or 50-metre strips around houses** in rural areas (regulatory);
- **the transposition into the regulation of the forestry use and exploitation rules** contained in the Regional Forestry Management Programme (PROF) (regulatory);
- **the delimitation and management of fuel strips** (regulatory/governance);
- the definition of **building restrictions for reasons of rural fire danger** and the conditioning plan (regulatory/territorial model);
- **the existence of afforestation and re-afforestation projects in compliance with the PROF guidelines** regarding the species to be favoured, the forestry standards to be adopted for the respective homogeneous sub-regions, and the maximum area limits to be occupied by eucalyptus and other applicable (regulatory) legislation;
- **forestry and natural heritage development** actions (operational);
- **the acquisition of means of prevention and combat by** the City Council (forestry sappers and municipal fire brigade) (operational);
- **the creation of a village condominium** (operational);
- the implementation of **water retention basins for firefighting** (operational).

6.2.4 Experience in integrating adaptation to the dangers of coastal erosion, overtopping and flooding

Coastal erosion and coastal overtopping and flooding, unlike the climate hazards analysed above, **have a more limited territorial expression, affecting only the coastal municipalities (52 municipalities). What's** more, their most critical expression only occurs in municipalities where the physiography of the coastline is characterised by low and sandy coastlines, which is not the case in much of the Alentejo coast or Lisbon and the Tagus Valley.

For this reason, **it is perfectly normal that the percentage of municipalities that consider climate change adaptation to these hazards to be relevant in their territories is relatively low**, namely 23 per cent in the case of coastal erosion and 25 per cent in the case of coastal erosion and flooding (Figures 19 and 23).

6.2.4.1 Coastal erosion

Of the 23 municipalities surveyed that consider adaptation to the danger of coastal erosion relevant, 78.3 per cent consider adaptation to this danger **significant. This is a critical level of response that differs from the previous ones** (Figure 20). This can be explained, at first, by the regressive dynamics of the continental coastline over the last few decades and the regular occurrence of impacts resulting from extreme climatic events, and, secondly, by the **role of the POOCs and POCs in raising awareness of this challenge.** In regional terms, and line with the scientific evidence of a receding coastline, the municipalities of the Algarve (100%), AML (100%), Centre (88.9%) and North (80%) valued it the most.

When assessing the degree of response of the **PDM to adaptation to this climate hazard (Figure 21), 73.9 per cent of municipalities believe that their plan makes a high or very high contribution**. In comparison, only 8.7 per cent consider that the contribution will be weak or non-existent.

As for **how the PDM addresses adaptation to the danger of coastal erosion, this occurs in almost all PDMs at the level of Characterisation Studies (91.3%) and Regulations (87.0%)** (Table 25).

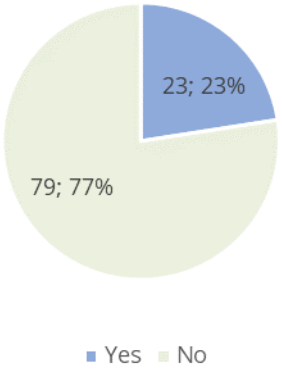
Regarding the regulatory issue, it should be noted that the PDMs of the North, Centre, AML and Alentejo coastal municipalities have integrated the risk protection rules contained in the recently approved POCs, which include provisions for risk bands. This contribution was recognised by the CCDRs **consulted in the *focus group,* which confirmed that this hazard was ahead of the previous ones regarding integrating climate adaptation into the PDMs due to the POCs**.

The CCDRs also emphasised that **public utility easements and restrictions are an essential means of promoting adaptation to hydrological hazards (although it is not always possible to ensure that the functions of the REN prevail)**, which in the case of the coastline involves prohibiting building on the edge of the sea.

The adaptive approach to coastal erosion is also present in the Territorial Model (69.6%) due to the integration of POC safeguard strips. At a strategic level, the impact of coastal erosion on coastal settlements and bathing activities means that adaptation to this climate hazard has an essential presence **in both the SEA (65.2 per cent) and the design of the Strategy (56.5 per cent)**. In the Implementation Programme, this hazard is present in only 34.8% of the municipalities surveyed, which is primarily explained by the fact that interventions in this area are not the municipalities' responsibility but the Portuguese Environment Agency (APA).

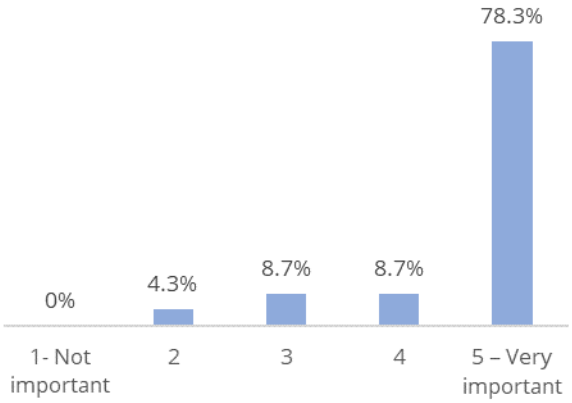
As for the **perceived difficulties for the PDM to promote adaptation to the danger of coastal erosion, the main ones mentioned were the lack of mapping on the impacts of the rise in mean sea level up to 2100** (47.8 per cent) and the lack of information on the evolution of coastal erosion in their municipality up to 2100 (43.5 per cent) (Table 26). **These answers are inconsistent with the area covered by the POOC/POC and the information produced within this framework,** so the answers essentially reveal a lack of knowledge on the part of the respondents.

