

# National climate change adaptation planning and strategies

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*Legal instrument: Regulation on the Governance of the Energy Union and Climate Action*

*Obligation: National climate change adaptation planning and strategies pursuant to Article 19(1) of the Governance Regulation 2018/1999*

## General information

*The information in this reporting is updated until (date: YYYY-MM-DD format)*

2023-03-15

## National circumstances, impacts, vulnerabilities, risks and adaptive capacity

### National circumstances relevant to adaptation actions

#### *Biogeophysical characteristics relevant to adaptation actions*

Portugal's territory has a total area of 92,225.20 km<sup>2</sup>, a perimeter of 3,931 km, an extensive coastline (2,612 km) and comprises three different areas, one of the parts in the European Continent (the Mainland) and the other two are archipelagos in the Atlantic Ocean (the Archipelago of the Azores and the Archipelago of Madeira).

The climate in mainland Portugal is predominantly influenced by latitude, topography and its proximity to the Atlantic Ocean and Mediterranean Sea.

According to Koppen's classification, Portuguese mainland climate is divided into two regions: one with a temperate climate with rainy winters and hot, dry summers (Csa - Hot-summer Mediterranean climate) and another with a temperate climate with rainy winters and warm, dry summers (Csb - Warm-summer Mediterranean climate). Although the inland regions are less than 220 km from the coast, some are influenced by the Iberian Peninsula's continental mass, which gives them less rainfall and a greater annual temperature range than the coast line.

The Mediterranean influence is felt mainly in the summer and south and east of the territory, causing high temperatures and low rainfall. The Atlantic influence is felt primarily in winter and in the northwest of the country. It is responsible for high precipitation and the attenuation of the effects of dry and cold winds from the Peninsula's interior.

During winter, the northern region, in particular, is under the influence of subpolar depressions, which circulate to the NE, in a trajectory that follows the axis of the European continent, with frequent weather changes originated by the passage of these depressions. However, their action weakens towards inland, dominated by higher pressures in winter, decreasing, in this sense, precipitation and average temperatures, the number of rainy days, and relative humidity.

There are climatic contrasts that result directly from some relief elements, which accentuates the climatic effects caused by the continental character of the Peninsula. Thus, the higher altitude zones also correspond to higher precipitation values, which, on the other hand, decrease as one moves towards inland. In terms of orography, significant areas in the Norte and Centro that exceed 1000 metres of altitude stand out. South of the Tagus River, the scarcity of essential reliefs allows large air masses to reach the Iberian Peninsula's inland without significant loss of humidity. But even in this region, the areas of most considerable precipitation are determined by the influence of small reliefs.

The average annual air temperature is around 14/15°C, and the average monthly values vary regularly throughout the year, with a maximum in August and a minimum in January. However, there are some regional variations in its distribution. The average annual temperature evolves inversely to precipitation, increasing from North to South and West to East. The highest

temperature in mainland Portugal was registered in Amareleja (47.3 °C on 1/8/2003), and the lowest temperature was recorded in Penhas da Saúde (-16.0 °C on 5/2/1954 and 12/2/1956) (Portuguese Institute for Sea and Atmosphere - IPMA).

The general climate conditions in the Azores Archipelago are determined by its geographical situation in the context of the global atmospheric and oceanic circulation and by the effect of the enormous mass of water that surrounds it. Overall, the Azores' climate is temperate maritime, reflected by the low-temperature range, high rainfall, relative humidity, and persistent winds.

The Madeira Archipelago is geographically located in the subtropical region, presenting a mild climate in winter and summer, except in the higher altitude areas, where lower temperatures are observed. The average annual temperature varies between 8 °C in the highest peaks and 19 °C in the coastal regions.

In the hydrographic network of Mainland Portugal five international rivers stand out (Minho, Lima, Douro, Tagus and Guadiana) that flow in the largest hydrographic basins of the Iberian Peninsula. Its management is coordinated with Spain through an international convention, which conditions the scope of national action in the sustainable management of water resources, in particular taking into account the existing reservoirs, irrigation and transfer infrastructures in Spanish territory.

More than 50% of the Mainland territory is prone to desertification, particularly in inland of the southern regions of Algarve and Alentejo. Expected climate change with higher temperatures, reduced precipitation and higher evapotranspiration, will reinforce susceptibility to desertification, combined with the maintenance of inadequate agricultural practices and cultures, water scarcity associated with dry periods, and land use/cover changes.

Portugal has the third largest Exclusive Economic Zone in EU (1.7 million km<sup>2</sup>) (IPMA; Directorate-General for Natural Resources, Safety and Maritime Services - DGRM). The coast of Mainland Portugal has an extension of 943 km, is densely populated – 83% of the Portuguese population, according to 2021 Census (Statistics Portugal), lives in the coastline – and faces a significant threat from the phenomena of coastal erosion, coastal floods, cliffs instability and landslides.

### *Demographic situation relevant to adaptation actions*

Recent demographic dynamics largely determine the priorities for climate adaptation in the country: concentration of the population along the coast between the largest metropolitan areas, increasing exposure to urban heat islands, flash floods, landslides and coastal risks; depopulation of the inland population and ageing of the age structure, implying a reduction in agroforestry activity and an increase in the risk of forest fires; intense seasonal population movements, which increase vulnerability in the regions most sensitive to droughts.

The resident population in mainland Portugal registered a decrease of 2% in the last decade (9,855,909 inhabitants in 2021) (Statistics Portugal). The interior, increasingly depopulated, has a significantly lower population density than the coast, where it continues to grow. The demographic change in recent decades at the municipality level shows that the territories

located in the interior of the country lose population and municipalities with population growth are located predominantly on the coastline, with a concentration around Lisboa and Algarve. Around 50% of the population in Portugal was concentrated in 2021 in only 31 municipalities, mostly located in the two main metropolitan areas (Área Metropolitana de Lisboa and Área Metropolitana do Porto) (Statistics Portugal).

There is considerable population affluence to the coastal tourist regions during the summer, especially to the Algarve. It is estimated that the population tripled during this period (about a million more people than the resident population). In this period, the affluence to the Inland regions can also be significant, with origin in the residents of the coast, foreign visitors, and Portuguese emigrants who spend their holidays in their hometowns.

The ageing of mainland Portugal's population has been intensifying, both through the decrease of young people and the increase of the elderly population. The decrease in birth rates and the rise in longevity has led to an inversion of the standard age structure (pyramid structure), with more elderly than young people. In 2021, there were 2,334,470 residents aged 65 or over in mainland Portugal, which corresponds to approximately 24% of the total resident population, while the population under 15 years old represented 13% (Statistics Portugal).

The Azores Archipelago population (236.413 inhabitants in 2021) has decreased in the last decade, in the order of -4.2% (Statistics Portugal). The population is younger than the national average but is also ageing and has a lower average life expectancy.

With 250,744 inhabitants in 2021, the Madeira Archipelago has high population density (about 314 inhabitants per km<sup>2</sup>), almost triple of the average of the country and of the EU, especially high on the south of the Madeira island. In 2021, 42% of the population of Madeira Island lived in the municipality of Funchal. In the last decade, the population registered a decrease of 6% (Statistics Portugal).

### *Economic and infrastructural situation relevant to adaptation actions*

The national economic structure has undergone a progressive process of tertiarization, and, in 2021, 72.7% of the population worked in the tertiary sector. The highest tertiarization rates, above 85%, are registered in the regions of Lisbon and Algarve, mainly due to tourism activity. On the other hand, the secondary sector still has a significant relevance (above the national average of 25%) in the Norte and Centro regions (33% and 29% respectively). The primary sector (national average is 3%) is still relevant in the Alentejo (9%) and Azores Archipelago (8%) regions (Statistics Portugal).

Regarding land use and land cover, the dominant occupations in mainland Portugal in 2018 are forest and agriculture (39% and 26% of the total area, respectively). The areas of wildwoods, agroforestry systems, and pasture occupy 12%, 8% and 7% of the land, respectively, demonstrating high potential of the land for forestry and agricultural production (Directorate-General of Territorial Development - DGT). Therefore rural regions are significant (around 92% of the total area), which means that natural capital and landscape exist and must be valorized

despite the historical vulnerability to rural fires in mainland Portugal. Urban areas are less significant in terms of the area they occupy but present specific risks and a higher potential for human damage than those of rural areas.

Although Portugal is a country with an average annual rainfall of circa 878 mm (normal between 1971-2000) (IPMA), its spatial-temporal distribution may lead to reduced water availability in certain regions and time of year, generating problems of water scarcity, which seriously affect most of agricultural activity, still highly dependent on weather conditions. Irrigation is a fundamental component to ensure the viability of agriculture, without which it is not possible to enhance the vegetative development of spring-summer crops and, consequently, to obtain income levels that fix agricultural populations, and counteract the progressive depopulation of rural regions of the interior. In Portugal, in 2021, 46% of farms have irrigation systems that accounts for 57% of national Total Standard Production Value (Statistics Portugal). Of the 4.0 million hectares of usable agricultural area, 16% are equipped for irrigation (630,517 ha) (Office of Planning, Policy and General Administration - GPP). However, in periods of continued drought, a significant part of these agricultural explorations loses viability.

One of the most vulnerable agriculture and forest systems is the 'montado' (cork oak forest), mostly located in the southern region of Alentejo, an extensive production system that is well adapted to its Mediterranean climate and weak soil conditions, but is endangered by increasing aridity, plagues, and the expansion of irrigation cultures. In the coastal areas to the south of the Tagus river there is also a greater use of greenhouses, which are particularly vulnerable to storms and events of strong winds.

The forestry sector is a significant exporter with high added value that generates significant employment. In addition to their economic importance and as promoters of social cohesion, forests play essential roles in protecting soil and water, supporting biodiversity, and combating desertification. However, the majority of forest areas are not actively managed, and extensive areas are abandoned, which contributed to increase the risk of wildfires, and the spreading of invasive species and plagues. The difficulties in the implementation of forest management policies are aggravated by the fragmentation of rural property, particularly to the North of the Tagus river, where the greater extent of forest is located. About 91% of Portugal's forest is privately owned, and only 3% belongs to the Portuguese State, while the remaining 6% are managed by local communities, but under a partial forest regime, while the private owned forests average in the EU is only 60% (Portuguese Institute for Nature Conservation and Forests - ICNF). Currently there are 10 Biomass Thermal Power Plants and 10 Pellet Plants in Portugal dedicated to forest biomass. Together they are responsible for a consumption of more than 2 million tonnes, and make an important contribution to the valorisation of forest waste and the cleaning of forests.

As tourism is an activity subject to intense competition between destinations, which depends on territory and climate as necessary "raw materials", climate change may have an extremely high impact on countries with a strong economic dependence on this sector, such as Portugal.

Therefore, the loss of biodiversity, coastal erosion, and consequent landscape degradation, or even the increase in vector-borne diseases, is today a growing concern.

For example, with the rise in the average sea level, "sun and beach" tourism will be strongly affected by the predicted disappearance of beaches and water scarcity, which could make certain activities unviable. In addition to the direct adverse effects that climate change may have on this sector, it should also be ensured that, in the future, it does not compromise its development and economic growth, so it is necessary to consider strategies that incorporate the most appropriate mitigation and adaptation measures as mechanisms to respond to this challenge.

Regarding the energy sector, risks related to climate change may affect both the supply and the demand side. On the supply side, extreme weather events like windstorms, forest fires, heavy precipitation and floods can directly impact infrastructures related to energy generation, transmission and distribution, but also the supply chain of fuels and other raw materials. On the demand side, atypical increases in energy consumption may occur as a result of extreme weather events (e.g., increases in electricity and gas demand for heating during cold spells and in electricity demand for cooling during heat waves). As these risks can affect the security of energy supply, they are taken into consideration in the national risk preparedness, preventive action and emergency plans established for the sector and also in the system operators' preparedness and contingency plans. Related to the risk of severe drought, which affects hydroelectric production, the Council of Ministers Resolution no. 82/2022 established a strategic water reserve in predetermined hydroelectric plants. A minimum water level was established for each reservoir and the use of water resources in those reservoirs was suspended until those minimum levels are reached.

The possibility of an increased frequency of extreme weather events that may hit essential transport, energy, and communications infrastructures in a continuous or untimely manner and sometimes with real catastrophic effects constitutes a significant risk to the safety of people and properties and the functioning of the economy and Society in general.

On the coast of mainland Portugal, the most important consequences of climate change are the rise in mean sea level and the modification of sea disturbance regime, storms, temperature, and precipitation. These changes have an impact on the sediment balance of the coastal strip. They may result in the establishment or variation of the intensity of erosion, the modification of the frequency and intensity of coastal flooding, and changes in estuaries, lagoons, and coastal aquifers' water quality.

The areas of greatest vulnerability in the coastal zone identified with a tendency to erosion or confirmed erosion and with a record of coastal overtopping and flooding are those where climate change impacts will be most evident. Thus, places with a high density of human occupation, protected or not by coastal protection/defence structures, are of additional concern, with relevance to coastal areas whose morphological content is associated with the soft or mobile and low rocky substrate (beaches, dunes, barrier islands, sand barriers, wetlands).

*If necessary, you can upload here an additional document*

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## **Climate monitoring and modelling framework**

### *Main activities on climate monitoring, modelling, projections and scenarios*

The Portuguese Institute for Sea and Atmosphere (IPMA) - <https://www.ipma.pt/pt/index.html> - is responsible for making observations for meteorological and climatological purposes. IPMA is responsible for deploying, operating, and maintaining the national network of meteorological stations; it is also responsible for archiving and quality control of meteorological observations.

Within the scope of the active provision of climate services on a global scale, IPMA integrates into its mission the collection and exchange of climate data and the research and creation of climate information products for distribution to more differentiated users. Under the guidance of the Global Framework, the IPMA has already established protocols and the exchange of data between meteorological services and other organisations and the development of products and provision of services, driven by the desire to improve the accessibility to and the benefits of users of climate information. With this purpose – and following a policy of gradual opening of meteorological data to civil society – IPMA is currently creating products and services tailored to users' needs, which will be integrated into its website. Some of the services already provided include the drought monitoring and the forecast of the fire risk index.

Additionally, there is the Climate Portal (Portal do Clima - <http://portaldoclima.pt/pt/>) that provides the climate projections for Portugal with more than 40 climate variables, aggregated into the following groups: temperature, precipitation, wind speed, relative humidity, global radiation, temperature range, drought index, aridity index, evapotranspiration, fire risk index and climate classification. This platform is based on CORDEX climate change projections, with multiple information regarding normal climate and scenarios (RCP4.5 and RCP8.5), time period, geographical areas (NUTS1, 2 and 3), statistics (30 year average or anomalies), global models and regional models, constituting a platform of easy access for the public on historical series, climate change at regional level and climate indicators for specific sectors in Portugal. Further refinements on the projections are presently being made including results for the RCP2.6 scenario and also CMIP6-based projections for Azores and Madeira islands.

The National Roadmap for Adaptation 2100 project - assessment of the Portuguese territory's vulnerability to climate change in the 21st century, supported by the EEA grants and by the Portuguese Environment Agency, is a current project (2020-2023) to assess the impacts and adaptation needs resulting from global warming in Portugal, focusing in the key mainland vulnerabilities: hydrological balance; forest fires; agroforestry; sea level rise, coastal erosion and

storm surges. In the context of this project, a multi-variable ensemble was built and tested, being the baseline for assessing future projections for three different emission scenarios (RCP2.6, RCP4.5, and RCP8.5) throughout the 21st century, accounting for the model's ability to simulate a set of variables. The future time periods analysed were 2011-2040, 2041-2070 and 2071-2100. In total, 13 EURO-CORDEX simulations were considered, covering all the experiments, the ones including the three emission scenarios.

The Portuguese Environment Agency (<https://apambiente.pt/>) keeps records of historical flood marks and manages a network of meteorological and hydrological monitoring stations (the SNIRH - National Information System on Water Resources - <https://snirh.apambiente.pt/>).

### *Main approaches, methodologies and tools, and associated uncertainties and challenges*

Our main tool, the Climate Portal, used past climate data and the IPCC AR5 climate projection data (CORDEX project) for dissemination through the website. This task involved all necessary calculations for the disaggregation of data at NUTS3 level and different periods and the estimation of aggregated indicators (e.g., drought index, meteorological fire risk, etc.). Different global and regional numerical climate models and their main features were analysed. Global climate models (GCMs) are based on general physical principles of fluid dynamics and thermodynamics and originate from numerical weather prediction. GCMs describe the interactions between the components of the global climate system, the atmosphere, the oceans, and a basic description of the earth's surface (i.e., aspects of the biosphere and lithosphere, relevant to the surface and energy balance). Regional climate models (RCM) have higher resolution over a limited area. A regional climate model is a numerical model for predicting a region's climate; such models are usually determined from GCMs, with horizontal resolutions of tens of kilometres, using the GCMs to define initial time-varying boundary conditions and surface boundary conditions. They include the effect of greenhouse gases and aerosol forcing and are determined statistically or dynamically. Regional climate models (RCM), forced by global climate models (GCM), allow solving physical processes on smaller scales and therefore with increased detail and realism compared to global model results. The global model, which describes the large-scale effects and atmospheric circulation processes, determines the sequence of meteorological events that characterise a particular region's climate. These features are the result of greenhouse gas emissions, variation in solar activity and volcanic eruptions. RCMs, forced with the consequence of GCMs, allow the study of regional processes and generate information at relevant scales for vulnerability, impact, and adaptation studies.

Each of the regional climate models, RCM, was forced by different model forcers (CNRM-CM5, ICHEC-EC-EARTH, IPSLCM5A-MR, HadGEM2-ES, MPI-ESM-LR). Two RCM (the CCLM and RCA4 models) were forced with three different GCMs, providing information from 1971 to the end of the 21st century.

Using the regional CODEX simulations performed for the European domain (EURO-CORDEX), it

was identified the simulations' characteristics, namely spatial and temporal resolution. A set of regional simulations from the CORDEX project, performed for the European domain (EURO-CORDEX), with a spatial resolution of 0.11° (~12 km) and a daily temporal resolution: the control period (1989-2008; assessment scenario); the historical period (1971-2005); two emission scenarios from the IPCC AR5 report: RCP 4.5 and RCP 8.5 (2006-2100).

For this portal, the following EURO-CORDEX variables were selected: Maximum surface temperature (K); Minimum surface temperature (K); Precipitation (kg/m<sup>2</sup>/s); Wind speed m/s; Relative surface humidity (%) (not available in all models); Surface downwelling solar radiation (W/m<sup>2</sup>); Surface upwelling solar radiation (W/m<sup>2</sup>).

These variables were used as the basis for all the indicators provided by the project. Using these data, numerical calculation processes were developed and implemented, allowing the generation of results related to estimating the current climate and future scenarios in Portugal. The results presented reflect the analysis defined in different periods, called "climatological normal", represented by a group of 30 years; 1971-2000, 2011-2040 (Near future), 2041-2070 (Intermediate Future) and 2071-2100 (Far Future).

The climate information relating to the observations comes from the matrix information of the Climate Atlas of Continental Portugal 1971-2000. The data used were obtained from the interpolation of the average values in 1971-2000 of the climatological parameters air temperature and precipitation, observed in 61 stations and 260 udometer stations. The multivariate regression method with altitude and distance from the coast and normal kriging of the residuals were used for the average values of minimum, maximum, and average air temperature and total precipitation. Normal kriging was used to interpolate the number of days for the different values indicated in the portal (e.g., minimum, maximum temperature and rain). The manual modelling of the experimental variogram was aided and optimised using the analysis of several types of error obtained by cross-validation.

According to the project requirements and the existing limitations in terms of simulations for climate scenarios, the variables, and indicators to be made available on the Climate Portal were identified, as well as the associated statistics, covering: temperature; precipitation; wind intensity; relative humidity; global solar radiation; daily temperature range; drought index; aridity index; evapotranspiration; fire risk index.

The uncertainty component was analysed, even considering that the current generation of climate models can faithfully represent aspects of the climate. However, as the global climate system is overly complex, involving processes in various Spatio-temporal scales, it has become necessary to include different simplifications that give rise to uncertainties in future climate projections.

Uncertainty is inherent in all projections of the future and is not peculiar to climate modelling. Climate change and the impacts associated with uncertainties are related to the future trajectory of emissions, resulting from the global development of technology, the energy consumption of the world's population and many other socio-economic factors, as well as the limitation of climate models, due to the limited knowledge of the climate system and the necessary simplifications in climate models.

One way to validate the results obtained using CORDEX data and the calculations performed on

them is to compare the modelled data with the observed data. To this end, the empirical data was used in 4 locations on the mainland. This choice was based on meteorological/climatological stations with records for the study period and the territory's spatial representation, considering the known climatological regions.

The modelled data were obtained using the same methodology adopted in all processes. For this validation process, the mean value of the 4 points of the matrix around the meteorological/climatological station's location were used. The statistics corresponding to the models (modelled history and projections) are calculated from each of the models' average values according to the period indicated (annual, monthly, or seasonal).

Despite the uncertainty, the rise in sea level by the end of the 21st century is expected to be 0.5 metres higher, possibly reaching values in the order of 1 metre above the 1990 level.

Future climate projections are subject to uncertainties, being its assessment more challenging for climate extremes and especially at regional scales, due to the influence of increased natural climate variability. Improvements on global and regional ESMs have been continuous in the last decades, and the recent phase 6 of the CMIP is expected to promote a further step ahead on the understanding of climate and future associated changes, with emphasis on the regional and local scales.

*If necessary, you can upload here an additional document*

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## **Meteorological Services (1)**

*Name of the meteorological service*

IPMA - Portuguese Institute of Sea and Atmosphere

*Status of the meteorological service*

Established

*Web link to the meteorological service*

<https://www.ipma.pt/pt/index.html>

## **Climate projections and services (1)**

*Description of climate projections and services*

Climate portal: Web platform that provides and compares climate data and scenarios for Portugal

*Status of the climate projections and services*

Established

*Web link to the climate projections and services*

<http://portaldoclima.pt/pt/>

## Observed and future climate hazards

### Overview of observed climate hazards and existing pressures and identification of key future climate hazards

#### *General aspects on the assessment of climate hazards and pressures*

The following information was provided by the sectors based on their experience and studies that they have developed over time. This information will be updated in the next report with National Roadmap for Adaptation 2100.

#### *Time horizon for the future climate hazards*

Based on SIAM - Climate Change in Portugal - Scenarios, Impacts and Adaptation Measures 2006 and on the Climate Portal.

### Acute hazards temperature related

#### *Heat wave: Observed climate hazard*

YES

#### *Heat wave: Future climate hazard*

+ significantly increasing

#### *Cold wave / frost: Observed climate hazard*

NO

#### *Cold wave / frost: Future climate hazard*

0 hazard not of relevance

#### *Wildfire: Observed climate hazard*

YES

#### *Wildfire: Future climate hazard*

+ significantly increasing

## **Acute hazards wind related**

*Cyclone: Observed climate hazard*

YES

*Cyclone: Future climate hazard*

+ significantly increasing

*Storm (including blizzards, dust and sandstorms): Observed climate hazard*

YES

*Storm (including blizzards, dust and sandstorms): Future climate hazard*

+ significantly increasing

*Tornado: Observed climate hazard*

NO

*Tornado: Future climate hazard*

= without significant change

## **Acute hazards water related**

*Drought: Observed climate hazard*

YES

*Drought: Future climate hazard*

+ significantly increasing

*Heavy precipitation (rain, hail, snow/ice): Observed climate hazard*

YES

*Heavy precipitation (rain, hail, snow/ice): Future climate hazard*

+ significantly increasing

*Flood (coastal, fluvial, pluvial, groundwater, flash): Observed climate hazard*

YES

*Flood (coastal, fluvial, pluvial, groundwater, flash): Future climate hazard*

+ significantly increasing

*Snow and ice load: Observed climate hazard*

YES

*Snow and ice load: Future climate hazard*

0 hazard not of relevance

*Glacial lake outburst: Observed climate hazard*

NO

*Glacial lake outburst: Future climate hazard*

0 hazard not of relevance

### **Acute hazards solid mass related**

*Avalanche: Observed climate hazard*

NO

*Avalanche: Future climate hazard*

0 hazard not of relevance

*Landslide: Observed climate hazard*

YES

*Landslide: Future climate hazard*

+ significantly increasing

*Subsidence: Observed climate hazard*

NO

*Subsidence: Future climate hazard*

= without significant change

## **Chronic hazards temperature related**

*Changing temperature (air, freshwater, marine): Observed climate hazard*

YES

*Changing temperature (air, freshwater, marine): Future climate hazard*

+ significantly increasing

*Temperature variability: Observed climate hazard*

YES

*Temperature variability: Future climate hazard*

+ significantly increasing

*Permafrost thawing: Observed climate hazard*

NO

*Permafrost thawing: Future climate hazard*

0 hazard not of relevance

## **Chronic hazards wind related**

*Changing wind patterns: Observed climate hazard*

NO

*Changing wind patterns: Future climate hazard*

= without significant change

## **Chronic hazards water related**

*Changing precipitation patterns and types (rain, hail, snow/ice): Observed climate hazard*

NO

*Changing precipitation patterns and types (rain, hail, snow/ice): Future climate hazard*

+ significantly increasing

*Precipitation and/or hydrological variability: Observed climate hazard*

YES

*Precipitation and/or hydrological variability: Future climate hazard*

+ significantly increasing

*Ocean acidification: Observed climate hazard*

NO

*Ocean acidification: Future climate hazard*

0 hazard not of relevance

*Saline intrusion: Observed climate hazard*

YES

*Saline intrusion: Future climate hazard*

= without significant change

*Sea level rise: Observed climate hazard*

YES

*Sea level rise: Future climate hazard*

+ significantly increasing

*Change in sea ice cover: Observed climate hazard*

NO

*Change in sea ice cover: Future climate hazard*

0 hazard not of relevance

*Water scarcity: Observed climate hazard*

YES

*Water scarcity: Future climate hazard*

+ significantly increasing

## Chronic hazards solid mass related

*Coastal erosion: Observed climate hazard*

YES

*Coastal erosion: Future climate hazard*

+ significantly increasing

*Soil degradation (including desertification): Observed climate hazard*

YES

*Soil degradation (including desertification): Future climate hazard*

+ significantly increasing

*Soil erosion: Observed climate hazard*

YES

*Soil erosion: Future climate hazard*

+ significantly increasing

*Solifluction: Observed climate hazard*

NO

*Solifluction: Future climate hazard*

0 hazard not of relevance

## Observed climate hazards and existing pressures.

### *Overview of existing pressures*

Regarding the impact on the distribution of ecosystems, a marked change in vegetation structure and composition is expected with consequences for biodiversity. In the northern and central coastal regions, dominated by mixed hardwood forest, a decrease in species more demanding in moisture is expected, with an increased mortality of older and less resistant trees. The regions of Minho, Douro Litoral and the mountain areas may benefit from a possible increase in biological diversity. The eucalyptus forests in the interior may be abandoned and replaced by wildwoods due to their low capacity for natural regeneration. The pine forests may

persist or tend to be replaced by wildwoods due to fires recurrence, in which case preservation of biodiversity is expected. Regarding cork oak forests, a drastic reduction in biological diversity results from crescent desertification processes in the regions with higher aridity index (semi-arid and dry sub-humid classes).

A considerable increase in demand for energy for cooling in the summer months is expected, associated with the projected increase in temperatures and the frequency, duration, and severity of heatwaves and tropical nights. Nevertheless, a significant part of the population - the neediest - may have difficulty adapting to these changes, given the characteristics of a great part of the residential buildings and the lack of financial capacity to invest in their thermal comfort and installation and use of climatization systems.

As for agriculture, a reduction in productivity is expected in any of the projected climate scenarios and in all crops, with activities displacement to the north and coastal areas in the case of mainland Portugal.

Regarding migratory movements, climate change may contribute to accentuating the process of population loss in the rural areas of the interior and the progressive concentration of the population on the coastline and in the metropolitan areas of Lisbon and Porto. This trend may also be reinforced by movements originating abroad, with an increase in the influx of immigrant populations from regions more vulnerable to climate change.

The rise in temperature and the prolonged periods of drought are also likely to be responsible for the increase in the number of rural fires, especially the number of large forest fires ( $\geq 10,000$  ha), that spread by canopy and become practically uncontrollable under certain atmospheric conditions. The risk associated with these occurrences has increased dramatically, imposing extremely high social and economic costs on the country. 2017 was a landmark year, recording the largest burnt area since 1995 and becoming the most tragic year ever, with more than 100 human lives lost.

## Identification of key future climate hazards

*(where relevant) Secondary effects of the selected hazards, such as forest fires, spread of invasive species and tropical diseases, cascading effects, and multiple hazards occurring at the same time.*

Although there is no exact quantification available to estimate the impacts of extreme weather events and the trends observed in recent years related to climate change, Portugal has estimates of 60-140 million euros in annual costs associated with forest fires, of around 290 million euros associated with the 2005 drought (the most severe this century), and circa 200 million euros from the 2012 drought (mainly in terms of agricultural production losses). Climate change tends to increase or accelerate other risks, where natural and anthropogenic factors combine, for example, in terms of coastal erosion or forest fires.

The reduction in annual precipitation, the increase in its variability and the consequent change in the flow regime will reduce river flows, affect the recharge of aquifers, and even dry out the

sources of essential rivers in the Iberian Peninsula for longer or shorter periods. These changes may be accompanied by water quality problems, intensification of drought events and increased pressure for desertification, increasing biodiversity loss associated with altered ecosystem structure and dynamics. This reduction in precipitation will also affect aquifers' recharging, enhancing the degradation of the quality of surface and underground water resources. Even so, the territory will remain vulnerable to flooding, given the projections of an increase of the number of days with heavy precipitation.

The new temperature and precipitation regimes associated with climate change imply: an increase in the number of heatwave occurrences, their duration and intensity; an increase in the number and intensity of major rural fires, and; extreme, unpredictable, intense, and localised meteorological phenomena, such as torrential rain, hail, cyclones and tornados. In addition to the tendency for heatwaves to become more intense and frequent or spatially extensive, it is also predicted that there will be a change in their seasonal distribution. Although heatwaves typically occur in the spring and summer, this phenomenon is expected to gain equal importance in the autumn.

In this context, climate change scenarios predict a significant increase in meteorological conditions conducive to large areas of fire across the Iberian Peninsula, namely the whole of Portugal.

The coastline is also particularly vulnerable to coastal erosion and coastal overtopping with very significant and severe effects. This is due to sea-level rise, hourly rotation of the mean wave direction on the west coast, and storm surge regime (despite uncertainty about the future evolution on this last point). These factors aggravate coastal swelling and flooding by allowing waves to break closer to the coast and transfer more energy to the beach, in addition to the deficit in river sediment inputs available for coastal drift. The effects of coastal erosion and overtopping are further enhanced by the characteristics of the anthropogenic occupation of the territory's coastal strip, that substantially increases the risk of socio-economic costs of climatic phenomena. Despite the uncertainty, the rise in sea level by the end of the 21st century is expected to be 0.5 meters higher, possibly reaching values in the order of 1 meter above the 1990 level. The rise in sea level also increases the risk of saline contamination of coastal aquifers, estuaries, and the final stretches of rivers, impacting some water supply systems.

## Key affected sectors

Identify key affected sectors (applying the best available science to assess the different aspects of the vulnerability and risk analysis by the Intergovernmental Panel on Climate Change and the latest Commission guidance on the climate proofing of the EU-funded projects)

### Affected Sectors (15)

#### *Title of the sector*

Mainstreaming Adaptation – Spatial Planning

#### *Key affected sector*

land use planning

#### *Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

#### *Different rating of the observed impacts of key hazards for:*

-

#### *Describe your assessment*

The main impacts are the increase of risk in coastal areas due to erosion, an increase in areas exposed to rapid flooding, an increase in territory exposed to drought, soil desertification, an increase in regions threatened by the saline intrusion, an increase of the generalised fire risk with a strong impact on the territory.

These critical vulnerabilities are considered in the National Programme for Spatial Planning Policies (PNPOT) and require an extra adaptation effort, induced by public policies, aiming to strengthen the adoption of measures to promote the resilience of the Portuguese territory to climate change. In the Program a geographical analysis is presented where the links between territories susceptible to certain hazards and the land uses that occur in them are evident, with emphasis being given to territories traditionally occupied by fragmented urbanisation and dispersed construction, where there are extensive and intertwined boundaries between built-up areas and forests with vulnerability to rural fire.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

The mapping of current hazards and the scenario of their future expression in the context of climate change is one of the main objectives of the National Programme for Spatial Planning Policies, which aims, from the established macro approach, to foster the detailed mapping of hazards (coastal erosion, flooding, mass movement on slopes, rural fire, water shortage, heat waves, soil desertification) and to deepen their knowledge, within the scope of territorial plans and spatial or sectoral programmes of various scales. Downstream of this mapping are the land occupations that can induce management concerns and the need to undertake actions of prevention and adaptation to reduce vulnerabilities. To this end mapping was carried out showing the relationship of territories susceptible to specific hazards with the intensities and forms of land use that occur therein.

Due to its geographical position, Portugal presents itself as a territory significantly exposed to climate change, which, combined with the mentioned vulnerabilities, points to the need to adopt policies to adapt and mitigate the effects of climate change in all sectors, including land use planning. The scarcity of resources and environmental risks that are a reality today will be intensified by climate change scenarios, and may contribute to an exodus from the low density regions of the country. According to National Programme for Spatial Planning Policies (PNPOT), in a time horizon of slightly more than two decades, the combined effect of the increase in the average annual temperature and the decrease in the average annual precipitation represents a significant change in climatic conditions, therefore it is urgent to consider them in land use and management options, both in rural and urban areas.

*Rating of the vulnerability, including adaptive capacity*

medium

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

National documents on spatial planning policy and urban development policy show that vulnerability exists. But, they also demonstrate a growing concern with the capacity to adapt to climate change, and therefore, guidelines have been developed that should be pursued in the strategies and plans of local and regional scope.

The identification of uses, activities or elements that are most vulnerable to each hazard is a key issue to improve adaptation and resilience. It is also an opportunity to stimulate and promote new models of land use planning and territorial development, which enable the achievement of benefits for objectives of sustainability. The new approach includes the adoption of natural-based solutions, the improvement of the ecosystem services and, in general, the enhancement of rural territories and the qualification of urban territories. Portugal has a strong planning system regarding land use change, carried out mainly at the municipal level: the primary goal is to optimise the spatial distribution of various land use categories by classifying and qualifying land use units. The National Agricultural Reserve and the National Ecological Reserve play an important role in this process. They protect areas that, due to their exposure and susceptibility to natural risks, need special protection.

### *Rating for the risk of potential future impacts*

medium

### *Different rating of the risk of potential future impacts for:*

-

### *Describe your assessment*

Climate change scenarios predict that Portugal will face more extreme and intense weather phenomena both in urban areas (heat waves, flooding, coastal erosion) and rural areas (rural fires, loss of biodiversity, less agricultural productivity). In this context it is essential to ensure solutions for a territorial organisation oriented to improving the resilience of natural, agriculture, forestry and communities, systems safeguarding, the sustainability and connectivity of the landscape and food sovereignty.

At the national level, National Programme for Spatial Planning Policies (PNPOT) defines precautionary measures for present and future risks, taking into account climate change scenarios. Prevention, adaptation and reduction of risk exposure, including the identification of exposed sensitive elements to be managed and relocated, are key issues. In this context, strategies and approaches to climate change adaptation are being integrated into different Plans and Programs. In addition, municipal master plans must delimit areas of susceptibility to hazards and risks, considering climate change scenarios.

---

*Title of the sector*

Economy - Business and Industry

*Key affected sector*

business; industry

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

low

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The main vulnerability for the areas where the industry is located is flooding due to heavy rainfall events. Another threat appears to be extreme meteorological events of strong wind and storm, by the fall of coating materials and structures on buildings. In summary, the maximum direct negative impacts (threats) concern the following types of extreme events: i. Intense precipitation; ii. Strong winds and storms; iii. Heatwaves.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

The climate sensitivity of industrial activities seems also to result from the impacts of extreme climate events on buildings, infrastructures and other economic assets. The main hazards for industry resulting from climate change are associated with: i. availability of water resources - degradation of quantity and quality; ii. vulnerability to flooding, and; iii. vulnerability to extreme weather events, of strong wind and storm. The indirect negative impacts (threats) include

damage to transport infrastructures, particularly roads. Concerning industry located in the Lisbon Metropolitan Area and due to industrial establishments' concentration, there is a strong potential for generating significant accidents involving hazardous substances, emphasising chemical and fuel establishments. The danger of technological accidents associated with industrial establishments that handle or store hazardous substances has also been identified.

#### *Rating of the vulnerability, including adaptive capacity*

medium

#### *Different rating of the vulnerability and/or adaptive capacity for:*

-

#### *Describe your assessment*

The location of commercial activities, particularly, on the ground floors of buildings, and service activities in the central and consolidated areas are sensitive to the potential occurrence of flash floods, which can result from episodes of intense and concentrated rainfall in a few hours, due to the accumulation of rainwater or deficiencies in drainage systems. The flooding of underground urban structures - with these uses - can also be observed with shortcomings and difficulties in the drainage of urban systems, particularly, during high tide periods. Institutional cooperation and the mechanisms defined between the entities responsible for the planning and executing actions have enabled a globally effective response to the consequences observed in the sector arising from extreme climate events.