Figure 19- Is climate change adaptation to the danger of coastal erosion in your municipality relevant?



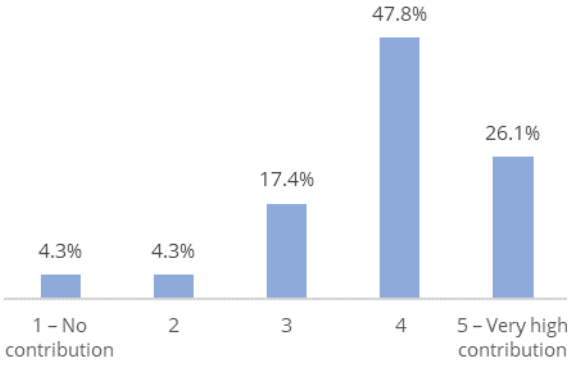
Source: Municipal survey (2023)

Figure 20 - How do you rate the importance of climate change adaptation to the danger of coastal erosion in your municipality?



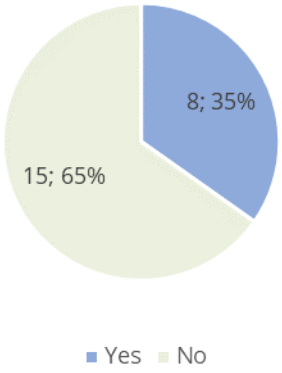
Source: Municipal survey (2023)

Figure 21 - How do you rate the degree of response of the PDM to the adaptation of your municipality to the danger of coastal erosion?



Source: Municipal survey (2023)

Figure 22 - Does your PDM foresee ways of adapting to the danger of coastal erosion that could be considered good practices to be followed by other municipalities?



Source: Municipal survey (2023)

Table 25 - How has the PDM, in preparation or approval, considered the municipality's adaptation to the coastal erosion hazard?

	NO.	%
In characterisation studies (climate scenarios, coastal erosion susceptibility, hazard mapping, etc.)	21	91,3
In the regulation (prohibitions or restrictions on land use, building or artificialisation related to coastal erosion have been defined)	20	87,0
In the territorial model (risk areas have been defined in the zoning plan)	16	69,6
In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)	15	65,2
In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)	13	56,5

	NO.	%
In the implementation programme (interventions and measures to adapt to the danger of coastal erosion are planned)	8	34,8
Governance (workshops were held or working groups set up on the subject)	1	4,3
Other	4	17,4

Source: Municipal survey (2023)

Difficulties in defining rules related to building adaptation (26.1%) and land use and occupation (21.7%) or lack of knowledge about erosion adaptation measures (13.0%) are also mentioned. It should be noted that only one municipality flagged the lack of sensitivity of technical teams and decision-makers to the problem and opposition to the measures proposed in public discussion as difficulties in its revision process. Even so, this **self-assessment seems overly optimistic compared to the adversity that municipalities have shown regarding the spatialisation of safeguard strips or the regime of constraints and prohibitions set out** in **the POC for these areas,** primarily when they affect urban land.

Table 26 - What kind of difficulties have been encountered so that the PDM promotes adaptation to the danger of coastal erosion?

	NO.	%
Lack of mapping on the impacts of rising sea levels by 2100	11	47,8
Lack of information on the evolution of coastal erosion in your municipality up to 2100	10	43,5
Difficulty in defining rules related to adapting buildings to the risk of coastal erosion	6	26,1
Difficulty in defining rules related to land use and occupation that reduce exposure to risk	5	21,7
Lack of knowledge about erosion adaptation measures	3	13,0
Lack of sensitivity of technical teams to the problem	1	4,3
Lack of political sensitivity to the problem	1	4,3
Opposition to the measures proposed in the Public Discussion	1	4,3
Other	5	21,7
Doesn't know/ Doesn't apply	7	30,4

Source: Municipal survey (2023)

The greater sensitivity and experience of municipalities in dealing with the impacts of coastal erosion means that a higher percentage **(35 per cent) of the 23** municipalities that considered it pertinent to adapt their territory to this climate hazard **emphasise that their PDM presents good** adaptation **practices** (Figure 22), giving the following examples:

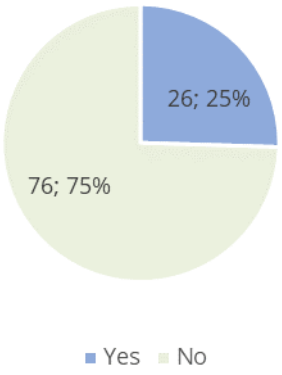
- the **identification of non-buildable areas for coastal protection** (regulatory/territorial model);
- the **protection of areas subject to coastal erosion**, creating buffer zones between the most sensitive zones and construction areas (regulatory/territorial model);
- the **inclusion of POC safeguard regimes in the regulation and planning plan of the PDM** (regulatory/territorial model);
- the **renaturalisation of dune strands** (operational);
- the **orderly, systematised and monitored reinforcement of natural ecosystems** with sediment, whether on a submerged beach or land (artificial nourishment) (operational);

- the **(systematic) restoration of riverbanks and the maritime coastline** (operational);
- **upgrading the urban waterfront** and increasing the city's relationship with the sea, minimising or eliminating (operational) road traffic;
- the **implementation of a coastline monitoring system** (governance).

6.2.4.2 Coastal overtopping and flooding

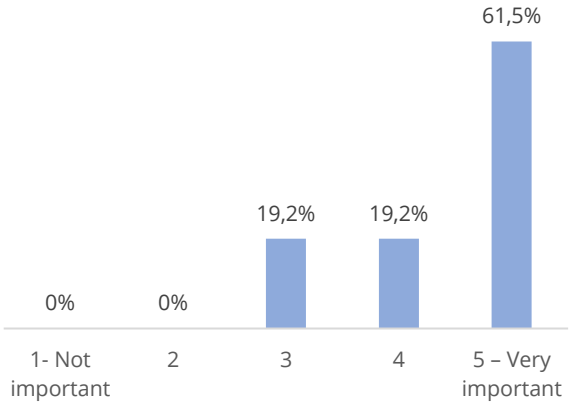
Among the 26 municipalities that consider adaptation to the danger of coastal flooding and overtopping relevant, 80.7 per cent rate adaptation to this climate hazard as essential or very important, an assessment consistent with the one made for the danger of coastal erosion (Figure 24). It should also be noted that unlike climate hazards related to drought, water scarcity or rural fires, **no municipality considers adaptation to the danger of coastal erosion and flooding to be of little or no importance,** which reflects the concern that this danger poses to communities in these areas.

Figure 23 - Is climate change adaptation to the danger of coastal overtopping and flooding in your municipality relevant?



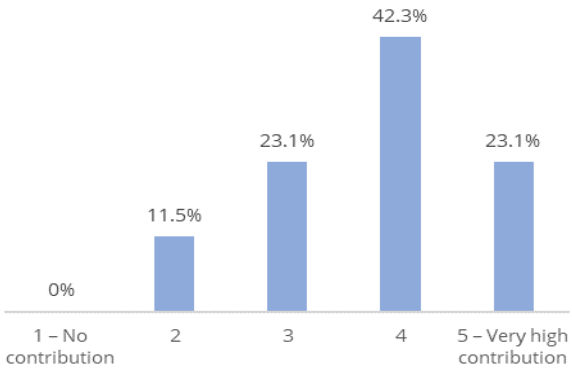
Source: Municipal survey (2023)

Figure 24 - How do you rate the importance of climate change adaptation to the danger of coastal flooding in your municipality?



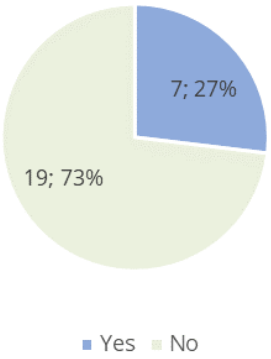
Source: Municipal survey (2023)

Figure 25 - How do you rate the degree of response of the PDM to the adaptation of your municipality to the danger of coastal overtopping and flooding?



Source: Municipal survey (2023)

Figure 26 - Does your PDM include ways of adapting to the danger of coastal overtopping and flooding that could be considered good practices for other municipalities to follow?



Source: Municipal survey (2023)

The degree of response expected from the MDPs is relatively positive: 65.4 per cent of municipalities point to a high or very high contribution, and only 11.5 per cent expect a weak contribution (Figure 25). **This outlook is consistent at the regional level, with** no significant disparities identified.

When present in the PDMs, **adaptation to the danger of coastal erosion and flooding is essentially present in the Regulations (80.8 per cent)**. As mentioned for coastal erosion, **this situation is mainly the result of the new generation of POCs** and the changes made to the PDMs of the municipalities concerned, which now include land use and occupation restrictions in the Coastal Risk Safeguard Bands.

The adaptive approach is also present in the Characterisation Studies (65.4%), the Strategy and Territorial Model (both 53.8%), the SEA (50.0%) and the Strategic Environmental Assessment (50%). The Implementation Programme considers this danger in 23.1% of the municipalities surveyed. As highlighted above, **coastal protection is a responsibility of the Central Public Administration, so it is understandable that the PDM Implementation Programmes, which essentially include municipal investments, do not generally include adaptation interventions**.

Chart 27 - How has the PDM, in preparation or approval, considered the municipality's adaptation to the danger of coastal overtopping and flooding?

	NO.	%
In the regulation (prohibitions or restrictions on land use and occupation, building or artificialisation related to coastal erosion and flooding have been defined)	21	80,8
In characterisation studies (climate scenarios, mapping of susceptibility and danger of overtopping and coastal flooding, ...)	17	65,4
In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)	14	53,8
In the territorial model (risk areas have been defined in the zoning plan)	14	53,8
In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)	13	50,0
In the implementation programme (interventions and measures to adapt to the risk of coastal overtopping and flooding are planned)	6	23,1
Governance (workshops were held or working groups set up on the subject)	2	7,7
Other	4	15,4

Source: Municipal survey (2023)

Concerning the **perceived difficulties in adapting to these coastal hazards in the PDMs, the municipalities focus above all on the lack of information on coastal evolution** in their municipality up to 2100 (46.2%) (Table 28). This **result essentially reveals a lack of knowledge on the part of the respondents**, given that except for the municipalities in the Algarve, all the other PDMs have 100-year flood and overtopping protection zones defined by the approved POCs and transposed into the PDMs in the last six years.