#### *Rating for the risk of potential future impacts*

high

#### *Different rating of the risk of potential future impacts for:*

-

#### *Describe your assessment*

It is estimated that the sectors where the incidence of climate change may be felt the most will be in the universe of industrial sectors covered by the following legal regimes: European Union – Emissions Trading Scheme (EU-ETS), Industrial Emissions Regime (Environmental Permit) and Prevention of Major Accidents involving hazardous substances, which coincide with the technological risks inherent to the respective activities and the vulnerability resulting from the greater frequency and magnitude of extreme weather events.

---

*Title of the sector*

Agriculture

*Key affected sector*

agriculture and food; rural development

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The assessment results from the existing perspectives on specific hazards: increase in temperature, reduction in precipitation and increase in its variability affecting the recharge of aquifers and the river regime with implications on water quality, drought events and desertification, biodiversity loss, floods, heatwaves, large fires, extreme weather events, diseases, plagues and the spread of exotic species.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

The assessment results from the existing perspectives for the sector. The Action Plan for Adaptation to Climate Change 2020-2030 – P-3AC (NAP), based on climate scenarios RCP4.5 and RCP8.5, predicts the worsening of a set of vulnerabilities: maximum temperature; extreme precipitation events; quality/quantity of water resources; susceptibility to desertification and

biodiversity loss; floods; heat waves; diseases, plagues, and weeds; rural fires.

*Rating of the vulnerability, including adaptive capacity*

medium

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

The assessment results from the existing perspectives on particular vulnerabilities: water for irrigation (droughts and floods); organic matter in the soil (productive capacity, water and CO2 retention); desertification; biodiversity (non-preservation of essential ecosystems for the sector); genetic heritage with plants and animals better adapted to climate change (water stress, temperature, diseases and plagues); alien species, emerging plagues and diseases; knowledge on good practices of adaptation to climate change and their adoption; systems of forecasting, warning and response to risks.

*Rating for the risk of potential future impacts*

high

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

The assessment results from the existing perspectives for the sector: reduction of guaranteed water for irrigation; increase of droughts and floods; destruction of infrastructures; reduction of soil organic matter; desertification, an increase of exotic species and the emergence of diseases and plagues; non-resilience of the current crop and livestock practices; increase of fires and reduction of biodiversity. Relocation of some crops and agricultural activities northwards on the mainland, with reduced production and/or productivity; worsening of desertification in the south of mainland Portugal.

---

*Title of the sector*

Biodiversity

*Key affected sector*

biodiversity (including ecosystembased approaches)

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

Climate change is forcing a range of pressures on ecosystems. Changes in rainfall patterns and significant increases in maximum temperatures cause drought periods with consequences for land degradation.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

A future framework in which the depopulation of territories emerges as a significant threat to biodiversity and the alteration of natural systems is exacerbated by the proliferation of invasive exotic species. Climate change (increased temperature, reduced rainfall) forces an increase in the area susceptible to desertification, putting at risk soil functions such as water retention capacity, infiltration, increasing soil erosion, with effects on habitat fragmentation and biodiversity loss.

*Rating of the vulnerability, including adaptive capacity*

high

*Different rating of the vulnerability and/or adaptive capacity for:*

-

### *Describe your assessment*

Biodiversity maintenance is threatened by the large spectrum of consequences derived from increasing temperature, reduced and concentrated precipitation and increasing aridity. These aspects pose enormous pressures on ecosystems leading to biodiversity loss. Ecosystems have a natural capacity for adaptation, nevertheless when the pressure is high, some measures must be taken to ensure ecosystems are providing their intrinsic functions and services. Restoration measures and NbS reinforce the adaptive capacity of ecosystems towards the development of invasive alien species.

### *Rating for the risk of potential future impacts*

high

### *Different rating of the risk of potential future impacts for:*

-

### *Describe your assessment*

Changes in the aridity index may lead to a greater predominance of invasive alien species, that's why biodiversity and nature conservation has to be seen as an opportunity or a solution for specific territories, playing a crucial role in climate change adaptation processes. At the same time, protected areas are understood as strategic assets, in which sustainable management is essential to maintain natural values. Biodiversity conservation can be reinforced by restoration measures to improve the habitat quality and avoid biodiversity loss, giving ecosystems more adaptation capacity.

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### *Title of the sector*

Economy - Tourism

### *Key affected sector*

tourism

### *Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The following hazards/effects with relevance for the sector are observed: temperature rise/increased drought periods and consequent impact on the attractiveness of the territories; sea-level rise and effects on the territory (changes in coastal erosion dynamics), with relevance for tourism demand; more intense periods of rainfall (alternating with hotter and drier periods).

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

It is considered that, under future climatic conditions, the probability of the main hazards will remain the same. However, it is expected that the sector will have a growing capacity to adapt to those hazards, resulting in a reduction in exposure to them, but still at a medium to short-term level.

*Rating of the vulnerability, including adaptive capacity*

high

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

The adaptation capacity of the tourism sector is high. There is intensive work in progress to train economic operators and to create Turismo de Portugal (national tourism board) funding lines. These resources are going to be used to achieve some objectives, such as to increase energy and water efficiency, to reduce waste and to increase sustainable construction, among others that

may be identified in the context of environmental sustainability, which should result in an increased capacity of the sector to adapt to climate change.

*Rating for the risk of potential future impacts*

medium

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

Climate, as a resource, is an extremely relevant factor in the touristic attractiveness of regions, which means that the tourism sector is vulnerable to the impact of climate change since this may imply a redistribution of the attractiveness of destinations. However, the growing focus on capacity building, specific funding lines for the sector, based on environmental sustainability criteria complemented with increasingly demanding legislation in environmental terms should contribute to an effective and efficient response to the risks associated with climate change by the sector.

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*Title of the sector*

Energy

*Key affected sector*

energy

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

Based on the experience reported by the operators of energy transmission and distribution systems, as well as by electricity producers, namely in the context of the Risk-Preparedness Plan

for the Electricity Sector and the National Risk Assessment for the National Gas System, impacts associated with extreme heat waves, long periods of drought, serious forest fires, high precipitation, floods and severe windstorms were observed.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

Existing data shows an increase in the frequency of extreme weather events, namely severe windstorms, extreme heat waves, serious forest fires and long periods of drought. These events seem to have a more continuous evolution of their expression, compared with high precipitation and floods.

*Rating of the vulnerability, including adaptive capacity*

medium

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

Vulnerabilities are essentially due to operational issues, consequence of extreme weather events, which may damage specific infrastructures (e.g., overhead electricity transmission and distribution networks). A reduction in vulnerability is expected due to the introduction of technological improvements and other preventive and contingency measures, namely those included in the Risk-Preparedness Plan for the Electricity Sector and in the Preventive Action Plan and Emergency Plan for the National Gas System. Still, it is expected that in the future, with the worsening of climatic conditions, an additional effort in adaptation will be necessary. Some additional measures could be taken by the sectorial operators, for example, in transmission and distribution grids (in the electricity and gas sector), and those measures are considered in the respective Network development plans (where the climate change/adaptation issues are considered).

*Rating for the risk of potential future impacts*

medium

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

It is expected that future hazards will be identical to the current ones, but with an aggravated impact, not only due to their greater frequency but also their higher severity. To reduce the risk and the respective impact and safeguard security of supply, there is a need to reinforce protection to minimise the severity of those events, and to use redundancy in the infrastructures.

---

*Title of the sector*

Forestry

*Key affected sector*

forestry

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

Fires were recorded with greater frequency and severity, and phytosanitary events also with greater frequency. Extreme weather events occur with strong winds, with impacts on vegetation's stability, such as falling trees. There are also impacts in terms of soil erosion resulting from these extreme events.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

There is a greater probability of extreme events affecting forestry systems. On the one hand, there is a decrease in the productivity of forest systems. On the other hand, there is less willingness to invest in forests due to risk perception. Also of note is the shortage of raw material for forestry industries, creating more favourable conditions for expanding invasive species and greater difficulty to establish stands during planting periods due to droughts and extreme temperatures.

*Rating of the vulnerability, including adaptive capacity*

medium

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

The systems are highly vulnerable due to their long-life cycle. There may be a reduced adaptive capacity of specific forest systems because of their ecological condition. Based on climate scenarios, the need to adapt to forest ecosystems is estimated with implications on forest distribution and composition to increase resilience.

*Rating for the risk of potential future impacts*

medium

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

It is necessary to adapt forest management models and to make use of suitable and improved genetic material. These measures may have an impact on the supply capacity of domestic forest-based industries. Adaptation should encompass specific vocational training, particularly at higher levels. In this context, the interconnection between the production and processing

sectors and academia, including research, innovation, and development centres would be significant.

---

*Title of the sector*

Health

*Key affected sector*

health

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

high

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The increased frequency, intensity and duration of heatwaves and droughts with extreme temperature have contributed to the increase of mortality records in those situations. In addition, the increased frequency and intensity of precipitation with floods and the greater frequency and intensity of hurricanes and storms have repercussions on the health of the population as well as on the response capacity of health services.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

The increased frequency of heatwaves and days with heavy rainfall, droughts, fires due to the combination of lack of humidity and higher temperatures will significantly affect public health.

The degradation of air quality will generate an increase in health problems related, namely, to respiratory diseases. The high probability of water quality and quantity changes and agricultural production, zoonosis and increased exposure to radiation will also have repercussions on public health and safety, increasing mortality and morbidity.

*Rating of the vulnerability, including adaptive capacity*

high

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

The increase in diseases associated with air pollution, heatwaves and cold spells (extreme temperatures), distribution and incidence of vectors that transmit diseases, availability and quality of water and food are susceptible to pressure on health services. Vulnerabilities at the level of coastal areas and estuaries, forest areas and buildings in floodplains, saline intrusion and agricultural production will also have repercussions on health services and on the morbidity and mortality of the population, especially on the most vulnerable population groups.

*Rating for the risk of potential future impacts*

high

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

It is expected that there will be a worsening in the living conditions and well-being of the population in the medium or long term, increasing mortality and morbidity, namely by infectious and oncologic diseases. Events with a great capacity to affect populations and ecosystems are predicted. Some typologies of buildings may also be compromised and the energy and water availability, including at the level of services and health care units.

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*Title of the sector*

Safety of People and Assets

*Key affected sector*

civil protection and emergency management

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

low

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The impact of the main hazards is assessed as low, considering what is set out in the National Risk Assessment, updated in July 2019, in which some anomalous situations that occurred in mainland Portugal in the recent past were identified, which can be considered to be under the effect of climate change, particularly on natural hazards (extreme weather events), such as heatwaves, floods, coastal overflows and on mixed risks, as is the case of rural fires.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

The probability of risks in the sector is assessed medium, considering what was set out in the National Risk Assessment (2019), based on climate models for the most severe scenario (RCP 8.5). An evolutionary analysis of the impacts of climate change has been presented for natural and mixed risks, resulting in an increase in frequency and/or intensity in various types of threats and showing a decreasing trend in other cases, such as in cold waves and snowfalls.

*Rating of the vulnerability, including adaptive capacity*

medium

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

It is expected that the vulnerability to climate change will be reduced through the adaptive capacity and measures planned for the sector. In this context, it is essential to highlight that civil protection is responsible for planning and responding to events resulting from meteorological and other risks. Therefore, it is a priority to make the respective readjustment given the potential impact of climate change.

*Rating for the risk of potential future impacts*

medium

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

It is considered that potential future impacts resulting from climate change will be expected. However, with the implementation of the sector's measures, it is assumed that a relevant contribution can be made to reduce these impacts.

---

*Title of the sector*

Transports and Communications

*Key affected sector*

transport

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

### *Describe your assessment*

From the conclusions of the sector survey conducted within the Transport Working Group – ENAAC2020 (NAS), in conjunction with the UNECE Group of Experts for Climate Change Impacts and Adaptation for TNN, regarding the impacts on road infrastructure, the meteorological or climatic factors that affect a broader universe of critical infrastructure are the situations of Precipitation/Flooding, followed by episodes of High Temperatures, Rising/Dropping Flows and Winds.

According to National Road administration, the effects of climate change (CC) on transportation infrastructure can be significant - most notably landslides and material washout due to flash floods, damage and wear and tear to materials and equipment, falling trees, and fires - causing disruptions in the provision of services, with economic, social, and environmental consequences.

### *Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

### *Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

### *Describe your assessment*

The assessment of the impact of climate change was recognised by the Transport Working Group – ENAAC2020 (NAS) as an intermediate level problem for transport services and infrastructures in Portugal. However, despite the apparent sensitivity to the impacts of climate change, there is a significant degree of uncertainty regarding the size of the challenge to be faced.

### *Rating of the vulnerability, including adaptive capacity*

high

### *Different rating of the vulnerability and/or adaptive capacity for:*

-

### *Describe your assessment*

Due to some extreme climate events, these issues have been introduced in the sphere of concern of the concessionaires, and some have adopted measures/actions that, although not

structured in a plan/strategy, are somehow related to climate change (e.g., Intensification of Infrastructure Monitoring and Inspection Plans).

Also, whenever possible, the history of climate events is used in the conception and design of new infrastructures or in the improvement of existing ones.

### *Rating for the risk of potential future impacts*

high

### *Different rating of the risk of potential future impacts for:*

-

### *Describe your assessment*

According to available information, extreme weather events, some of which increase in intensity and frequency, and slower onset climate change (e.g., sea-level rise) and cumulative effects can produce damage to transport infrastructure, operational disruptions and pressures on supply chain capacity and efficiency.

---

### *Title of the sector*

Coastal areas and Maritime affairs

### *Key affected sector*

marine and fisheries

### *Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

### *Different rating of the observed impacts of key hazards for:*

-

### *Describe your assessment*

Portugal is particularly threatened by rising sea levels and increasingly frequent and intense extreme weather events. The coastline's extension, the reduction of dune and marsh systems (and their protective capacity), and the shoreline's occupation by the economic activities that

develop there (port activity, recreational boating, maritime transport, among others) justify the implementation of measures to fight climate change.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

Changes in seawater temperature, salinity and acidity can be expected from models estimating the impact of climate change, affecting biota, producing changes in the species diversity and abundance of individual taxa or populations. In fishing opportunities, which are established based on specific stocks, the impact already felt tends to multiply.

*Rating of the vulnerability, including adaptive capacity*

high

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

The sector is highly vulnerable to climate change producing cascading effects that give rise to discontent among all those involved and demand response at the level of measures to prevent and mitigate climate change. The impact of climate change on marine ecosystems will be severe, with increased pressure not only on the fisheries and aquaculture sectors, but also on the other activities of the sea's economy.

*Rating for the risk of potential future impacts*

high

*Different rating of the risk of potential future impacts for:*

-

### *Describe your assessment*

The country's marine biodiversity is threatened by climate change and natural phenomena such as coastal erosion and the overexploitation of resources caused by human activities such as fishing, which, if not managed sustainably, can lead to the collapse of stocks and other imbalances in ecosystems. Different activities bring other impacts in terms of oil pollution, such as maritime transport.

---

### *Title of the sector*

Mainstreaming Adaptation – Water Resources

### *Key affected sector*

water management

### *Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

high

### *Different rating of the observed impacts of key hazards for:*

-

### *Describe your assessment*

At Portugal mainland level, there has been an increase in extreme precipitation events of extremely high intensity in short periods, impacting on the urban areas. In mainland Portugal, it should be highlighted the prolonged hydrological drought in the south of the country, that in 2022 also affected the northern region, with a sharp decrease in annual precipitation, with a consequent reduction in surface and groundwater water resources.

### *Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

### *Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

*Describe your assessment*

Given the climate scenarios available for mainland Portugal, an increase in the frequency and duration of drought events is expected. Water scarcity will be intensified under future climatic conditions, constituting one of Portugal's major future problems. On the other hand, it is expected an increase of extreme precipitation events, of short duration, which carry increased difficulties for the timely warning of fast flood risks for the population in urban areas.

*Rating of the vulnerability, including adaptive capacity*

high

*Different rating of the vulnerability and/or adaptive capacity for:*

-

*Describe your assessment*

There is a high vulnerability to both droughts and floods. There is some adaptive capacity that is being developed with early warning system implementation and the Floods River Management Plan (FRMP) and River Basin Management Plan (RBMP) elaboration. However, there is still room for improvement, namely raising awareness among the population and sectors, particularly in terms of behaviour and risk communication.

*Rating for the risk of potential future impacts*

high

*Different rating of the risk of potential future impacts for:*

-

*Describe your assessment*

Since there is a high probability of the main hazards and exposure to them under future climate conditions, it will also imply high future impacts on water management. The need for adaptation measures to minimise the effects arising from extreme events is fundamental.

-----

*Title of the sector*

## Mainstreaming Adaptation – Spatial Planning

### *Key affected sector*

buildings

### *Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

### *Different rating of the observed impacts of key hazards for:*

-

### *Describe your assessment*

Among the main hazards affecting the national territory, and focusing specifically on those that will affect the building sector the most, the increase in the frequency and intensity of precipitation, flooding and flash floods, strong winds, droughts and heat waves are the hazards of greater concern. For the municipalities located along the coastline, the main hazards for the sector are coastal landslides and flooding.

Expected impacts on buildings are infrastructure damage and increased energy consumption due to the use of air conditioning, especially in residential buildings, as a result of extreme weather events (cold waves and heat waves).

### *Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

### *Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

### *Describe your assessment*

The National Risk Assessment from 2019 identifies hazards of natural, technological or mixed origin, likely to affect the national territory, and the impact of climate change scenarios. For the risks affecting the buildings sector, it points to the following scenarios and degrees of probability of occurrence: i. Heatwaves - In summer, heatwaves will occur throughout the continental territory, except on the coast between Setúbal and Caminha and the Eastern Algarve (medium-high probability of occurrence); ii. Strong winds - The incidence of strong winds is random throughout the territory and may affect large geographical areas (typically associated with

winter depressions) or reach relatively small areas and therefore it is not possible to assess its susceptibility. For the scenario of strong wind with gusts exceeding 120 km/h in several locations, the fall of trees, power cuts in thousands of homes, damage to various structures, with some human victims and high economic damage to infrastructures and housing are to be expected (Medium-High Probability of occurrence); iii. Flooding and fast floods - As a result of a relatively long period of above average rainfall during the winter and in several hydrographic basins, the flooding in various parts of the country, will affect several urban centres, leading to the consequent unavailability of some services and causing economic damage to infrastructure and housing (medium-high degree of probability of occurrence).

#### *Rating of the vulnerability, including adaptive capacity*

medium

#### *Different rating of the vulnerability and/or adaptive capacity for:*

-

#### *Describe your assessment*

The guidelines on the adaptive capacity of the sector are set out in the National Spatial Planning Policy and city policy documents and are progressively being integrated into the regional and local strategies and plans. Some adaptation measures that could reduce vulnerability are i. Increasing insurance premiums' costs for buildings located in areas of higher exposure; ii. Improve construction techniques to make buildings and infrastructure more resilient and use materials that promote external cooling, insulation of walls, windows, roofs and floors, external sun protection, better ventilation and natural lighting; iii. Adopt urban planning solutions conceived to reduce the urban heat island effect; iv. Relocate urban centres, sensitive buildings, infrastructure and industries in less vulnerable areas; v. Promote measures that enhance energy and water efficiency associated with greater thermal comfort, such as decentralised electricity production in buildings (solar and wind) and the use of rainwater for purposes compatible with non-potable uses.