Less mentioned were the difficulties in defining rules related to the adaptation of buildings (23.1 per cent), land use and occupation (19.2 per cent) and lack of knowledge about specific adaptation measures (15.4 per cent), which indicates the need for a capacity-building effort in these areas.

Chart 28 - What kind of difficulties have been encountered so that the PDM promotes adaptation to the danger of overtopping and flooding?

	NO.	%
Lack of information on coastal development in your municipality up to 2100	12	46,2
Don't know / Doesn't apply	9	34,6
Difficulty in defining rules related to adapting buildings to the danger of overtopping and coastal flooding	6	23,1
Difficulty in defining rules related to land use and occupation that reduce exposure to risk	5	19,2
Lack of knowledge about adaptation measures to coastal erosion and flooding	4	15,4
Other	4	15,4
Lack of political sensitivity to the problem	2	7,7
Lack of sensitivity of technical teams to the problem	1	3,8
Opposition to the measures proposed in the Public Discussion	0	0,0

Source: Municipal survey (2023)

Finally, **27 per cent of the 26 municipalities** that considered it pertinent to adapt their territory to this climate hazard **said that their PDMs have good practices to be followed by other municipalities** (Figure 26). However, these are identical to those suggested for coastal erosion.

6.3 Conclusive summary

Reading the experience of implementing adaptation to climate change through the PDM, based on an analysis of 102 municipalities in mainland Portugal, complemented by the opinions of the CCDR technicians who accompany the drawing up of the plans and the consultants who support the municipalities in their realisation, allows for a comprehensive analysis of the successes and failures of using municipal spatial planning instruments as a tool for climate adaptation.

In general terms, from the point of view of the articulation between reference instruments, although the importance that local councils attached to the top documents of the land-use planning policy (PNPOT) and climate adaptation (ENAAC 2020) stands out, **the most crucial aspect is that the inter-municipal and municipal plans and strategies for adapting to climate change are not achieving the expected results**. On the one hand, municipalities do not consider them when drawing up their PDMs since inter-municipal plans and strategies **were only considered by 42.2 per cent of councils**. On the other hand, the analysis of the various climate hazards shows that municipalities with **a local** climate change adaptation **plan or strategy do not perform better in terms of the quality of adaptation integration in their PDMs**.

This situation is the result of three main weaknesses pointed out in the analysis: (i) the **lack of integration and coordination between the various technical teams in the municipalities**, specifically between those promoting climate adaptation and those promoting planning and land use; (ii) the lack of **depth and assertiveness with which the EMAACs** approached the issue of land use planning, not making its integration into the territorial plans expedient and assertive; (iii) the lack of coordination **between the timetable for** revising the PDMs and that for drawing up adaptation plans and strategies.

Bearing in mind the second weakness identified, **the 24-month deadline imposed by the Basic Climate Law for the approval of Municipal Climate Action Plans could result in the plans being drawn up hastily**, with little chance of generating the desired effects with adaptive planning.

It would be necessary for these plans to follow clear guidelines that **ensure alignment with other planning and land-use instruments**, with the **appropriate financial framework comprising European and national funds and the European sustainable financing framework**. These guidelines should also promote an effective ecosystem for guaranteeing climate action, highlighting the role of the various decision and implementation support tools and processes made available and provided for under national and EU adaptation policies, emphasising the provisions set out in the Basic Climate Law. Without this framework and a standard on how climate action plans should address the integration of adaptation and mitigation measures, their preparation may have little effect on territorial management instruments.

It is also evident from the consultation that there is **a need for a robust, continuous and persistent process of training municipal technicians and all those who make up the technical and institutional ecosystem involved in drawing up the PDMs and that the preparation** of guides and manuals is insufficient. This urgency is emphasised by the **need to increase levels of technical and political sensitivity to the impacts that climate change will have**. Of the various climate hazards addressed by RNA 2100, those related to water resources are the most fragile.

Even though the territory of mainland Portugal has been regularly affected by severe droughts in recent years, especially in the centre and south of the country, **only 66.0% of the municipalities consulted consider it relevant to adapt their municipality to this danger**. This insensitivity is slightly more severe in the case of water scarcity (63.0%).

Contrary to what might have been expected, the development of local adaptation planning instruments does not seem to have the expected impact, particularly in recognising climate challenges.

In the case of **rural fires and coastal hazards, the perception of the importance of implementing adaptation through the PDM is more present**, at one time due to the regular occurrence of catastrophic situations with high local impacts and at a second time due to the existence of various legal and planning instruments promoted by the Central Administration.

It is also worth reflecting on regional disparities in sensitivity to climate hazards, not least to design capacity-building strategies with each of the CCDRs that better respond to the specific needs of municipalities. It should be noted, for example, that in terms of the danger of water scarcity, **the AML municipalities are the most sensitive to this challenge (81.8% consider it pertinent to adapt), followed by those in the Alentejo (79.2%)**. In contrast, less than half of the municipalities in the North consider it relevant to adapt to water scarcity (only 45.2%).

Another aspect of this inability/unpreparedness/insensitivity is reflected in the PDM's low contribution to climate adaptation to droughts and water scarcity within a framework of action that falls short of the seriousness of the challenges. **Only 40.6 per cent of municipalities state that their PDM will make a high or very high contribution to responding to this problem; conversely, 25 per cent identify a weak or nil contribution.**

Regarding **rural fires, the self-assessment of the degree of response of the PDMs to adaptation to this hazard is more optimistic,** with 76.5 per cent expecting a high or very high contribution. A**daptation is present in the PDMs, in the various documentary and material contents**, and even in the Regulations, the Territorial Model or the Implementation Programme**, which generates more remarkable results**.