#### *Rating for the risk of potential future impacts*

medium

#### *Different rating of the risk of potential future impacts for:*

-

#### *Describe your assessment*

The publication of the National Programme for Spatial Planning Policies (PNPOT) in 2019 has given spatial expression to situations where hazard conflicts with land use and occupation. These conflicts are mainly associated with built-up areas where the principles of precaution and prevention should be maximised and where adaptation solutions are needed to improve the resilience of the elements to the risks of potential climate change impacts.

The National Risk Assessment mentions the following risks of future climate change impacts, relevant to the sector: i. Heatwaves - The risk of heatwaves will be increased in frequency and intensity by an increase in average and maximum temperature (1.1°C - 1.6°C) in the hottest months (June to October) and an increase in the number of hot days (maximum above 35°C) and tropical nights (minimum above 20°C) in summer; ii. Flooding and fast floods - Despite the uncertainty associated with precipitation, the patterns of its evolution tend towards a shorter rainy season and more intense rainfall during this period, in contrast to the reduction of rain in spring, summer and autumn. This dynamic may determine the occurrence of a higher number of flooding episodes during winter; iii. Flooding and coastal overflows - The increase in the average sea level, which by the end of the XXI century is expected to be 0.5 m higher, possibly reaching values around 1 m above the 1990 level, and the change in the storms regime are two factors that contribute to the worsening of this risk; iv. Rural fires - Contributing to this risk is the rise in temperature that will give rise to a more significant number of hot days and heatwaves and the growing trend towards periods of drought that will make rural areas buildings more vulnerable to fires.

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*Title of the sector*

Mainstreaming Adaptation – Spatial Planning

*Key affected sector*

urban

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The main hazards affecting the sector include increases in the frequency and intensity of floods, flash floods, heatwaves, rural fires and coastal overflows. An increase in the number of extreme precipitation events and a reduction in days with low to medium/high precipitation are also expected. The seasonal variability of rainfall is expected to increase. The territory will remain vulnerable to flooding, given the trend towards a more significant contribution to the annual precipitation from heavy rainfall days. The new temperature and precipitation regimes associated with climate change are increasing the occurrences of extreme weather events such as torrential rain, hail, cyclones and tornadoes. The urbanised areas subject to the risks of flooding and coastal erosion caused by rising sea level are areas of potential loss of territory with high socio-economic costs.

### *Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

medium

### *Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

### *Describe your assessment*

For the risks affecting the urban sector, the National Risk Assessment points to the following scenarios and degrees of probability of occurrence: i. Heatwaves - In the summer, heat waves will occur in most mainland Portugal (medium-high probability of occurrence); ii. Strong winds - The incidence of strong winds is random throughout the territory. For the strong wind scenario with gusts exceeding 120 km/h the falling of trees, power cuts in thousands of homes, cuts in several roads and damage to various structures, with severe high economic damage to infrastructures and housing (medium-high probability of occurrence); iii. Flooding and flash floods - The development of floods and flash floods in various parts of the country, as a result of above-average rainfall during the winter and in various hydrographic basins, affecting several urban centres, will make some services unavailable and will cause economic damage to infrastructure, and housing (medium-high probability of occurrence); iv. Coastal flooding and overflows - In a scenario of very rough sea coinciding with high tides (winter equinox), strong swell at high tide with the destruction of protective jetties will lead to the overflowing of the sea and consequent flooding, causing damage to housing, facilities and infrastructures (medium-high probability of occurrence).

### *Rating of the vulnerability, including adaptive capacity*

medium

### *Different rating of the vulnerability and/or adaptive capacity for:*

-

#### *Describe your assessment*

At the national level, National Programme for Spatial Planning Policies (PNPOT) provided measures that improve knowledge about the territorial impact of natural hazards and adaptation to climate change, including the necessity to apply construction and urban management norms in risk zones and the development of guidelines on risk prevention and reduction measures (including climate risk), for adoption in territorial plans. These guidelines are being pursued progressively in local strategies and plans. At the local level, the planning and design of urban areas has begun to incorporate the perspective of adaptation. Changing the transportation modes and forms of transport use, reducing the urban heat island effect, managing the water cycle and making an efficient use of energy in all activities (by promoting local structures of consumption, for example), buildings and infrastructures are some of the main measures that aim to increase resilience, hold soil artificialization, limit urban compaction and promote sustainable mobility.

### *Rating for the risk of potential future impacts*

medium

### *Different rating of the risk of potential future impacts for:*

-

#### *Describe your assessment*

In the framework of urban management, climate change will particularly affect coastal areas (erosion and storms), reinforce the heat island effect, increase droughts (affecting the quality of urban services) and water scarcity (with impacts on quantity and quality). The National Risk Assessment mentions the following risks of future climate change impacts, with relevance to the sector: i. Heatwaves - The risk of heatwaves will be increased in frequency and intensity by the increase in average and maximum temperature (1.1°C - 1.6°C) in the hottest months (June to October) and an increase in the number of hot days (maximum above 35°C) and tropical nights (minimum above 20°C) in summer; ii. Strong winds – For the strong wind scenario (with gusts exceeding 120 km/h), it is expected the falling of trees, power cuts in thousands of homes, cuts in several roads and damage to various structures, with high economic damage to infrastructures and housing (medium-high probability of occurrence) are to be expected iii. Flooding - Despite the uncertainty associated with precipitation, the patterns of its evolution tend towards a shorter rainy season and more intense rainfall during this period, in contrast to the reduction of rain in spring, summer and autumn. This dynamic may determine the

occurrence of a more significant number of floods during winter; iv. Floods and coastal overflows - The increase in the average sea level, which by the end of the 21st century is expected to be 0.5 m higher, possibly reaching values around 1 m above the 1990 level, and the change in the storms regime are two factors that contribute to the worsening of this risk on the coastline and the buildings therein.

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*Title of the sector*

Coastal areas and Maritime affairs

*Key affected sector*

coastal areas

*Rating of the observed impacts of key hazards, including changes in frequency and magnitude*

medium

*Different rating of the observed impacts of key hazards for:*

-

*Describe your assessment*

The increase in the magnitude and frequency of the phenomena affecting the low, dune-supported coastline induced average retreat rates of 0.5 to 9 m/year between 1958 and 2010, representing an approximate loss of territory of 12 km<sup>2</sup>. Based on the COSMO programme results, the loss between 2010 and 2021 can be estimated at 1.3 km<sup>2</sup>. It is estimated a loss of coastal territory in mainland Portugal in the 1958-2021 period of 13.3 km<sup>2</sup>. The retreat is not so relevant on cliff coasts, although instability movements and block falls may induce significant risk.

*Rating of the key hazards' likelihood of occurrence and exposure to them under future climate*

high

*Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:*

-

#### *Describe your assessment*

The available climate modelling indicates a high probability of a change in the wave climate off mainland Portugal's coast, with a rotation of 5-10° in the wave direction for the 2100 time horizon. Regarding the significant wave height, a minor increase is expected. There is also a high probability of sea-level rise between 25 and 110 cm by 2080, leading to an increase between 15 and 25% of the current erosion rate.

#### *Rating of the vulnerability, including adaptive capacity*

high

#### *Different rating of the vulnerability and/or adaptive capacity for:*

-

#### *Describe your assessment*

The available forecasts regarding the rise in the average sea level and the modification of the sea agitation regime that reaches the Portuguese coast indicate that the coastal zones present a high vulnerability to climate change, namely in the low sandy sections and in the low rocky coast supported by dunes. The insufficient sediment supply aggravates the coastal vulnerability, which reduces coastal systems' capacity to adapt to the predicted changes.

#### *Rating for the risk of potential future impacts*

high

#### *Different rating of the risk of potential future impacts for:*

-

#### *Describe your assessment*

The potential future impacts of sea-level rise are mainly related to the coast's geological nature and its altimetry. Thus, impacts are expected to be negligible on rocky coastlines and significant on sandy stretches, especially those of low elevation, such as the coasts of central Portugal and the eastern Algarve.



## Legal and policies

### Legal and policy frameworks and institutional arrangements

#### *Legal and policy frameworks and regulations*

The main strategic documents at national level comprise: 1) the National Climate Change Adaptation Strategy (EN AAC) - National Adaptation Strategies (NAS); 2) the Action Programme for Climate Change Adaptation (P-3AC) - National Adaptation Plans (NAP) and 3) the Portuguese Climate Law, adopted respectively in 2015, 2019 and 2021.

EN AAC (a revised NAS) mainly establishes the governance and responsibilities of the public entities involved to address its three main objectives: 1) Improvement of the level of knowledge about climate change; 2) Implementation of adaptation measures; and 3) Promotion of the mainstreaming of adaptation into sectoral policies. Other specific responsibilities / objectives are defined for its nine sectoral working groups and six thematic areas.

P-3AC (NAP) complements and systematises the work carried out in the context of EN AAC's second objective by defining nine adaptation priority lines of action. This instrument supports the planning and mobilisation of financing instruments and other policy-setting exercises, guided by a list of concrete actions on the territory and a dedicated line of action for generic cross-cutting actions. P-3AC also establishes an indicator based monitoring system to track progress.

The first Portuguese Climate Law defines the objectives and other considerations for climate policies. On adaptation matters, it introduces some new elements to integrate on the adaptation policies and governance including some tasks to accomplish within a 1-year / 2-years timeframes, amongst others: a) creation of a climate action portal; b) development of municipal and regional climate action plans; c) development of sectoral adaptation plans; d) additional monitoring and reporting processes (including in the national budget); e) introduction of the climate legislative impact assessment; f) integration of climate risks in the decision-making of public and private institutions and agents.

### National Adaptation Policies (9)

#### *Adaptation Policy type*

A: Climate Law (including adaptation)

*If type is 'Other', please explain*

-

*Adaptation policy title*

Portuguese Climate Law

*Adaptation policy status*

c-actual adaptation policy (adopted)

*Year the adaptation policy was adopted*

2021

*Period covered by the adaptation policy*

until 2050

*Link to the adaptation policy*

<https://files.dre.pt/1s/2021/12/25300/0000500032.pdf>

*Sectors covered by the adaptation policy*

-

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

-

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*Adaptation Policy type*

B: National Adaptation Strategy (NAS)

*If type is 'Other', please explain*

-

*Adaptation policy title*

National Adaptation to Climate Change Strategy (ENAAC 2020)

*Adaptation policy status*

c-actual adaptation policy (adopted)

*Year the adaptation policy was adopted*

2015

*Period covered by the adaptation policy*

from 2015-2025

*Link to the adaptation policy*

<https://files.dre.pt/1s/2015/07/14700/0511405168.pdf>

*Sectors covered by the adaptation policy*

ICT (information and communications technology);agriculture and food;biodiversity (including ecosystembased approaches);business and industry;civil protection and emergency management;coastal areas;energy;finance and insurance;forestry;health;land use planning;marine and fisheries;tourism;transport;water management

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

c-adaptation

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*Adaptation Policy type*

C: National Adaptation Plan (NAP)

*If type is 'Other', please explain*

-

*Adaptation policy title*

Action Plan for Adaptation to Climate Change (P-3AC)

*Adaptation policy status*

c-actual adaptation policy (adopted)

*Year the adaptation policy was adopted*

2019

*Period covered by the adaptation policy*

until 2030

*Link to the adaptation policy*

<https://dre.pt/application/conteudo/123666112>

*Sectors covered by the adaptation policy*

-

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

-

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*Adaptation Policy type*

D: Sectoral Adaptation Plan (SAP)

*If type is 'Other', please explain*

-

*Adaptation policy title*

Regional Strategies of Adaptation to Climate Change - Health Region of Lisboa e Vale do Tejo

*Adaptation policy status*

c-actual adaptation policy (adopted)

*Year the adaptation policy was adopted*

2019

*Period covered by the adaptation policy*

From 2019

*Link to the adaptation policy*

[https://www.dgs.pt/ficheiros-de-upload-2013/link-17\\_enaac-estrat\\_arslvt-pdf.aspx](https://www.dgs.pt/ficheiros-de-upload-2013/link-17_enaac-estrat_arslvt-pdf.aspx)

*Sectors covered by the adaptation policy*

health

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

a-vulnerability and risk

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*Adaptation Policy type*

D: Sectoral Adaptation Plan (SAP)

*If type is 'Other', please explain*

-

*Adaptation policy title*

National Strategy for a Preventive Civil Protection 2030

*Adaptation policy status*

c-actual adaptation policy (adopted)

*Year the adaptation policy was adopted*

2021

*Period covered by the adaptation policy*

From 2021- 2030

*Link to the adaptation policy*

<https://files.dre.pt/1s/2021/08/15500/0013300156.pdf>

*Sectors covered by the adaptation policy*

civil protection and emergency management

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

-

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*Adaptation Policy type*

B: National Adaptation Strategy (NAS)

*If type is 'Other', please explain*

-

*Adaptation policy title*

National Adaptation to Climate Change Strategy (ENAAC 2010)

*Adaptation policy status*

d-previous adaptation policy (superseded)

*Year the adaptation policy was adopted*

2010

*Period covered by the adaptation policy*

2010-2015

*Link to the adaptation policy*

<https://dre.pt/dre/detalhe/resolucao-conselho-ministros/24-2010-612654>

*Sectors covered by the adaptation policy*

agriculture and food; biodiversity (including ecosystembased approaches); buildings; business and industry; civil protection and emergency management; coastal areas; energy; forestry; health; land use planning; marine and fisheries; tourism; transport; urban; water management

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

c-adaptation

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*Adaptation Policy type*

G: Other (specify below)

*If type is 'Other', please explain*

National adaptation strategy progress report

*Adaptation policy title*

2013 National adaptation strategy progress report

*Adaptation policy status*

d-previous adaptation policy (superseded)

*Year the adaptation policy was adopted*

2013

*Period covered by the adaptation policy*

2013

*Link to the adaptation policy*

[https://apambiente.pt/sites/default/files/\\_Clima/Adapta%C3%A7%C3%A3o/Relat\\_Progresso%20ENAAAC%20SET%202013.pdf](https://apambiente.pt/sites/default/files/_Clima/Adapta%C3%A7%C3%A3o/Relat_Progresso%20ENAAAC%20SET%202013.pdf)

*Sectors covered by the adaptation policy*

agriculture and food; biodiversity (including ecosystembased approaches); buildings; business and industry; civil protection and emergency management; coastal areas; energy; forestry; health; land use planning; marine and fisheries; tourism; transport; urban; water management

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

c-adaptation

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*Adaptation Policy type*

F: Climate Risk Assessment (CRA)

*If type is 'Other', please explain*

-

*Adaptation policy title*

SIAM 2006 - Climate change in Portugal. Scenarios, impacts and adaptation measure

*Adaptation policy status*

c-completed

*Year the adaptation policy was adopted*

2006

*Period covered by the adaptation policy*

2100

*Link to the adaptation policy*

<http://cciam.fc.ul.pt/prj/siam/SIAM-II-BOOK.zip>

*Sectors covered by the adaptation policy*

agriculture and food; biodiversity (including ecosystembased approaches); coastal areas; energy; forestry; health; marine and fisheries; water management

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

a-vulnerability and risk

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*Adaptation Policy type*

E: Regional Adaptation Plan (RAP)

*If type is 'Other', please explain*

-

*Adaptation policy title*

Lisbon Metropolitan Area Climate Change Adaptation Plan

*Adaptation policy status*

c-actual adaptation policy (adopted)

*Year the adaptation policy was adopted*

2019

*Period covered by the adaptation policy*

2019-2030

*Link to the adaptation policy*

<https://www.aml.pt/index.php?cMILID=SUS5B26D38C7E6F8&cMILL=3&mIID=SUS5B26D2AD40BAF&mIN=Elementos%20do%20Plano%3A%20conte%FAdo%20documental%20constituente%20%28downloads%29&mILA=&cMILID1=SUS57DBD63E8B375&mIID1=0&mIN1=%C1reas%20de%20atividade&cMILID2=SUS5B2>

*Sectors covered by the adaptation policy*

ICT (information and communications technology); agriculture and food; biodiversity (including ecosystembased approaches); buildings; business and industry; civil protection and emergency management; coastal areas; energy; forestry; health; marine and fisheries; tourism; transport; water management

*If sector is 'Other', please explain*

-

*Focus of the adaptation policy*

a-vulnerability and risk; b-impact; c-adaptation

## **Overview of institutional arrangements and governance at the national level**

*Climate vulnerability and risk assessment*

The first integrated assessment of impacts and adaptation measures in Portugal “SIAM - Climate Change in Portugal – Scenarios, Impacts and Adaptation Measures” was completed in 2002 and revised in 2006.

Later, in 2013, it was published a Progress Report of the NAS which systematised the climate vulnerabilities and adaptation measures for the sectors covered in the NAS. To some extent, climate scenarios have also been integrated in the National Risk Assessment (for Disaster Risk Management) in 2014 and 2019.

There is an ongoing project – the National Roadmap for Adaptation 2100 – that aims to define storylines on evolution of climate change vulnerabilities and impacts, as well as determine investment needs for adaptation and economic costs of inaction.

*Planning, implementation, monitoring, evaluation and revision of adaptation policy*

The Climate Action Commission (CAC), created in 2015, seeks to enhance the involvement and promote the accountability of the various sectors for greater integration of climate policy in sectoral policies. It is composed of government departments from relevant sectors, promoting policy coordination, a greater dynamism and sectorial responsibility. It is chaired by the Minister of the Environment and Climate Action and includes government departments from the areas of energy, spatial planning, finance, agriculture, sea, economy and innovation, transport, health, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, education and science, and representatives of the regional governments of the Azores and Madeira. CAC is responsible for: a) Providing political guidelines in the context of climate change; b) Promoting the articulation and integration of climate change policies in sectoral policies; c) Monitoring the implementation of sectoral measures, programmes, and actions.

At the level of the ENAAC (NAS) governance structure, the aim is to promote the involvement of the relevant authorities and articulation with the Autonomous Regions of the Azores and Madeira, increase the interaction between sectoral groups and thematic areas and also between the various administrative levels. The ENAAC (NAS) coordination group is composed by: a) the Portuguese Environment Agency, which chairs; b) The coordinators of thematic areas; c) the coordinators of sectoral working groups; d) the representatives of the Autonomous Regions of the Azores and Madeira; e) the representatives of the National Association of Portuguese Municipalities.