In the case of the coastal zone, there are no substantial differences in the practices of integrating adaptation into the PDM in response to the danger of coastal erosion or the threat of coastal erosion and flooding. The greater sensitivity to these hazards is reflected in the importance that municipalities attach to adaptation, which is considered very important by 78.3 per cent of municipalities in the case of coastal erosion and 61.5 per cent in the case of overtopping and flooding. On the other hand, **as a result of the transposition of standards into Regulations and safeguard strips into Territorial Models, the impact of POCs on the adaptive capacity of**

PDMs **is very significant, expressed by the** integration of adaptation into PDM Regulations in 87.0 per cent of cases in response to coastal erosion and 80.8 per cent in response to overtopping and flooding.

It seems clear from this data that the existence of **operational and binding instruments on a national scale with the legal force to be integrated into the PMOTs is** more effective in speeding up adaptation and universalising it. However, as was evident in the recently approved new Rural Fire Danger Map (promoted by the Institute for Nature Conservation and Forests, I.P.), this approach may, on the one hand, prove to be out of step with specific territorial realities and, on the other, may not be adequately understood and implemented at a local level.

Finally, it is essential to **highlight the catalogue of good practices suggested by the municipalities** based on the experience of drawing up their PDMs. In addition to the **diversity of adaptation measures proposed**, the collection of good practices created is characterised by a **balance between the regulatory and operational dimensions,** which can be inspiring in the face of the difficulties, pointed out by the municipalities, of establishing normative adaptation measures. The establishment of rules to protect native vegetation in the event of droughts, sustainable construction in the event of water shortages, conditioning land use and occupation in the event of rural fires, or bans on coastal protection zones are good examples of the use of regulations as instruments to promote climate adaptation.

At the operational level, the **promotion of adaptation based on ecosystem services** (e.g. renaturalisation of dune strands) should be highlighted, as should proposals for a multi-hazard approach, such as creating retention basins.

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Annexes

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A.4. Complementary tables for analysing the integration of adaptation into Municipal Master Plans

Drought and Water Scarcity

Measurement category	Form of integration into the PDM			Type of intervention		
	Strategy	Regulate	Operational	IV	IC	*Soft*
Urban design and *water-sensitive* construction	2	13	0	4	3	8
Efficiency in urban irrigation	0	6	2	3	2	3
Aquifer management	4	15	2	6	2	13
Urban green infrastructure and nature-based solutions	3	8	1	9	1	2
Prohibition of uses that harm the water ecosystem	1	148	0	8	4	137
Rehabilitation, renaturalisation or conservation of watercourses and riparian galleries	5	69	9	42	3	38
Strengthening the availability and alternative sources of water resources	3	3	0	3	3	0
Water distribution and storage systems	8	49	48	5	59	41
Wastewater treatment systems	5	57	94	5	110	41
Other	4	19	15	14	11	13

Source: CEDRU (2023)

Rural fires

Measurement category	Form of integration into the PDM			Type of intervention		
	Strategy	Regulate	Operational	IV	IC	*Soft*
Adaptation or protection of infrastructure	0	75	2	25	15	37
Control and utilisation of forest biomass	1	21	9	11	0	20
Fuel management strips	0	75	0	61	5	9
Prohibition of use and occupation of risk areas	0	92	0	8	1	83
Surveillance or fire-fighting equipment	3	31	4	6	16	16
Forest planning and management plans	11	25	3	6	0	33
Promoting agroforestry activities	10	31	1	16	0	25
Promoting the forest mosaic	0	8	1	7	0	2
Reforestation	1	7	4	12	0	0
Use of native or adapted forest species	2	158	3	73	0	90
Other	0	34	1	2	1	32

Source: CEDRU (2023)

Erosion, Overtopping and Coastal Flooding

Measurement category	Form of integration into the PDM			Type of intervention		
	Strategy	Regulate	Operational	IV	IC	*Soft*
Adaptation of infrastructures	0	0	75	45	24	6
Beach nourishment or dune reinforcement	0	0	16	4	1	11
Delimitation or retreat of risk zones (including limits on building, construction, reconstruction, infrastructure installation and access)	0 (0)	1 (0)	341 (337)	317 (312)	23 (23)	2 (2)
Cliff stabilisation	0	0	44	24	15	5
Coastal protection works	1	0	26	5	20	2
Renaturalisation or ecological regeneration of coastal areas	0	4	169	136	11	26

Source: CEDRU (2023)

A.5 Survey form

In accordance with the General Data Protection Regulation (GDPR) [Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016], we inform you that the data provided in this form will be stored in information systems owned by CEDRU. The process of collecting and processing personal data complies with the applicable legal provisions, taking into account the principles of trust, security, confidentiality and secrecy. In this way, all technical and procedural measures are adopted to guarantee data subjects lawfulness, transparency, accuracy, security and limited access to data for specific purposes. The information requested in this context will be used exclusively for the evaluation study. By completing this form, you agree to the processing of your information for the purposes described above. You are also informed that, at any time, you may exercise your right of access to the data concerning you, request its rectification, deletion or limitation or object to its processing, as well as request that it be passed on to other data controllers, via e-mail: geral@cedru.com. If you have any questions about the data privacy policy, please contact us by e-mail, addressed to CEDRU, at: geral@cedru.com.