It is organised into six thematic areas and nine priority sectors. The coordination of each one is shared between the Portuguese Environment Agency (NAS general coordinator), and the entities with specific thematic competences, acting as facilitators. In addition to the entities that coordinate the sectoral groups of the different priority sectors, other entities or personalities identified as relevant for the implementation of the NAS also participate in the work, contributing to a broader co-responsibility and the co-construction of the priority measures to be developed. The priority sectors correspond to strategic domains for the promotion and implementation of adaptation in Portugal. They are structured in 9 working groups, each one coordinated by the respective central administration organisations with sectoral competences.

The responsibility to implement and monitor P-3AC (NAP) lies on the Portuguese Environment Agency (as ENAAC's coordinating entity) and the remaining entities that integrate ENAAC's Coordination Group. Additionally, P-3AC introduces another level of interaction with the entities responsible for the management of financial instruments to improve cooperation, including for reporting purposes.

The Portuguese Climate Law introduces new elements to the governance although maintaining ENAAC (NAS) as the primary policy for adaptation. Among other considerations, it creates the Climate Action Council that will be composed by relevant personalities. This Council will work as an independent and advisory body providing inputs to Parliamentary and Governmental initiatives, such as climate studies and legislative acts. It will also assess the status and progress of the climate policy and its premises, providing recommendations including for the State Budget and State's General Account.

### *Integration of climate change impacts and resilience into environmental assessment procedures*

The Environmental Impact Assessment (EIA) procedures consider: national and territorial adaptation planning instruments; current and future climatic vulnerabilities through historical data on climate and occurrences of extreme weather events. EIA procedures consist furthermore of environmental, social and economic impacts and consequences, considering climate changes scenarios; key risks/impacts of climate changes in the project; assessment if pre-existing vulnerabilities to climate changes will be exacerbated; alternatives more resilient to

climate pressures and/or allowing a more significant climate vulnerability reduction; critical thresholds that compromise the project or the environment, forcing the adoption of adaptation measures; minimisation measures based on NAP for the relevant vulnerabilities or impacts. These procedures are intended to define the information to be included and the scenarios to be considered in the environmental impact report and to establish criteria for assessing climate change and for establishing appropriate measures, so as to enable monitoring impacts throughout the life cycle of the project (construction, operation and deactivation phases) The assessment of climate change is also considered at the Strategic Environmental Assessment level.

Thus, an evaluation tool has been developed to measure climate impacts of legislative proposals and sectoral policies that has been incorporated in an existing evaluation systems, "Model of the Pilot Project on Prior Evaluation of Legislative Impact on Climate Action". This pilot project is being implemented regarding preliminary legislative impact assessment on climate action, promoting alignment with the objectives undertaken by Portugal in terms of climate policy and providing an enhanced legislative procedure and a more transparent legal system. Note that impact on climate action is identified in terms of energy, mobility, agriculture, forests or other land use, water, waste, circular economy, health, protection of people and goods and economic incentives, employment, capacity building and innovation.

With the adoption of the Portuguese Climate Law, it is set that the legislative procedures always need to have this climate impact assessment.

### *Collection, ownership and re-use of relevant data and access to it*

The Portuguese National Authority for Emergency and Civil Protection (ANEPC) is developing a project, through membership of the United Nations DESINVENTAR Programme, for the construction of a database of losses and damages associated with the various types of risks, including in this context extreme meteorological and hydrological risks and mixed risks that may be exacerbated by climate change.

Likewise, ANEPC provides a Portal based on a Geographic Information System, which allows the dissemination of information to the general public on the identification and characterization of phenomena of natural, technological or mixed origin, likely to affect the national territory, as a basis for the contents of the National Risk Assessment.

### *Integration of climate change impacts and adaptation planning into disaster risk management frameworks and vice versa*

Access to information on the risks to which citizens are subject is an essential tool to ensure the population's awareness of self-protection, contributing to the adoption of measures to reduce

the risk of accidents or catastrophes. In this context, the National Authority for Emergency and Civil Protection published the National Risk Assessment in 2019, which carries out the identification and characterization of hazards of natural, technological or mixed origin, likely to affect the territory at national level, taking into account, for the applicable risks, the impact of climate change and the resulting scenarios, with an indication of trends towards risk aggravation or mitigation. Thus, National Strategy for a Preventive Civil Protection 2030 was adopted in 2021. This current Strategy focuses on enhancing risk reduction activities already underway and, at the same time, encouraging the suppression of identified gap.

## Strategies and plans

### Adaptation strategies, policies, plans and goals

#### *Adaptation priorities*

The main priorities for Adaptation (according to ENAAC 2020 and P-3AC) are: Strengthen resilience and national capacities through greater involvement of the various sectors, in a logic of integration (mainstreaming) and implementation of concrete measures; Stimulate research, innovation and knowledge production on climate change and develop a knowledge base to support public policy making; Involve society in the challenges of climate change, promoting individual and collective action; Increase the effectiveness of information, report and monitor systems, and ensure the active participation of relevant entities; Secure financing conditions and increase investment levels, ensuring self-sustainability of climate policy funding.

#### *Challenges, gaps and barriers to adaptation*

The following challenges, gaps and barriers to adaptation were presented by the sectors, according to national, community and international policies that they are obliged to implement in Portugal.

In Agriculture and rural development, the main challenges are to guarantee water for multiple uses, to reduce the knowledge gap of risks and water availability, and to improve the programme coordination and governance.

In Biodiversity the main challenge to halt and reverse the biodiversity decline is to mainstream biodiversity into multiple land based policies, and ensure effective financing measures to this end. Other aspect is the fact that the majority of land is from private owners which creates difficulties to the implementation of large scale measures.

In Forest, the main challenges are lack of financial and human resources specialised in adaptation to face the scale of the climate risks.

In Tourism, it is fundamental to improve training of technicians/decision-makers and to produce adequate risk mapping and legislation.

In Energy, new requirements and planning are needed. Screening of policy measures through climate-proofing could be used to test alignment with adaptation. Continue to work on climate-sensitive energy supply and demand models and energy system scenarios on time scales consistent with climate change.

In Health, it is essential the involvement of the relevant entities, the definition of measures by decision-makers, the creation of adequate indicators and the professionals training to establish correlations between risk/preventive measures/mitigation.

In People and goods' safety, it is essential to promote better coordination and involvement of the relevant entities and in-depth knowledge of data on damage and losses associated with extreme weather events.

Adaptation can occur in anticipation of impacts through spatial planning and by adapting urban spaces to climate events. Urban spatial planning and construction will incorporate adaptation responses: restrictions on new construction, planned setback(s) and accommodation measures, reduction of the urban heat island effect, urban water cycle management and energy and water use efficiency in all activities, buildings and infrastructure.

An increase of sectoral and intersectoral coordination is needed, in the sense of operational articulation to fulfil strategies, programmes and plans, data sharing and systematised and updated information on actions and projects under development. Implementing the measures recommended in the plans and strategies for adaptation requires adequate funding.

### *Summaries of national strategies, policies, plans and efforts, with a focus on goals and objectives, foreseen actions, budget and timeline*

The main strategic documents at national level: 1) the National Climate Change Adaptation Strategy ENAAC (NAS); 2) the Action Programme for Climate Change Adaptation P-3AC (NAP); 3) the National Energy and Climate Plan 2021-2030 (NECP 2030) and 4) the Portuguese Climate Law.

EN AAC (NAS), adopted in 2015, proposes to improve the level of knowledge on climate change, promote the integration of climate adaptation in the various public policies and operationalisation instruments, placing greater emphasis on the implementation of adaptation measures. The EN AAC promotes, through working groups and thematic areas, the coherent vertical integration of the different scales necessary for climate adaptation, from international to local, and prioritises its mainstreaming in various sectoral policies and the implementation of adaptation measures, based on technical and scientific knowledge and acceptable practices that are being developed.

NAS is guided by three main objectives:

- Improving the level of knowledge on climate change - updating, developing, and promoting understanding on climate change and assessing its potential risks, impacts and consequences, including those related to extreme weather events.
- Implement adaptation measures - assess current adaptive capacity and prioritise the implementation of adaptation options and measures that moderate future negative impacts and/or help take advantage of opportunities arising from climate change.
- Promote the integration of adaptation into sectoral policies - promote the integration and monitoring of the climate change adaptation component (mainstreaming) in the most relevant public and sectoral policies, including spatial planning and sustainable urban development policies and their territorial planning and management instruments.

Action Plan for Climate Change Adaptation - P-3AC (NAP), adopted in 2019, complements and systematises the work done in the context of the EN AAC, aiming at its second objective, the implementation of adaptation measures. NAP elects eight direct intervention lines in the territory and infrastructures, complemented by a string of transversal nature, seeking to

respond to Portugal's significant impacts and vulnerabilities. The definition of these intervention lines resulted from the screening and prioritisation of the various adaptation measures listed in sectoral, municipal, and inter-municipal planning exercises. The lines of action and measures to reduce vulnerabilities to climate change recorded in the NAP constitute the benchmark for national action on climate change adaptation,, and among others, the sectoral planning and preparation of financing instruments under the Multiannual Financial Framework 2021-2027. The NAP also includes a mapping exercise of consigned public expenditure for adaptation action under the main financial instruments available at the time. It was also included an estimate of available funds within the same financial instruments to support the actions listed. The National Energy and Climate Plan 2030 (NECP 2030) approved by Resolution of the Council of Ministers nº. 53/2020, of July 10, 2020, is the main instrument of national energy and climate policy for the next decade towards carbon neutrality in 2050 and has extended the validity of the ENAAC until December 31, 2025. PNEC 2030 has a chapter dedicated to “Resilience and capacity to adaptation to climate change” as a co-benefit of decarbonisation and energy transition and stressing the symbioses between adaptation and mitigation.

## **Selection of actions and (programmes of) measures (24)**

### *Title of the measure or action*

Study to assess water needs for the agricultural sector in the context of Climate Change (Plan for the Adaptation of Water Resources Management to Climate Change for the Agricultural Sector)

### *Key Type Measure (KTM)*

A: Governance and Institutional

### *sub-KTM*

A2: Management and Planning

### *Specification*

-

### *Short description of the measure or action*

Forecasting water needs for irrigation in each crop and ensuring future availability in national hydro-agricultural uses, depending on climate change, changing agricultural practices or irrigation strategies, was the purpose of the studies carried out by the Directorate-General for Agriculture and Development Rural, and by its partners, within the scope of the Project “Conhecer para Prever o Futuro”, of the Rural Development Programme (PDR 2020).

### *Climate threat*

Water-related - acute - Drought

*Sectors affected*

agriculture and food

*Status*

implemented/completed

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

<https://inovacao.rederural.gov.pt/projetos/projetos-rrn/37-projetos-rrn/1456-conhecer-para-prever-o-futuro>

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*Title of the measure or action*

Risk management (included in Initiative 4 - Adaptation to Climate Change)

*Key Type Measure (KTM)*

B: Economic and Finance

*sub-KTM*

B2: Insurance and risk sharing instruments

*Specification*

Creation / revision of contingency funds for emergencies

*Short description of the measure or action*

This measure, called "Risk management", is included in Initiative 4 - Adaptation to climate change and corresponds to a review of the existing insurance schemes to integrate the risk associated with climate events.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

agriculture and food; finance and insurance

*Status*

being implemented

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Study on adaptation and mitigation measures (Plan for the Adaptation of Water Resources Management to Climate Change for the Agricultural Sector)

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A1: Policy instruments

### *Specification*

Creation / revision of policies

### *Short description of the measure or action*

This action focuses on elaborating a study on adaptation and mitigation measures, integrated into a more comprehensive exercise called "Water Management Adaptation Plan to Climate Change for the Agricultural Sector". Partially included in the study "Knowing to predict the future" Study to assess water needs for the agricultural sector in the context of Climate Change (Plan for the Adaptation of Water Resources Management to Climate Change for the Agricultural Sector)

### *Climate threat*

Water-related - acute - Other

### *Sectors affected*

agriculture and food; water management

### *Status*

implemented/completed

### *Administrative level the measure is implemented*

Regional (sub-national)

### *If 'other', please explain*

-

### *The cost of implementing the measure*

-

### *Weblink*

<https://inovacao.rederural.gov.pt/37-projetos-rrn/1456-conhecer-para-prever-o-futuro>

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### *Title of the measure or action*

Forest Risks (includes the actions "Prevention of forests against biotic and abiotic agents and "Restoration of forests damaged by biotic and abiotic agents or catastrophic events")

### *Key Type Measure (KTM)*

E: Knowledge and behavioural change

### *sub-KTM*

E2: Capacity Building, empowerment and lifestyle practices

### *Specification*

Service / process applications

### *Short description of the measure or action*

This "forest risks" measure includes actions associated with the prevention of forests against biotic and abiotic agents and the restoration of forests affected by biotic and abiotic agents or catastrophic events.

### *Climate threat*

Temperature-related - acute - Other

### *Sectors affected*

biodiversity (including ecosystembased approaches); forestry; land use planning; water management

### *Status*

being implemented

### *Administrative level the measure is implemented*

Regional (sub-national)

### *If 'other', please explain*

-

### *The cost of implementing the measure*

-

### *Weblink*

-

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*Title of the measure or action*

Climate change adaptation measures associated with freshwater and coastal species and habitats

*Key Type Measure (KTM)*

D: Nature based solutions and ecosystem-based approaches

*sub-KTM*

D2: Blue options

*Specification*

-

*Short description of the measure or action*

The aim is to begin implementing 50% of the climate change adaptation measures defined in the sectoral plan, giving priority to those relating to freshwater and coastal species and habitats.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

biodiversity (including ecosystembased approaches)

*Status*

being implemented

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

---

*Title of the measure or action*

Survey of typical native species and establish key reference (indicator) species for arid and semi-arid areas

*Key Type Measure (KTM)*

D: Nature based solutions and ecosystem-based approaches

*sub-KTM*

D1: Green options

*Specification*

Creation / revision of ministerial coordination formats

*Short description of the measure or action*

Carry out a survey of typical native species and establish key reference (indicator) species for arid and semi-arid areas. This survey will be especially important for better land use management, particularly in terms of forest management.

*Climate threat*

Water-related - acute - Other

*Sectors affected*

biodiversity (including ecosystembased approaches)

*Status*

planned

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

System of sustainability indicators for the sustainable management of destinations

*Key Type Measure (KTM)*

E: Knowledge and behavioural change

*sub-KTM*

E1: Information and awareness raising

*Specification*

Creation of new / improvement of exiting green infrastructure

*Short description of the measure or action*

Implementation throughout the country of a system of sustainability indicators of international reference for the sustainable management of destinations, in partnership with the World Tourism Organisation.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

ICT (information and communications technology)

*Status*

implemented/completed

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Inclusion of the sustainability dimension in the enterprise classification system

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A1: Policy instruments

*Specification*

Creation / revision of ministerial coordination formats

*Short description of the measure or action*

Inclusion of the sustainability dimension, for example in terms of management of the water resource, as a valuing element in the classification system of the undertakings.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

buildings

*Status*

studies ongoing

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

---

*Title of the measure or action*

Implement mosaics of fuel management plots

*Key Type Measure (KTM)*

D: Nature based solutions and ecosystem-based approaches

*sub-KTM*

D1: Green options

*Specification*

Creation of new / improvement of exiting green infrastructure

*Short description of the measure or action*

Implement mosaics of fuel management plots in order to improve response capacity and reduce the impact of forest fires.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

forestry

*Status*

being implemented

*Administrative level the measure is implemented*

Multilevel

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Definition and implementation of measures and strategies of adaptation of the health sector

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A2: Management and Planning

*Specification*

Natural and/or semi-natural water and marine areas management

*Short description of the measure or action*

This measure focuses on the definition and implementation of various actions and strategies to adapt the health sector to climate change.

*Climate threat*

Temperature-related - acute - Heat wave

*Sectors affected*

buildings; civil protection and emergency management; health

*Status*

studies ongoing

*Administrative level the measure is implemented*

Regional (sub-national)

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

<https://www.insa.min-saude.pt/category/areas-de-atuacao/doencas-infeciosas/revive-rede-de-vigilancia-de-vetores/>

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*Title of the measure or action*

Update of the National Risk Assessment

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A2: Management and Planning

*Specification*

Creation / revision of funding schemes

*Short description of the measure or action*

This action focuses on updating the National Risk Assessment to carry out a current identification and characterisation of hazards of natural, technological or mixed origin, likely to affect the Portuguese territory, considering, for the applicable risks, the impact of climate change and the resulting scenarios, indicating tendencies to worsen or mitigate the risks.

*Climate threat*

Solid mass-related - acute - Landslide; Temperature-related - acute - Other; Water-related - acute - Other

*Sectors affected*

civil protection and emergency management

*Status*

implemented/completed

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

---

*Title of the measure or action*

Strengthening risk monitoring and warning systems

*Key Type Measure (KTM)*

C: Physical and technological approaches

*sub-KTM*

C2: Technological options

*Specification*

Training and knowledge transfer

*Short description of the measure or action*

This measure focuses on strengthening monitoring and warning systems on risks to improve the responsible entities' response capacity and as an essential tool to ensure the population's awareness of self-protection and thus promote the better application of the precautionary principle and anticipation of the response.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

civil protection and emergency management

*Status*

implemented/completed

*Administrative level the measure is implemented*

Multilevel

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Public warning systems

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A2: Management and Planning

### *Specification*

Creation / revision of technical rules, codes and standards

### *Short description of the measure or action*

This measure focuses on the implementation of warning systems for the population, an essential tool for raising the population's awareness of self-protection and thus promoting the better application of the precautionary principle, contributing to the adoption of measures to reduce risk.

### *Climate threat*

Temperature-related - acute - Other; Water-related - acute - Other; Wind-related - acute - Other

### *Sectors affected*

civil protection and emergency management

### *Status*

implemented/completed

### *Administrative level the measure is implemented*

Multilevel

### *If 'other', please explain*

-

### *The cost of implementing the measure*

-

### *Weblink*

-

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### *Title of the measure or action*

Water retention systems to be used in periods of drought

### *Key Type Measure (KTM)*

C: Physical and technological approaches

*sub-KTM*

C1: Grey options

*Specification*

Rehabilitation, upgrade and/or replacement of physical infrastructure(s)

*Short description of the measure or action*

This measure comprises actions that consider water retention capacity, safe storage, so that it can be used in periods of drought.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

civil protection and emergency management

*Status*

being implemented

*Administrative level the measure is implemented*

River Basin District

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Clearance, river regulation and flood control

*Key Type Measure (KTM)*

C: Physical and technological approaches

*sub-KTM*

C1: Grey options

*Specification*

Rehabilitation, upgrade and/or replacement of physical infrastructure(s)

*Short description of the measure or action*

This measure comprises a set of structural interventions for clearing, river regulation and flood control in areas of frequent flooding and high damage.

*Climate threat*

-

*Sectors affected*

water management

*Status*

being implemented

*Administrative level the measure is implemented*

River Basin District

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

## Good Practice Guidelines for Disaster Risk Reduction and Promoting Resilience

### *Key Type Measure (KTM)*

E: Knowledge and behavioural change

### *sub-KTM*

E2: Capacity Building, empowerment and lifestyle practices

### *Specification*

-

### *Short description of the measure or action*

This measure comprises the development of Good Practice Guides for Disaster Risk Reduction and Resilience Promotion, translating the best lessons from experience to prevent or mitigate disaster risks and their effects.