SURVEY OF LOCAL AUTHORITIES

Dear Sir Sir

As part of the preparation of the **National Roadmap for Adaptation 2100 - RNA2100** (https://rna2100.apambiente.pt/), a project that aims to assess the vulnerability of Portuguese territory to climate change in the 21st century, the Directorate General for Territory, with the technical assistance of CEDRU (Centre for Regional and Urban Studies and Development), is carrying out the necessary studies to review the current outlook on adaptation to climate change in territorial plans and programmes.

In this context, a survey was designed for municipalities, with the aim of finding out about adaptation measures to the risks of drought, water scarcity, rural fires, coastal erosion and coastal overtopping and flooding, which have already been considered or are being considered in the PMOTs in force or under preparation, and to evaluate these practices, identifying their successes and failures.

In this context, we ask you to fill in this survey by 14 July 2023. Filling in the survey only takes 10 minutes and can be done in stages by clicking on the top button ("Save and continue later") on the page. Once you have completed the questionnaire, all you have to do at the end is click on the blue "Submit" button.

For any questions or support, please contact CEDRU (email: goncalo.caetano@cedru.com).

Thank you in advance for your co-operation and best regards.

1. identification of the respondent

1.1. Nome_____
1.2. Função_____
1.3. Contacto email_____

2. Identifying the municipality

2.1 Select the NUTS II where your municipality is located (from a list).
2.2 Select NUTS III where your municipality is located (from a list)
2.3 Select your municipality (from a list)

3. State of play of the PDM

3.1 What stage has been reached in the process of revising the Municipal Master Plan following the approval of the revision of the Legal Framework for Territorial Management Instruments (Decree-Law no. 80/2015 of 14 May)?

☐ Not started (selecting this option results in the conclusion of the survey)
☐ Constituted Advisory Committee (selecting this option results in the conclusion of the enquiry)
☐ Characterisation studies submitted (selecting this option results in the survey being completed)
☐ Proposed Plan
☐ Awaiting final opinion
☐ In public discussion
☐ Awaiting approval by the Municipal Assembly
☐ Awaits publication
☐ Published

4. Overall assessment of the integration of climate change adaptation into the MDP

Global approach

4.1 Have any of the following studies/plans been taken into account in the review of the PDM with regard to adaptation to climate change related to the risks of drought, water scarcity, rural and forest fires, coastal erosion or coastal erosion and flooding?

☐ National Spatial Planning Policy Programme (PNPOT)
☐ PDM GO - Good Practices for Municipal Master Plans (CNT, 2020)
☐ National Strategy for Adaptation to Climate Change (ENAAC 2020)
☐ Climate Change Adaptation Action Programme (P-3AC)
☐ Regional Climate Change Adaptation Plan
☐ Intermunicipal Climate Change Adaptation Plan or Strategy
☐ Municipal Climate Change Adaptation Plan or Strategy
☐ Municipal Climate Action Plan or Strategy
☐ ♦□♋♦♓♋● Planning in Response to Climate Change: Contribution to PDM (CCDRLVT, 2019)
☐ Manual Integration of Adaptation Options in Municipal Territorial Management Instruments (ClimAdaPT.Local, 2015)
☐ Other. Qual?_____

5. Integrating drought risk adaptation into the revised or draft PDM

5.1. Is climate change adaptation to the risk of drought in your municipality relevant?

☐ Yes
☐ No (selecting this option takes you to point 6 of the survey)

5.2 How do you rate the importance of adapting to climate change and the risk of drought in your municipality?

☐ 1 - Not important
☐ 2
☐ 3
☐ 4
☐ 5 - Very Important

5.3 How do you rate the degree of response of the PDM to your municipality's adaptation to the risk of drought?

☐ 1 - No contribution
☐ 2
☐ 3
☐ 4
☐ 5 - Very high contribution

5.4 How does the PDM consider the municipality's adaptation to the risk of drought?

☐ In characterisation studies (climate scenarios, drought susceptibility and hazard mapping,...)
☐ In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)
☐ In the regulation (prohibitions or restrictions on land use, building or artificialisation related to drought have been defined)
☐ In the territorial model (risk areas have been defined in the zoning plan)
☐ In the implementation programme (interventions and measures to adapt to the risk of drought are planned)
☐ On governance (workshops were held or working groups set up on the subject)
☐ In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)

5.5 What kind of difficulties have been encountered so that the PDM promotes adaptation to the risk of drought?

☐ Lack of information on the evolution of droughts and precipitation in your municipality up to 2100
☐ Lack of knowledge about drought adaptation measures
☐ Lack of sensitivity of technical teams to the problem
☐ Lack of political sensitivity to the problem
☐ Opposition to the measures proposed in the Public Discussion
☐ Difficulty in defining rules related to land use and occupation that increase water efficiency
☐ Difficulty in defining building rules that increase water efficiency
☐ Other, which one?_____

5.6. Does your PDM include ways of adapting to the risk of drought that could be considered good practice for other municipalities to follow?