### *Climate threat*

-

### *Sectors affected*

civil protection and emergency management

### *Status*

implemented/completed

### *Administrative level the measure is implemented*

Multilevel

### *If 'other', please explain*

-

### *The cost of implementing the measure*

-

### *Weblink*

-

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*Title of the measure or action*

Adequate management of extreme flows in areas of frequent flooding with high damage

*Key Type Measure (KTM)*

C: Physical and technological approaches

*sub-KTM*

C1: Grey options

*Specification*

-

*Short description of the measure or action*

The aim of this measure is to provide a framework for the hydraulic works required for the proper management of extreme flows in areas of frequent flooding with high damage.

*Climate threat*

-

*Sectors affected*

civil protection and emergency management

*Status*

being implemented

*Administrative level the measure is implemented*

Multilevel

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

---

*Title of the measure or action*

Resilience of ecosystems, species, and habitats to the effects of climate change

*Key Type Measure (KTM)*

D: Nature based solutions and ecosystem-based approaches

*sub-KTM*

D1: Green options

*Specification*

Communication and dissemination

*Short description of the measure or action*

This measure comprises a set of actions contributing to increase the resilience of ecosystems, species, and habitats to the effects of climate change.

*Climate threat*

Temperature-related - acute - Other

*Sectors affected*

water management

*Status*

being implemented

*Administrative level the measure is implemented*

Multilevel

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Removing constructions

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A2: Management and Planning

*Specification*

Decision support tools and databases

*Short description of the measure or action*

Removal of constructions on the coastline, located in flood-critical territories.

*Climate threat*

Solid mass-related - chronic - Coastal erosion; Water-related - acute - Flood (coastal fluvial pluvial ground water)

*Sectors affected*

buildings; coastal areas; transport

*Status*

studies ongoing

*Administrative level the measure is implemented*

Local

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Monitoring of critical areas, including cliffs, to know the evolution of the territory, its occupation and the state of coastal systems

*Key Type Measure (KTM)*

E: Knowledge and behavioural change

*sub-KTM*

E1: Information and awareness raising

*Specification*

Decision support tools and databases

*Short description of the measure or action*

Monitoring of critical areas, including cliffs, to know the evolution of the territory, its occupation and the state of coastal systems.

*Climate threat*

Solid mass-related - chronic - Coastal erosion

*Sectors affected*

coastal areas

*Status*

being implemented

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Maintenance of the coastline, through artificial feeding of sediments

*Key Type Measure (KTM)*

D: Nature based solutions and ecosystem-based approaches

*sub-KTM*

D2: Blue options

*Specification*

Communication and dissemination

*Short description of the measure or action*

Maintenance of the coastline, through artificial feeding of sediments.

*Climate threat*

Water-related - acute - Flood (coastal fluvial pluvial ground water)

*Sectors affected*

coastal areas

*Status*

studies ongoing

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Proposal for National Guidelines for Adaptation of the Transport Sector to Climate Change

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A1: Policy instruments

*Specification*

Decision support tools and databases

*Short description of the measure or action*

Preparation of a set of Guidelines for the Adaptation of the Transport Sector to Climate Change which would allow an increase of the transport sector resilience, including the transport infrastructure.

*Climate threat*

-

*Sectors affected*

transport

*Status*

planned

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

---

*Title of the measure or action*

Adaptation plans or contingency plans for extreme events – APCAP - Portuguese Association of Toll Road and Bridge Concessionaires

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A1: Policy instruments

*Specification*

Mainstreaming adaptation into other sectors

*Short description of the measure or action*

Most of the concessionaires/subconcessionaires that are members of APCAP (Associação Portuguesa das Sociedades Concessionárias de Autoestradas ou Pontes com Portagens / Portuguese Association of Toll Road and Bridge Concessionaires) are developing adaptation plans or contingency plans for extreme events. Notwithstanding the existence of plans under development, the concessionaires/subconcessionaires have preventive and response measures for extreme events that have occurred in the network.

*Climate threat*

-

*Sectors affected*

transport

*Status*

being implemented

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

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*Title of the measure or action*

Airports - Risk analysis matrix of infrastructure vulnerability

*Key Type Measure (KTM)*

A: Governance and Institutional

*sub-KTM*

A2: Management and Planning

*Specification*

Hazard / risk mapping

*Short description of the measure or action*

According to ANA - Aeroportos de Portugal, the company responsible for airport management in Portugal, although there is currently no airport with a completed Climate Change Adaptation

Plan, a risk analysis matrix of infrastructure vulnerability to climate change was prepared in 2021.

Following this analysis, the preparation of the first Adaptation Plan was started for Faro Airport, considered to be the most sensitive airport, and is expected to be completed during 2023. During 2023 and 2024 it is intended to move forward with the preparation of these plans for the remaining airports under ANA management.

*Climate threat*

-

*Sectors affected*

transport

*Status*

being implemented

*Administrative level the measure is implemented*

National

*If 'other', please explain*

-

*The cost of implementing the measure*

-

*Weblink*

-

*If necessary, you can upload here an additional document on the actions and (programmes of) measures reported in the optional table above*

-

*Overview of efforts to integrate climate change adaptation into sectoral policies, plans and programs, including disaster risk management strategies and action plans*

Portugal has made efforts to promote adaptation to climate change in sectoral policies, plans and programmes.

The National Programme for Spatial Planning Policies (PNPOT) identified 2 relevant adaptation commitments for the territory: "Adapt the territories and generate resilience"; "Ensure the reduction of exposure to risks in Land Management Instruments". Within the (50) measures established in the Action Program of PNPOT, the measure "1.7 Prevent risks and adapt the territory to climate change" also directly contributes to adaptation, aiming to deepen the knowledge about the areas subject to natural hazards, in order to give spatial expression to situations in which land use and occupation increase vulnerability or are affected by it. National Landscape Transformation Programme were as created (PTP), aiming to promote the transformations towards a landscape that guarantees resilience, sustainability and recognition of the territory.

One of the programmatic measures established in the PTP is the development of Landscape Planning and Management Programmes (PRGP) that are carried out through other programmatic measures of the PTP, namely the Integrated Areas for Landscape Management (AIGP) and Integrated Operations for Landscape Management (OIGP).

In the agriculture and food/rural development sector, the sectoral plan, AGRI-ADAPT develops the monitoring of the integration and implementation of adaptation measures foreseen for the sector and supports the development of studies on climate change on ecosystem services. Terra Futura 2020-2030 integrates an initiative dedicated to the sectors' adaptation to climate change and other measures that impact it. Additionally, the development of knowledge within the scope of climate change and ecosystem sustainability is being supported by the measure of the Recovery and Resilience Plan- Research and innovation agenda for the sustainability of agriculture, food and agroindustry (support the implementation of Terra Futura).

In the Biodiversity sector, one line of action is "promote the integration and monitoring of biodiversity adaptation measures to climate change in the various sectoral policies, plans and programs". The process of reconfiguring the Protected Areas Management Plans to Special Programs incorporates structural changes that consider the increase in coastal erosion, the occurrence of extreme weather events or flooding.

In the Coastal Zone sector the territorial model of the special programs designed for coastal areas (POC) identifies set-back lines for coastal risks, aiming at risk prevention and the protection and safeguarding of the territory. In sandy littoral, intended to safeguard and mitigate the impacts arising from the mobility and dynamics of the coastal area in the time horizons of 50 and 100 years, including the impacts arising from climate change. In cliff areas, these lines were designed taking into account the evolutionary behaviour of the cliffs as a result of the erosive action of waves, including the rise in sea level resulting from climate change. These lines and the associated regime must be incorporated in the municipal master plans. The POC implements a policy of prevention/adaptation to coastal risks and reduction of vulnerability to climate change, which encompasses a preventive attitude and also coastal protection, accommodation and planned retreat/relocation. Also identify critical areas, for which the adaptation strategy to present and future risks considers the susceptibility to them and the exposure of people, assets and natural values, within a framework of optimization of the cost/benefit ratio of the interventions, to be developed by the municipalities in articulation with the various entities with competence in the matter.

Both the Tourism Strategy 2027 and Sustainable Tourism Plan 20-23 aim to transform climate challenges into opportunities. One of the guiding principles is minimise the impact of climate change. Identifying risk areas and adaptation measures through the definition of the tourism load of the most sensitive territories (coastline, inland waters, and classified areas) should be highlighted.

In the energy sector, aiming to rehabilitate and make buildings more efficient, in convergence with the adaptation needs, it was published the long-term strategy for the renovation of buildings. Regarding the security of supply and resilience of infrastructures, the networks' Development and Investment Plans have particular relevance. Some actions and investments aimed at adaptation to climate change are already defined. In particular, the Preventive Action Plan for the National Gas System (April 2020), the Emergency Plan for the National Gas System (October 2022) and the Risk-Preparedness Plan for the Electricity Sector (January 2023) (revised version), include the assessment of risk scenarios related to extreme weather events and establish measures to prevent, prepare for and mitigate their negative effects.

In Forests, the Regional Forestry Management Programmes were revised with scenarios based on climate models and the integration of measures to prevent and protect forests and population. Rural fires risk management mechanisms were created, namely the platform for the registration of requests for burning authorisations and the production of weather warnings.

In the health sector, is essential to monitor the state health of the population, considering diseases transmitted by water, food, vectors and pathologies aggravated by air quality and exposure to extreme weather events. The monitoring of vectors that transmit diseases is carried out by the National Vector Surveillance Network (REVIVE).

In order to prevent the negative effects of intense cold or heat, Portugal has a Seasonal Health Contingency Plan – Winter Module and Summer Module. The Water Sanitary Surveillance Programs in the five health regions cover water for human consumption, mineral, natural and spring waters and bathing areas, and have as objectives the surveillance of the microbiological and chemical quality of the water in accordance with its uses.

In the National Strategy for Preventive Civil Protection, climate adaptation was integrated into disaster risk reduction. A set of adaptation measures was identified (as for the 17 District Civil Protection Emergency Plans). Disaster risk management strategies are already the "core business" of Civil Protection for the various types of risk, where climate risks are included. However, this situation may imply a greater responsibility to integrate into planning and with greater detail the potential impacts of climate change.

In transport, the vulnerability of projects to climate change has been assessed, changing how project risk is analysed to consider the probability of major accidents or disasters occurring and the project's ability to withstand such significant accidents or disasters.

The Hydrographic Region Management Plans integrate climate change adaptation measures directed to the sectors to manage the existing water scarcity aggravated in periods of drought. Regarding the risk of floods, the implementation of hydrological and hydraulic forecasting models will enable timely warnings to the population and better civil protection actions.

### *Overview of measures in adaptation policy at the national level to engage with stakeholders particularly vulnerable to climate change impacts*

In the agriculture and food/rural development sector, the AGRI-ADAPT was designed in a participatory manner with representatives of the main stakeholders, developing a series of proposals to be implemented, which meet the needs felt by the various actors in the sector, complementing the measures provided by sectoral strategy, which are being implemented, with financial support from the Rural Development Programme. The National Competence Centre for Climate Change in the Agroforestry Sector has been set up, a partnership involving the productive sector, advisory entities, R&D entities and the public sector. Among its objectives are assessing the response capacity and vulnerability to Climate Change and the development and evaluation of adaptation measures given the need to ensure the sustainability of Portuguese agriculture and forestry in productive, environmental and social aspects. Some of these programs are focused in vulnerable groups, such as Small and Medium Enterprises (SME), to assist them to face unavoidable effects of climate change.

The Sustainable Tourism Plan 20-23 includes over 70 actions/projects that aim, fundamentally, to ensure the empowerment of professionals in the sector as agents of change to make the sector more resilient to climate challenges. It contemplates specific actions/projects such as identifying risk areas in terms of climate change and adaptation measures through the definition of the tourist load of the most sensitive territories (coastline, inland waters and classified areas). In the Energy sector, the transmission system operators and other relevant stakeholders cooperate with the competent authority on the establishment of risk scenarios that include extreme weather events, which are evaluated in risk assessment studies. Based on these risk assessments, a set of measures is presented in order to prevent, prepare for and mitigate their negative effects. These measures are part of the Preventive Action Plan and the Emergency Plan for the National Gas System and the Risk-Preparedness Plan for the Electricity Sector.

The implementation of health sector strategies is based on the networking of health services with other security, environmental, municipalities and social support entities.

Finally, in a country where water scarcity is increasing, the incentive to use alternative water sources becomes urgent. In this sense, one of the major national issues for reducing quantitative pressures on water bodies is the promotion of water reuse from treated wastewater from any source for multiple purposes. Decree-Law No. 119/2019 of August 21 was published to control the practice, which advocates an approach similar to that provided for Regulation EU 2020/741, supported by the case-by-case definition of quality standards (fit-for-purpose) and risk management on health and environment. Thus, water reuse projects involving irrigation of

urban green spaces are defined to maximise the reuse of nutrients and minimise negative impacts on water's respective bodies. There are some pilot projects in Portugal with EU funding. The Portuguese Climate Law adopted at the end of 2021 reinforced the public participation on the development and review of climate policy instruments. This includes considerations for the organization of information sessions and debates, and for the improvement of the accessibility to clear and systematized information.

### *Overview of measures in adaptation policy at the national level to engage with the private sector*

In Portugal, in recent years, several actions have been developed to involve the private sector in adaptation policy measures.

In the agriculture and food/rural development sector, support for innovation and the development of solutions has been strengthened, using participatory approaches and partnership projects between public and private entities. The private sector, supported by its associations and R&D entities, has adopted acceptable management practices (e.g., precision management). Warning systems have been developed (irrigation, among others). Regarding risk management, the Integrated System of Protection against Climate Randomness has been revised and improved, allowing better control of the risk associated with climate change by the private sector.

In the Coastal zone sector the implementation of adaptation measures in landscape planning and urban licensing, such as raised constructions and ban on overnight stays on floors affected by coastal flooding, represent some important development in adaptation policy. Also, the demolition of beach support buildings and the removal/relocation of buildings in risk areas and beach profile replacement and dune recovery are other good practice examples.

Regarding the Tourism sector, several stakeholders have been adopting measures with a view to climate transition. Within the scope of the Sustainable Tourism Plan 20-23, several partnerships were established, namely with sector associations, with a view to a faster climate transition of the sector, which reflects the direct involvement and concern of the private sector in accommodating/ adopting acceptable practices in terms of adaptation to climate change. The following actions/projects stand out as the most relevant at this level: "AQUA+ Hotéis", through which the aim is to create a national reference for water efficiency in hotel buildings and infrastructures; and, "Por um Turismo sustentável" platform, which aims to monitor the consumption of hotels and disseminate information and good practices for increasingly efficient consumption.

In energy, the actions and investments defined in the operators' Investment Plans should be highlighted. Besides, also note the participation in the consultations carried out by some stakeholders within the scope of their climate change adaptation strategies and plans by identifying potential actions to be implemented for the resilience of the territories and energy networks. The participation of operators as partners in the European project RESCCUE (Resilience to deal with climate change in urban areas, which developed a model for planning urban resilience to climate change) is also worth mentioning. Implementing internal adaptation

plans for companies to promote an integrated and transversal action to all activities with identified climate risk is also pointed out.

In the Forestry sector, the private sector contributed to the implementation of discontinuity networks in areas with easements associated with infrastructure (electricity distribution networks) and the Implementation of R&D projects (e.g. REPLANT). On the other hand, there are measures relating to selecting clones and improved plants more resistant to drought by foresters.

In the context of the work developed within the Sub-Commission of the National Platform for Disaster Risk Reduction, a Working Group named "Resilience of Critical Infrastructures of the Private Sector and the State Enterprise Sector" was created, whose main objective is to promote the incorporation of the sectorial interdependencies management in the increase of resilience of critical infrastructures providing essential care. In this context, the Guide "Good Practices for Critical Infrastructure Resilience" was produced, which aims to promote acceptable practices to reduce risk and increase critical infrastructures' resilience in the Private Sector and the State Enterprise Sector.

## Monitoring and evaluation

### Monitoring, reporting and evaluation of adaptation actions and processes

#### *Monitoring, reporting and evaluation (MRE) methodology related to reducing climate impacts, vulnerabilities, risks, and increasing adaptive capacity*

The MRE at national level is mainly ensured by the biannual Progress Reports of ENAAC 2020 (NAS) and the Monitoring of P-3AC (NAP). The Portuguese Climate Law also introduced provisions for monitoring and reporting in particular for the annual provision of information to the Parliament.

The biannual progress reports of the NAS are intended to respond to the provisions of chapter 2.5 of ENAAC 2020 (NAS). The progress for two years is reported for each of the NAS objectives and also includes recommendations to address difficulties or gaps and suggest improvements. The report focuses on the various thematic areas and priority sectors, the current state of the art, the degree of integration of adaptation in the various public and sectoral policies, and the implementation of adaptation measures. Since ENAAC's adoption, three biennial reports have been produced.

It is the responsibility of the NAS Coordination Group to ensure the elements for adequate reporting on climate change adaptation to comply with national, Community and international obligations.

All adaptation reporting exercises are developed with the contributions of ENAACs Coordination Group, in particular the various thematic areas and working groups. The same framework is used to address the international reporting obligations (in particular to UNFCCC and to the European Commission). Presently the main international reporting processes are the following: a) National Communications (under UNFCCC); b) provisions on international cooperation within the Biennial Reports (under UNFCCC); c) Adaptation Communications (under UNFCCC); c) the forthcoming Biennial Transparency Reports (under UNFCCC); d) adaptation biennial reporting to the European Commission (under Art.17 and Art.19 of Regulation (EU) 2018/1999).

Further annual monitoring of the implementation of adaptation measures is envisaged within the P-3AC and the Portuguese Climate Law. However the monitoring framework is currently starting to become operational, so no systemic report has been published yet. The P-3AC first report is planned to be published this year. Some adjustments may be made to P-3AC monitoring framework in order to accommodate some of the Portuguese Climate Law provisions (e.g. the State's General Account as another source of information to monitor adaptation action). The progress reports of P-3AC update the indicators (including allocation of funds) established for each of its nine lines of action. The indicators and most of the targets of P-3AC come directly from funding programmes (e.g., those funded by the European Structural and Investment Funds) and sectoral plans and strategies (e.g. PNUEA - National Plan for Efficient Water Use). In this way, the management authorities of the financial instruments that provide

funding to the adaptation measures have a key role in this process by providing data on an annual basis to the Portuguese Environment Agency (general coordinator of ENAAC and P-3AC). Due to these challenges, currently most of the progress made on adaptation policy is provided in qualitative information.