☐ Yes
☐ No (selecting this option takes you to point 6 of the survey)

5.6.1 If yes, please give a brief description of the practice(s), highlighting the success factors?

(maximum 2,500 characters (including spaces))

6. Integrating adaptation to the risk of water scarcity into the revised or draft MDP

6.1 Is adapting to climate change the risk of water scarcity in your municipality relevant?

☐ Yes
☐ No (selecting this option takes you to point 7 of the survey)

6.2 How do you rate the importance of adapting to climate change to the risk of water shortages in your municipality?

☐ 1 - Not important
☐ 2
☐ 3
☐ 4
☐ 5 - Very Important

6.3 How do you rate the degree of response of the PDM to your municipality's adaptation to the risk of water scarcity?

☐ 1 - No contribution
☐ 2
☐ 3
☐ 4
☐ 5 - Very high contribution

6.4 How does the PDM consider the municipality's adaptation to the risk of water scarcity?

☐ In characterisation studies (climate scenarios, mapping of susceptibility and danger of water scarcity,...)
☐ In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)
☐ In the regulation (prohibitions or restrictions on land use, building or artificialisation related to water scarcity have been defined)
☐ In the territorial model (risk areas have been defined in the zoning plan)
☐ In the implementation programme (interventions and measures to adapt to the risk of water scarcity are planned)
☐ On governance (workshops were held or working groups set up on the subject)
☐ In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)

6.5 What kind of difficulties have been encountered so that the PDM promotes adaptation to the risk of water scarcity?

☐ Lack of information on the evolution of droughts and rainfall in your municipality up to 2100
☐ Lack of knowledge about drought adaptation measures
☐ Lack of sensitivity of technical teams to the problem
☐ Lack of political sensitivity to the problem
☐ Opposition to the measures proposed in the Public Discussion
☐ Difficulty in defining rules related to land use and occupation that increase water efficiency
☐ Difficulty in defining building rules that increase water efficiency
☐ Other, which one?_____

6.6 Does your PDM foresee ways of adapting to the risk of water scarcity that could be considered good practices for other municipalities to follow?

☐ Yes
☐ No (selecting this option takes you to point 7 of the survey)

6.6.1 If yes, please give a brief description of the practice(s), highlighting the success factors?

(maximum 2,500 characters (including spaces))

7. Integrating adaptation to rural and forest fire risk into the revised or draft PDM

7.1 Is adaptation to climate change relevant to the risk of rural and forest fires in your municipality?

☐ Yes
☐ No (selecting this option takes you to point 7 of the survey)

7.2 How do you rate the importance of climate change adaptation to the risk of rural and forest fires in your municipality?

☐ 1 - Not important
☐ 2
☐ 3
☐ 4
☐ 5 - Very important

7.3 How do you rate the PDM's response to adapting your municipality to the risk of rural and forest fires?

☐ 1 - No contribution
☐ 2
☐ 3
☐ 4
☐ 5 - Very high contribution

7.4 How did the PDM take into account the municipality's adaptation to the risk of rural and forest fires ?

☐ In characterisation studies (climate scenarios, susceptibility and fire hazard mapping, etc.)
☐ In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)
☐ In the regulation (prohibitions or restrictions on land use, building or artificialisation related to fires have been defined)
☐ In the territorial model (risk areas have been defined in the zoning plan)
☐ In the implementation programme (interventions and measures to adapt to fire risk are planned)
☐ On governance (workshops were held or working groups set up on the subject)
☐ In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)

7.5 What kind of difficulties have been encountered so that the PDM promotes adaptation to the risk of rural and forest fires?

☐ Lack of information on the evolution of heatwaves until 2100
☐ Lack of knowledge about adaptation measures to rural and forest fire risk
☐ Lack of sensitivity of technical teams to the problem
☐ Lack of political sensitivity to the problem
☐ Opposition to the measures proposed in the Public Discussion
☐ Difficulty in defining rules related to land use and occupation that reduce exposure to the risk of rural and forest fires
☐ Difficulty in defining rules related to land use and occupation that regulate forest areas
☐ Other, which one?_____

7.6 Does your PDM include ways of adapting to the risk of rural or forest fires that could be considered good practice for other municipalities to follow?

☐ Yes
☐ No (selecting this option takes you to point 8 of the survey)

761. If so, can you provide a brief description of the practice(s), highlighting their success factors?

(maximum 2,500 characters (including spaces))

8. Integration of adaptation to the risk of coastal erosion into the revised or draft PDM

8.1. Is adaptation to climate change relevant to the risk of coastal erosion in your municipality?

☐ Yes
☐ No (selecting this option takes you to point 9 of the survey)

8.2 How do you rate the importance of adapting to climate change on the risk of coastal erosion in your municipality?

☐ 1 - Not important
☐ 2
☐ 3
☐ 4
☐ 5 - Very important

8.3 How would you rate the degree of response that the new PDM will provide in terms of adapting to climate change and the risk of coastal erosion in your municipality?