### *MRE methodology related to the implementation of adaptation actions*

The entities that integrate the ENAAC (NAS) Coordination Group, in coordination with the Portuguese Environment Agency, elaborate the monitoring reports and make proposals for the review of actions, indicators and targets and collaborate in the annual monitoring of P-3AC (NAP), providing relevant sectoral information for indicators and targets, and in the preparation of proposals for coordination mechanisms to be established with third-countries. The entities responsible for the financial instruments that provide funding for the measures identified in P-3AC (NAP) share with the Portuguese Environment Agency information about their implementation, on an annual basis and accordingly with the appropriate indicators.

## **Sources for monitoring, reporting and evaluation (MRE) indicators and methodologies (1)**

### *Name or short description for the MRE indicators or methodologies*

Monitoring of the P-3AC (NAP)

### *Status of the MRE indicators and/or methodology*

Being developed

### *Link to the MRE indicators and/or methodologies*

<https://files.dre.pt/1s/2019/08/14700/0001000045.pdf>

### *State of play of the implementation of measures planned under 'Strategies and Plans' and the disbursement of funding to increase climate resilience*

In recent years important progress in the implementation of adaptation measures were seen. EU funds had contributed significantly to this fact. In a first moment, through the definition of eligibility and development of selection criteria for the financing of adaptation projects through EU funds of Portugal 2020 (in the Operational Programme for Sustainability and Efficient Use of Resources - PO SEUR) and, in a second moment, with the implementation of projects financed by the AdaPT Programme (intermunicipal and Local Climate Change Adaptation Plans) and through the implementation of P-3AC (NAP).

Currently, the main sources of financial support for adaptation are the POSEUR and Rural Development Programme (PDR 2020), under EU funds of Portugal 2020, the Recovery and Resilience Plan, the national Environment Fund, EEA grants, among others.

The Thematic Objective 5 of the PO SEUR aims to strengthen national adaptive capacity. It's Priority Axis 2 - Adaptation to climate change and risk prevention and management, includes two investment priorities (IP): 5.1. Support for investment for adaptation to climate change; 5.2. Promoting investments to address specific risks, ensure disaster resilience and develop disaster management systems.

In 2021, two calls were opened regarding the investment priority 5.2., 23 applications were approved, which absorbed a total Cohesion Fund amount of 10 million euros. At the end of 2021, 443 operations were supported, with a total eligible cost of 506 million euros and a Cohesion Fund allocation of 432 million euros. The financial implementation rate of Axis 2 at the end of 2021 was 81% of the programmed fund, translating into 387 million euros and Cohesion Fund of 346 million euros. In 2022, two calls were also opened regarding the investment priority 5.2. By the end of 2022, 442 operations were supported, with a total eligible cost of 493 million euros and a Cohesion Fund allocation of 427 million euros. The financial implementation rate of the Axis 2 at the end of 2022, was 91% of the programmed fund, translating into 435 million euros and Cohesion Fund of 390 million euros.

The Environmental Fund is the main Portuguese Fund created to support environmental policies pursuing sustainable development goals, contributing to the fulfilment of objectives and commitments associated with climate change. Thus, finances adaptation operations aimed at implementing material measures recommended in local or regional planning exercises, namely those that reduce or minimise climate risks associated with flood events and increase the resilience of infrastructures and ecosystems, species, and habitats.

In 2021, the Environmental Fund investment in projects to adapt to climate change, related to forests and water resources, amounted to 4,784 million euros. For 2022 the budget of the environmental fund foreseen for adapting to climate change was around 40,479 million euros, with the majority of the budget, around 35,349 million euros, being associated with interventions in the forestry area.

- In the case of the agriculture and food/rural development sector, the Rural Development Programme (PDR 2020) supported with 2,642 million euros of Public Expenditure (execution level as of 12.31.2022) the adaptation of agriculture/forest to Climate Change (46% of total funding to agriculture and forests). This amount was distributed as follows: 0.8% (knowledge); 10.4% (investments in physical assets); 1.7% (agricultural risks); 11.9% (forestry); 52% (agri-environmental measures and climate); 23.2% (areas with constraints). In the case of the P-3AC (NAP) the impact of executed public expenditure (PDR2020) translated into 949.7 million euros (fires); 1,291.8 million euros (soil); 1,189.4 million euros (water); 1,295.9 million euros (biodiversity); 953.2 million euros (diseases/plagues); 203.8 million euros (floods); 225.6 million euros (knowledge).

- In the case of biodiversity, two measures shall be stressed: i. Restoration, preservation and enhancement of biodiversity, including in "Natura 2000" areas, and areas subject to natural or

other specific constraints, and in the agricultural systems of High Natural Value, as well as the state of European landscapes; ii. Erosion prevention and improved land management supported through the Rural Development Programme (PDR2020) with 137,149 euros of Public Expenditure (execution level as of 12.31.2022).

- Regarding the Tourism sector, the project "Sustainable Tourism: a better future for [with] everyone" should be highlighted. This project includes 6 actions: "Re-Educar para uma Restauração circular"; Circular economy practices in coastal tourist destinations; Carbon neutrality in tourist resorts; Sustainable construction in tourist resorts; Water efficiency in golf courses in Portugal; and reduction of plastic in hotels.

- In the case of Forests, the Rural Development Programme (PDR 2020) is being implemented on forestry actions/operations that contribute to adapting to climate change, namely efforts to prevent and defend forests against fires. In 2021, these kind of actions were financed by PDR 2020 in 182,188 euros.

- In 2021 and 2022 the Environment, Climate Change and Low Carbon Economy Programme integrated in the EEA Grants Portugal financed in 1.9 million euros (a cumulative value for the period 2021-2022) several projects to improve the territories' resilience to climate change. These projects aim to create tools to identify climate vulnerabilities in order to support decision-making at the various territorial levels, as it is the case of Municipality Adaptation Plans or the National Roadmap for Adaptation 2100 (RNA 2100), as well as to improve resilience of the forest and burned areas or of coastal areas. The RNA 2100 is a Predefined Project of the EEA Grants, which will provide for the all project (2020-2023) €400,000 out of a total of €1,300,000. Consequently, the financing rate for EEA Grants is 30.77%, the remaining amount will be provided by Portuguese Environment Agency (APA). In 2021 and 2022, the RNA 2100 was financed by the EEA Grants with 132,835.09 euros and by APA with 298,447.67 euros.

### *State of play of the implementation of measures planned under 'Strategies and Plans': spending earmarked for climate adaptation including in disaster risk management*

Portugal concluded the EU Multiannual financial framework (MFF) for 2021-2027 that will be implemented through a new partnership agreement (called "Portugal 2030"). Its programming is based on 5 strategic objectives, which includes a greener Europe. It sets a thematic operational programme called Climate action and sustainability and Maritime (3.1 billion euros financed by the Cohesion Fund), which aims to ensure climate transition and actions promoting adaptation to climate change, circular economy and urban mobility.

Following the recovery and resilience facility, Portugal developed a national Recovery and Resilience Plan. It relies on the objectives of the European Green Deal and aims to stimulate the green and digital transition to achieve a climate-neutral Europe in 2050. To this end, the plan foresees significant resources for adaptation to climate change to increase the hydric management in response to the need to mitigate water scarcity and ensure the resilience of the Algarve, Alentejo and Autonomous Region of Madeira. The projects under this component are:

Algarve Regional Water Efficiency Plan (200 million euros), Crato multi-purpose hydroelectric plant (120 million euros) and Plan for water efficiency and reinforcement of the water supply and irrigation systems of the Autonomous Region of Madeira. The plan also foresees financing for adaptation to climate change in order to improve the territory's resilience to forest fires. The projects under this component which are relevant to achieve this goal are: "Transformation of the landscape of vulnerable forest territories" (270 million euros), "Rustic Property Registration and Land Occupation Monitoring System" (86 million euros), "Fuel management tracks" (120 million euros), "Program MORE Forest" (50 million euros) and "Means of preventing and fighting forest fires" (89 million euros).

*To the extent possible, state of play of the implementation of measures planned under 'Strategies and Plans': the share of spending used to support climate adaptation in each sector*

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*If necessary, you can upload here an additional document*

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*Progress towards reducing climate impacts, vulnerabilities and risks*

Regular assessments of impacts, vulnerabilities, and risks to assess progress in reducing them have not yet been implemented.

The biennial Progress Report of ENAAC 2020 (NAS) related with the developments in the period 2019 and 2020 was concluded during 2022. Regarding the monitoring report of P-3AC, the indicators and values of the monitoring parameters are being updated with the collaboration of the sectoral working groups and thematic areas of ENAAC 2020 (NAS). These indicators and most of the targets of P-3AC (NAP) come directly from funding programmes (e.g., those funded by the European Structural and Investment Funds) and sectoral plans and strategies.

*Progress towards increasing adaptive capacity*

Regular evaluations of adaptive capacity progress have not yet been implemented.

Nevertheless, it is essential to highlight the positive evolution of the national territory coverage by climate change adaptation strategies and plans. Until 2015 only three municipalities had elaborated adaptation plans and strategies. Since then, this coverage has expanded considerably, first as a result of the ClimAdaPT.Local project funded by EEA Grants and the Environmental Fund, followed by funds provided by the Operational Programme for Sustainability and Efficiency in the Use of Resources, along with strategies and plans funded by the municipalities themselves. At the end of 2022, the number of municipalities covered by climate change adaptation plans or strategies (of municipal and/or inter-municipal or metropolitan scope) was 295, corresponding to 96% of Portuguese municipalities.

### *Progress towards meeting adaptation priorities*

Three major instruments were developed to address the three main objectives of ENAAC (NAS). For the ENAAC objective on knowledge improvement, a Research & Innovation Agenda for Climate Change was developed through a process within the Thematic Area “Research and Innovation” focusing on the identification of needs and knowledge gaps and on the establishment of priority areas for research. The Scientific Panel had a major role drafting the Agenda counting also with the contributions of the ENAAC’s Coordination Group.

For the ENAAC objective of implementation of adaptation measures, the publication of the P-3AC (NAP) and the progress on the financial mechanisms were the major milestones. The first financial mechanism dedicated to adaptation was the AdaPT Programme (financed by EEA Grants 2009-2014 and PT Environmental Fund), which was built based on the needs identified on the first ENAAC progress report. It was of great relevance as it focused on strategic areas, covering a website for climate scenarios, development of local adaptation strategies and training of local officers, integration of climate change in schools activities, and development of small scale sectoral projects. The development of P-3AC (NAP), the equivalent to a National Adaptation Plan, was supported on different sources of information namely: from products developed under ENAAC (NAS), from other strategic and programmatic instruments, as well as from municipal and intermunicipal adaptation plans. Like ENAAC (NAS), the P-3AC (NAP) was developed with contributions of ENAAC’s coordination group and scientific panel, being also subject to public hearing.

Regarding the ENAAC’s objective of mainstreaming adaptation, the PNPOT - National Programme for Spatial Planning Policies was published and considered climate change as a transversal theme and integrated it into the different themes diagnosed, in the environmental, social and economic areas, assessing the impact of global scenarios applied to the national territory, and seeking to indicate the direction that some variables take in the region. This law is a territorial development instrument of strategic nature that establishes the great options with relevance to the organization of the national territory, consubstantiates the framework of reference to be considered in the elaboration of other Territorial Management Instruments, and constitutes an instrument of cooperation with the other Member States for the management of the territory. The review of PNPOT was the primary priority within ENAAC’s Thematic Area “Mainstreaming Adaptation - Spatial Planning”.

Other substantial progress was on building the capacity of municipalities and inter-municipalities on adaptive management through local adaptation strategies and/or plans. The importance of this aspect was highlighted within the first ENAAC progress report becoming the major priority on the design of the Programme AdaPT. This capacity building was then kicked-off through a major project under Programme AdaPT that had a great reach within municipalities and other local and regional entities.

### *Progress towards addressing barriers to adaptation*

Regarding the lack of funding for adaptation, P-3AC (NAP) has defined priorities and mobilised financing and can be used as a reference for the implementation of the Multiannual Financial Framework 2021-2027 and other funding instruments (e.g., the Environmental Fund and the EEA Grants Environment Programme).

Regarding the lack of information, very significant progress has been made with the publication of the Climate Portal and with the development of the National Roadmap for Adaptation 2100, a large-scale exercise to assess the impact, vulnerability, and risk of climate change in the national territory.

As for the lack of adaptive management capacity, Portuguese municipalities' coverage by adaptation strategies and plans has increased from only 1% to 96% in the last seven years.

### *Steps taken to review and update vulnerability and risk assessments*

The National Roadmap for Adaptation 2100 (ongoing until December 2023) will update and deepen for the XXI century the first assessment of risk and vulnerability of the Portuguese territory carried out under the SIAM I and II projects (2002 and 2006). These served as a basis and were complemented by the sectoral reports of the 1st NAS and its respective progress report. The Portuguese Environment Agency also promoted the Flood Risk Studies, associated with the Flood Risk Management Plans, which allowed updating the information on the susceptibility to flooding risks.

The National Authority for Emergency and Civil Protection published in 2019 the update of the National Risk Assessment, which generally maintains the structure of the previous 2014 assessment and was prepared following the "Risk Assessment and Mapping Guidelines for Disaster Management" issued by the European Commission (document SEC (2010) 1626 final, 21.12.2010).

### *Steps taken to review and update national adaptation policies, strategies, plans, and measures*

In 2010 Portugal approved its National Strategy for Climate Change Adaptation – ENAAC (NAS). The first phase of ENAAC's work took place between 2010 and 2013 with the following objectives: i) Information and knowledge: to keep up-to-date and available scientific knowledge; (ii) reducing vulnerability and increase responsiveness: in an integrated manner, defining measures to minimise the effects of climate change; (iii) Participate, raise awareness and disseminate: raise awareness of climate change and its impacts; (iv) International cooperation: supporting the most vulnerable countries, in particular within the framework of the Community of Portuguese-Speaking Countries. The work of the various sectoral groups and a progress report were developed that highlighted the strategic nature of the work carried out, but also identified its limitations.

The first review of ENAAC (NAS) was promoted in 2015, bridging the gaps and capitalising on the strengths and opportunities identified. The ENAAC 2020 (NAS) defines an organisation model that clearly promotes articulation between various sectors and stakeholders, pursuing priorities of certain thematic areas and the three objectives of the strategy: i) Improving the level of

knowledge on climate change; (ii) Implement adaptation measures; iii) Promote the integration of adaptation into sectoral policies. ENAAC 2020 (NAS) will be into force until the end of 2025. The same applies to the Action Programme for Climate Change Adaptation – P-3AC (NAP), which was published in 2019. It complements and systematises the work carried out in the context of ENAAC 2020 (NAS), focused on its second objective: to implement adaptation measures. The Portuguese Climate Law, adopted in 2021, envisages the review of the ENAAC (NAS) every 10 years with an update halfway.

## Cooperation and experience

### Cooperation, good practices, synergies, experience and lessons learned in the field of adaptation

#### Good practices and lessons learnt (13)

##### *Title*

Agriculture

##### *Area of good practices*

Efforts to integrate climate change adaptation into development and sectoral policies, plans and programs

##### *Good practices and lessons learnt*

Sector "Agriculture": The definition of adaptation priorities carried out in a participatory manner; the creation of knowledge transfer platforms and the National Competence Centre for Climate Change in the Agroforestry Sector (knowledge coordination and dissemination); the effort made by public actors responsible for the definition of policy and management of community support to improve the quality of monitoring and evaluation of the measures of the funding instruments for adaptation.

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##### *Title*

State Budget to Climate Action

##### *Area of good practices*

Institutional arrangements and governance at the national level

##### *Good practices and lessons learnt*

The Portuguese Climate Law introduced requirements for the creation of a State Budget for Climate Action, establishing the need to consolidate allocations for climate policy (mitigation and adaptation). Hence, the first budget exercise took place for the 2022 State Budget and the guidelines for the next State Budget for Climate Action are currently being developed.

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*Title*

Biodiversity

*Area of good practices*

Institutional arrangements and governance at the national level

*Good practices and lessons learnt*

Sector "Biodiversity": The various sectoral strategic instruments promote an intricate relationship between biodiversity protection and ecosystem restoration, with the achievement of climate change adaptation objectives, halt and reverse biodiversity loss and achieve neutrality in land and soil degradation.

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*Title*

Tourism

*Area of good practices*

Stakeholder engagement

*Good practices and lessons learnt*

Sector "Tourism": The good practices underway in the sector, and which we hope will be densified in the future, contribute directly towards attracting more sustainable tourism, and the tourists themselves, as we know today, are also increasingly sensitive to these issues.

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*Title*

Energy

*Area of good practices*

Efforts to integrate climate change adaptation into development and sectoral policies, plans and programs

*Good practices and lessons learnt*

Sector "Energy": a growing focus on increasing the resilience of infrastructures by operators; greater integration of adaptation in sector emergency planning (operators' contingency plans, more significant capacity building); consideration and greater visibility of adaptation to climate change in plans and programmes associated with national policies.

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*Title*

Forests

*Area of good practices*

Integration of indigenous, traditional and local knowledge into climate adaptation

*Good practices and lessons learnt*

Sector "Forests": following the fires, the development of various actions to produce forest reproductive material, reinforcing the focus on more well adapted native species (strengthening the respective harvest and production in public nurseries); the implementation of fuel management areas; the implementation of initiatives, such as the CELPA Projects: Best Eucalyptus; Clean & Fertilise Programme and the Replant Programme.

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*Title*

Health

*Area of good practices*

Climate risk communication

*Good practices and lessons learnt*

Sector "Health": Improved risk communication and information to the population. The progressive participation of the various public health services and departments in the National Vector Surveillance Network (REVIVE), in the Seasonal Health Contingency Plan – Winter Module and Summer Module and in the Water Sanitary Surveillance Programs, in collaboration with other entities, has allowed gains for the health resulting from knowledge and the better articulation of services.

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*Title*

Safety of people and goods

*Area of good practices*

Disaster risk reduction and management, innovative adaptation solutions and innovative financing mechanisms

*Good practices and lessons learnt*

Sector "Safety of people and goods": Creating the Sub-Commission of the National Platform for Disaster Risk Reduction, where several good practice guides were produced: i. Handbook "Resilient Cities in Portugal 2018" with measures to promote resilience at the local level; ii. Guidance Guide for the Constitution of Local Platforms for Disaster Risk Reduction"; iii. Guide "Good Practices for Resilience of Critical Infrastructures"; iv. Guide Flood Risk Management. Good Practice Support Document.

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*Title*

Transport

*Area of good practices*

Disaster risk reduction and management, innovative adaptation solutions and innovative financing mechanisms

*Good practices and lessons learnt*

Sector "Transport": more focus on increasing the resilience of infrastructures by operators; greater integration of adaptation in the sector emergency planning and maintenance; consideration and greater visibility of adaptation to climate change in plans and programmes associated with national policies.