☐ 1 - No contribution
☐ 2
☐ 3
☐ 4
☐ 5 - Very high contribution

8.4 How has the PDM being prepared or approved taken into account the municipality's adaptation to coastal erosion risk?

☐ In characterisation studies (climate scenarios, coastal erosion susceptibility and hazard mapping, etc.)
☐ In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)
☐ In the regulation (prohibitions or constraints on land use, building or artificialisation related to coastal erosion have been defined)
☐ In the territorial model (risk areas have been defined in the zoning plan)
☐ In the implementation programme (interventions and measures to adapt to the risk of coastal erosion are planned)
☐ On governance (workshops were held or working groups set up on the subject)
☐ In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)

8.5 What kind of difficulties have been encountered so that the PDM promotes adaptation to the risk of coastal erosion?

☐ Lack of information on the evolution of coastal erosion in your municipality up to 2100
☐ Lack of mapping on the impacts of rising sea levels by 2100
☐ Lack of knowledge about erosion adaptation measures
☐ Lack of sensitivity of technical teams to the problem
☐ Lack of political sensitivity to the problem
☐ Opposition to the measures proposed in the Public Discussion
☐ Difficulty in defining rules related to land use and occupation that reduce exposure to risk
☐ Difficulty in defining rules related to adapting buildings to the risk of coastal erosion
☐ Other, which one?_____

8.6 Does your PDM include ways of adapting to the risk of coastal erosion that could be considered good practice for other municipalities to follow?

☐ Yes
☐ No (selecting this option takes you to point 9 of the survey)

8.6.1 If yes, please give a brief description of the practice(s), highlighting the success factors?

(maximum 2,500 characters (including spaces))

9. Integration of adaptation to the risk of coastal overtopping and flooding into the revised or currently being drawn up PDM

9.1 Is adaptation to climate change relevant to the risk of coastal flooding and overtopping in your municipality?

☐ Yes
☐ No (the selection of this option results in the conclusion of the survey)

9.2 How do you rate the importance of adapting to the risk of coastal flooding and overtopping in your municipality?

☐ 1 - Not important
☐ 2
☐ 3
☐ 4
☐ 5 - Very important

9.3 How would you rate the degree of response that the PDM will provide in terms of adapting to climate change and the risk of coastal flooding in your municipality?

☐ 1 - No contribution
☐ 2
☐ 3
☐ 4
☐ 5 - Very high contribution

9.4 How has the PDM being prepared or approved taken into account the municipality's adaptation to the risk of coastal erosion and flooding ?

☐ In characterisation studies (climate scenarios, mapping of susceptibility and danger of overtopping and coastal flooding,...)
☐ In the strategy (has it been taken into account in the scenarios, vision, principles or objectives)
☐ In the regulation (prohibitions or restrictions on land use and occupation, building or artificialisation related to coastal erosion and flooding have been defined)
☐ In the territorial model (risk areas have been defined in the zoning plan)
☐ In the implementation programme (interventions and measures to adapt to the risk of coastal erosion and flooding are planned)
☐ On governance (workshops were held or working groups set up on the subject)
☐ In the SEA (this climate hazard was taken into account in the assessment, in the critical factors, scenarios or indicators)

9.5 What kind of difficulties have been encountered so that the PDM promotes adaptation to the risk of overtopping and flooding?

☐ Lack of information on coastal development in your municipality up to 2100
☐ Lack of knowledge about adaptation measures to coastal erosion and flooding
☐ Lack of sensitivity of technical teams to the problem
☐ Lack of political sensitivity to the problem
☐ Opposition to the measures proposed in the Public Discussion
☐ Difficulty in defining rules related to land use and occupation that reduce exposure to risk
☐ Difficulty in defining rules related to adapting buildings to the risk of overtopping and coastal flooding
☐ Other, which one?_____

9.6 Does your PDM include ways of adapting to the risk of coastal overtopping and flooding that could be considered good practice for other municipalities to follow?

☐ Yes
☐ No (the selection of this option results in the conclusion of the survey)

9.6.1 If yes, please give a brief description of the practice(s), highlighting the success factors?

(maximum 2,500 characters (including spaces))

Thank you very much (end of enquiry)

A.6 Focus group participants

Online Focus Group - Spatial Planning Specialists (12 July 2023)

- Ana Barroco (Quaternaire Portugal)
- Ana Daam (APA)
- Ana Sofia Rizzone (DGT)
- Célia Mendes (Geoatributo)
- Guilherme Santos (DGT)
- José António Lameiras (Portuguese Association of Town Planners and GIPP)
- José Mourato (ICS-UL)
- Leonel Ferreira (SPI - Sociedade Portuguesa de Inovação)
- Liliana Calado (CEDRU)
- Renato Dias & Vilma Silva (Território XXI)
- Sara Dionísio (DGT)
- Sérgio Barroso (CEDRU)

Focus Group online - CCDR (13 July 2023)

- Ana Daam (APA)
- Ana Sofia Rizzone (DGT)
- Carla Velado (CCDR Centre)
- Graça Fonseca (CCDR Norte)
- Guilherme Santos (DGT)
- Helena Oliveira (CCDR Centre)
- Helga Cabrita (CCDR Algarve)
- Isabel Rodrigues (CCDR Lisboa e Vale do Tejo)
- Manuel Vieira (CCDR Algarve)
- Maria Gomes (CCDR Lisboa e Vale do Tejo)
- Maria José Nunes (CCDR Algarve)
- Nuno Mota (CCDR Norte)
- Rosa Onofre (CCDR Alentejo)
- Sara Dionisio (DGT)

Document:
Report: WP7B - Review of guidelines on adaptation to climate change in spatial plans and programmes, including sub-national strategies and plans

General coordination:
Direção Geral do Território (DGT)

Technical coordination:
CEDRU – Centro de Estudos e Desenvolvimento Regional e Urbano

Date:
October 2023