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*Title*

Land use planning - Serras de Monchique and Silves

*Area of good practices*

Efforts to integrate climate change adaptation into development and sectoral policies, plans and programs

### *Good practices and lessons learnt*

Sector "Land use planning": The Landscape Planning and Management Programmes (PRGP) for Serras de Monchique and Silves has identified priority intervention areas aimed at the enhancement of water lines and agro-forestry mosaics for combustible management, the rehabilitation of the terrace system and the recovery of surplus forest biomass. Within the scope of this programme, the Monchique Pilot Area was formally set up in 2022 to implement these priority areas.

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#### *Title*

Land use planning - Integrated landscape management areas

#### *Area of good practices*

Disaster risk reduction and management, innovative adaptation solutions and innovative financing mechanisms

### *Good practices and lessons learnt*

Sector "Land use planning": During 2021 and 2022, were set up a total of 71 integrated landscape management areas (AIGP), aimed at the common management and exploitation of agricultural and forestry spaces in small rustic property and high fire risk areas, in order to ensure greater resilience to fire and improve ecosystem services, while also promoting the revitalisation of these territories and adaptation to climate change, the valorisation of natural capital and the promotion of the rural economy.

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#### *Title*

Land use planning - The National Landscape Award 2020

#### *Area of good practices*

Institutional arrangements and governance at the national level

### *Good practices and lessons learnt*

Sector "Land use planning": The National Landscape Award 2020 awarded two honourable mentions that address sustainability and resilience of the territory to climate change.

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### *Title*

Land use planning - PDM GO Good practices for Municipal Master Plans

### *Area of good practices*

Efforts to integrate climate change adaptation into development and sectoral policies, plans and programs

### *Good practices and lessons learnt*

Sector "Land use planning": the creation of the publication "PDM GO Good practices for Municipal Master Plans", which points out guidelines and methodologies that should be taken into consideration in the planning processes at the local scale, especially in the PDMs, concerning themes such as "the adaptation to climate change".

### *Synergies of adaptation actions with other international frameworks and/or conventions*

In November 2021, Portugal submitted the first Adaptation Communication (ADCOM) to the United Nations Framework Convention on Climate Change (UNFCCC), under the Paris agreement.

The development cooperation actions reported as Official Development Assistance have demonstrated their contribution to achieve the Sustainable Development Goals and presented risk matrices. All the Portuguese Cooperation Programs, Projects and Actions (PPA) marked as adaptation and reported as Official Development Assistance aim to support developing countries, in particular the most vulnerable ones, such as LDC and SIDS. Regarding mainstreaming climate change adaptation into development cooperation, Portugal, as a Member State of the OECD Development Assistance Committee, applies the Rio marker methodology and tracks adaptation financing flows through the climate change adaptation marker.

Since the adoption of the Sendai Declaration and the Framework for Disaster Risk Reduction 2015-2030, Portugal has developed efforts and actions that contribute towards their goals, namely reducing disaster risk. Recognising the potential impact of the climate change related disasters and their complexity, Portugal has made increased efforts to reduce the potential effects of disaster risks.

Within the theme of resilient cities, National Authority for Emergency and Civil Protection and

the Municipality of Amadora are part of the U-SCORE project, co-financed by the European Commission, which aims to promote good practices between 5 resilient cities. The objectives are to prepare cities better for an eventual disaster scenario, to be a platform for the exchange of knowledge and experiences between experts in this field, and also to involve other municipalities in action for disaster risk reduction.

Regarding biodiversity, efforts have been made to deepen synergies with the other Rio Conventions, namely with the UN Convention of Combat Desertification, to which climate change impacts deeply the process of land degradation, desertification and drought, as well as endangers biodiversity. The National Action Program to Combat Desertification will be revised in 2024.

*Cooperation with Union Member States, international cooperation, and with regional and international organisations to share information and to strengthen science, institutions and adaptation knowledge*

One of the main objectives of the National Climate Policy is to ensure the committed participation of Portugal in international negotiations and regarding development cooperation, contributing to achieve Paris Agreement goals, pursuing ambitious policies consistent with the objectives set at the EU level and responding to international commitments to cooperate and support developing countries in climate action and, in particular, climate change adaptation. In this context, the National Climate Policy promotes the integration of the stakeholders of the International Cooperation thematic area in international networks focused on adaptation to climate change, as well as the exchange of knowledge and the establishment of project development partnerships (sharing of information on acceptable practices and experiences has contributed to strengthening expertise and facilitating the exchange of relevant actors - for example, academy, researchers, grant holders).

Also noteworthy in this area, in addition to the numerous contributions prepared and made available by the thematic area within the biannual reports of the EU and OECD, within the scope of PCD (Policy Coherence for Development), is the participation in the LIFESHARA project - Sharing Awareness and Governance of Adaptation to Climate Change in Spain, which among other actions provides for the establishment of an Iberian cooperation system between the Adaptation Units to climate change in Spain and Portugal for the identification of risks, vulnerabilities, priorities and joint actions. In addition to cooperation with the activities of the European Strategy for Adaptation, the European Climate-Adapt platform (<http://climate-adapt.eea.europa.eu/>), and with national adaptation platforms in other countries, it should be noted the promotion of bilateral relations with Norway, Iceland and Liechtenstein under the AdaPT Programme and the National Roadmap for Adaptation 2100, in which one of the project partners is DSB - Norwegian Civil Protection.

Important to emphasise the “Go Portugal- Global Science and Technology Partnerships Portugal” Programme aimed at funding of 25 new projects approved, comprising a total funding of €55.2 millions for the next 3 years, including €16.7 millions funded by partner American

universities (UT Austin, CMU and MIT), that includes projects related with adaptation, namely a robotic system for forest cleaning and fire prevention.

The Portuguese Space Agency opened the Earth Observation (EO) PhD fellowships covering R&D activities for intelligent space systems, in particular for technological development for (EO) satellite constellations, use of satellite data and artificial intelligence to create applications. Additionally it will also promote studies that combine Earth Observation and artificial intelligence for the creation of solutions that support sustainable development goals and the assessment, mitigation and adaptation to the impacts of climate change.

*Cooperation with Union Member States, international cooperation, and with regional and international organisations to enhance adaptation action at national, macro-regional and international level*

Portugal has been implementing climate change policies that have successfully guaranteed compliance with the objectives established under various international commitments. International cooperation on climate change is aimed at responding to international commitments to support developing countries under the UNFCCC and its Kyoto Protocol, and the Paris Agreement, focusing on priority countries for Portuguese cooperation, according to the principles and priorities set out in the previous Strategic Concept of Portuguese Cooperation (2014-2020) and now aligned with the Portuguese Development Cooperation Strategy 2030, approved in November 2022. In this framework, the thematic area dedicated to international cooperation on adaptation has been promoting cooperation for development work with other developing countries on the issues necessary for implementing ENAAC 2020 (NAS) and equivalent strategies in those countries and regions of the world.

Benchmarking and cooperation for exchanging knowledge on best adaptation practices with countries from southern Europe (particularly with Spain) and the Maghreb, among others, has enabled the finding of innovative and appropriate solutions to the climate and national context. Under the priorities defined for the thematic area of International Cooperation, it is essential to establish an Iberian cooperation system for adaptation, which supports the articulation of adaptation strategies of Portugal and Spain, enhances an integrated intervention in border regions, and boosts the current mechanisms for managing water resources in river basins shared by both countries.

One of the main objectives of the Portuguese climate policy is to ensure participation in international negotiations, responding to international commitments of cooperation and support to developing countries in this field, privileging priority countries, according to the principles and priorities defined in the Portuguese Development Cooperation Strategy 2030. The Unit for the Coordination of Operational Strategy for Humanitarian and Emergency Action promotes action in the case of Portugal's public aid to developing countries that require humanitarian and emergency action following losses and damage resulting from natural disasters caused by extreme weather events.



## Sub-National Adaptation

### LEGAL AND POLICY FRAMEWORKS AND INSTITUTIONAL ARRANGEMENTS

#### Overview of institutional arrangements and governance at the sub-national level

##### *Legal requirements and strategic documents*

The ENAAC (NAS) promoted the integration of adaptation in sectoral policies and territorial programs and plan ( at sub-national level). Thus, the Regional governments and the association of Portuguese municipalities participate in the NAS governance structure, considering their specific competencies and the importance of sub-national levels in terms of climate change impacts, and the respective adaptation response. The thematic area dedicated to the integration of adaptation into spatial planning also enables governance arrangements at subnational level.

The Autonomous Region of Madeira approved in 2015 the Madeira Climate Change Adaptation Strategy.

The Autonomous Region of the Azores proceeded with the Regional Programme for Climate Change (PRAC), approved by the Regional Legislative Decree No. 30/2019/A, of November 28, which encompasses mitigation and adaptation.

##### *Networks or other collaborations on adaptation across national authorities*

Climate adaptation is a transversal subject, so its policies and actions result of the contributions of various sectors, administrative levels and stakeholders. This is a key aspect that set the adaptation governance policies, designed to ensure horizontal and vertical coordination. The public authorities of the relevant sectors are represented in ENAAC's Coordination Group and are responsible for mainstream adaptation into their sectoral policies and measures. The ENAAC (NAS) coordination group is composed by: a) Portuguese Environment Agency, which chairs; b) coordinators of thematic areas; c) coordinators of sectoral working groups; d) Autonomous Regions of the Azores and Madeira; e) National Association of Portuguese Municipalities.

##### *Good practice examples of networks or other collaborations on adaptation across local and regional authorities*

Created in December 2016, adapt.local - Network of Municipalities for Local Adaptation to Climate Change constitutes a partnership led by municipalities and involves academy, research centres, non-governmental organisations, and companies. This network contributes to a closer working relationship and partnership between authorities of different scales of action. In terms of collaboration between regional authorities, the PLANCLIMAC project stands out, included in Interreg – MAC2/3.5b/244 of INTERREG – MAC 2014-2020, Axis 3 – Promoting adaptation to climate change and risk prevention and management, which began in October 2019. The general objective of the PANCLIMAC project is to take advantage of the scientific knowledge and technological capacity of the Madeira-Azores-Canary Region to provide tools that facilitate the application of adaptation policies and preparing for the natural risks inherent in climate change.

## **ADAPTATION STRATEGIES, POLICIES, PLANS AND GOALS**

### *Overview of the content of sub-national strategies, policies, plans and efforts*

NAS (ENAAC 2020) seeks to promote and assist the various sectors, the central, regional and local administration and policymakers in finding the means and tools for the implementation of climate adaptation and to promote its integration in the various sectoral policies and territorial programmes and plans (at lower scales - NUTS II, NUTS III, municipal).

On the other hand, the thematic area dedicated to integrating adaptation into spatial planning seeks to promote and stimulate, among its stakeholders, the introduction of the adaptation component in policy and territorial management instruments at all relevant scales for a coherent implementation of NAS (ENAAC 2020). It also develops capacity building initiatives for sectoral actors regarding the territorial integration of specific adaptation measures, considering threats and opportunities associated with the effects of climate change. It is within the scope of the work of this Thematic Area, which integrates territorial and sectoral stakeholders, that relevant dynamics are promoted to enhance the concerns associated with climate change, as well as to placing the planning process as a priority action in the institutional and governance arrangements at subnational level.

The AdaPT Programme, supported by the EEA Grants, was the pilot programme for adaptation in Portugal and originated landmark projects in the national adaptation process, in particular the ClimAdaPT.Local project (under which 27 municipal adaptation strategies were developed) and the Climate Portal. This programme was a driver of adequate action in adaptation to climate change and a significant contribution to raise awareness, increase the ability to assess vulnerabilities, and promote awareness and education on this issue at the local level.

The current Cohesion Policy national support framework – Portugal 2020, in particular the Operational Programme for Sustainability and Efficient Use of Resources (PO SEUR) – includes several funding opportunities for climate adaptation, and has allowed the continuation of the path initiated by the AdaPT Programme, through support to municipal and inter-municipal adaptation planning, and the implementation of adaptation measures, particularly in the areas of coastline, water resources and nature conservation. As a result, most of the territory is now covered by intermunicipal climate change adaptation plans, including the Lisbon and Porto metropolitan plans, promoted by sub-regional structures (Intermunicipal Communities and Metropolitan Areas), in which there was a broad participation and involvement of municipalities (including capacity building of their technical structures).

The structure of these plans is generally based on 2 phases. According to the climate scenarios previously analysed, a step associated with 'Impacts and vulnerabilities' identifies the territories' adaptive capacity and the current and future vulnerabilities, which allows the prioritisation of adaptation. A phase associated with 'adaptation options' focused on identifying and planning the realisation of adaptation options and measures, establishing the respective priorities and deadlines, and defining the institutional management, monitoring, and communication models to support their implementation.

96% of the municipalities in Mainland Portugal, Azores, and Madeira (of a total of 308) were covered in 2022 by a municipal, intermunicipal or metropolitan planning instrument (plan or strategy) on climate adaptation.

The Autonomous Region of Madeira has also started to develop several action plans towards adaptation and integration of climate action policies, like PAESC-RAM, Action Plan on Sustainable Energy and Climate (Regional Government Council Resolution No. 1271/2022, December 9th), a revised PGRI, Flood Risk Management Plan for 2022-2027 (in progress) or the PREPCRAM, Regional Emergency and Civil Protection Plan ( Regional Government Presidency Resolution n.º 60/2022, February 7th ).

The Autonomous Region of the Azores proceeded with the Regional Programme for Climate Change (PRAC), approved by the Regional Legislative Decree No. 30/2019/A, of November 28, which encompasses mitigation and adaptation.

The Portuguese Climate Law strengthens this process by setting mandatory development (in a 2-year timeframe) of Climate Action Plans (both mitigation and adaptation) for all municipalities, all intermunicipal communities (NUTS3 level) and all regional development and coordination commissions (approximate to NUTS2 level). From the adaptation perspective these plans will be the main instrument to support the role of the local governments. The plans seek to promote proper vertical integration (e.g. integration of intermunicipal plans at the municipal scale), to define climate adaptation planning, to strengthen the role of land use planning in adaptation, to establish municipal adaptation action programmes to be implemented until 2030, to empower municipal officials and technical staff, and to prepare communities for the challenges of climate

change.

## Stakeholder engagement

### *Overview of good practice examples from the sub-national levels to engage with stakeholders particularly vulnerable to climate change impacts*

In the Forestry sector, national and regional awareness campaigns have been promoted to implement a more resilient forest to fires and plagues, thus changing climate change. Guidelines have been produced for municipalities to implement the Aldeia Segura (Safe Village) and Pessoas Seguras (Safe People) programmes to adopt acceptable practices when faced with imminent rural fires.

In the context of the work developed in various working groups under the Sub-Commission of the National Platform for Disaster Risk Reduction, we highlight the preparation of several useful practice guides in recent years, namely the Guide "Resilient Cities in 2018" and the Guide "Flood Management. Support document for good practices".

(Note: see national examples in the section "Overview of measures in adaptation policy at the national level to engage with stakeholders particularly vulnerable to climate change impacts" on tab "strategies and plans".)

### *Overview of good practice examples from the sub-national levels to engage with the private sector*

In Portugal, in recent years, several actions have been developed to involve the private sector in adaptation policy measures.

In the Biodiversity sector, of particular note is the "Best Practices in the Vineyard" project run by Vinhos do Alentejo, which aims to adopt innovative approaches that lead to the conservation of natural resources and biodiversity, contributing to adapting to climate change, generating opportunities for growth and valorisation of the vineyard, and promoting the maintenance of public goods (water, air and soil quality).

Given the high number of flood and inundation situations recorded in the country, the Portuguese Insurers Association and the Faculty of Science of the University of Lisbon developed the CIRAC project to assess flood risk and vulnerability in mainland Portugal. A high-resolution risk analysis was carried out to characterise the potential impacts and damage for Lisbon, Algés, Coimbra and Porto/Gaia, namely in the buildings located there, according to climate change scenarios. This project was an important risk assessment tool for the insurance sector assisting local stakeholders in making strategic decisions.

Finally, it should be noted that the private sector is increasingly concerned with the efficient use of water and the reuse of nutrients, contributing to a circular economy. Also, in terms of water reuse in urban services, the application of treated wastewater of urban origin in the irrigation of green spaces, has been developed through the framework of the Lisbon Strategic Plan for Water

Reuse, developed by public and private entities.

(Note: see national examples in the section “Overview of measures in adaptation policy at the national level to engage with the private sector” on tab “strategies and plans”.)

## MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES

### *State of play of the implementation of measures planned under sub-national strategies, policies, plans and efforts and stakeholder engagement*

The Autonomous Region of the Azores proceeded with the Regional Programme for Climate Change (PRAC), approved by the Regional Legislative Decree No. 30/2019/A, of November 28, which encompasses mitigation and adaptation. PRAC allowed improving the level of knowledge on climate change in the Region through the studies of current and future vulnerabilities and the definition of adaptation measures for the most relevant sectors. PRAC implementation is ongoing, with the first monitoring report on its implementation, in December 2022, concluding that of the 115 planned adaptation measures, 11 are fully implemented, 65 are being implemented, leaving 39 measures whose implementation has not been started by the end of 2021. Within the scope of the implementation of the adaptation measures planned in the PRAC, the value of execution until the end of 2021 was €5.4 million, with the largest share of the investment, €5.2 million, earmarked for strengthening coastal protection.

The Autonomous Region of Madeira has continued the regional policies and programs that were overview designed in Madeira Climate Change Adaptation Strategy, approved in 2015, to improve the level of knowledge of climate change, having implemented, throughout this period, several measures and concluded vital projects to improve adaptation to climate change, making the Region more resilient and better prepared for the challenges, like AESC-RAM, Action Plan on Sustainable Energy and Climate, a revised PGRI, Flood Risk Management Plan for 2022-2027 (in progress) or the PREPCRAM, Regional Emergency and Civil Protection Plan

At local level (NUT 2 and NUT3), the regions and municipalities continued to develop the Adaptations Strategy and Adaptations Plans. Some of them were supported by EEA grants (for example Local Plans for Climate Change Adaptation of Arrábida and Municipal Strategy for Adaptation to Climate Change of Almodôvar) and also by the Operational Programme for Sustainability and Efficient Use of Resources - PO SEUR (EU funds of Portugal 2020) Under the Portugal Climate Law, started the development of Climate Action Plans (both mitigation and adaptation) for all municipalities, all intermunicipal communities (NUTS3 level) and all regional development and coordination commissions (approximate to NUTS2 level).

For the implementation of adaptation measures the financial support is essential. The Environmental Fund finances adaptation operations aimed at implementing material measures recommended in local or regional planning exercises, namely that reduce or minimise climate risks associated with flood events and increase the resilience of infrastructures and ecosystems,

species, and habitats.

For example, In 2021, the Environment Fund fully financed the project “Enhancement of the Monchique and Silves mountains’ landscape – support for the rehabilitation and regeneration” with a total investment of €0.3 million, this project aims to improve the adaptation and resiliency territories’ ability to the climate change impacts. It continued to supported applications with the objective to implement adaptation measures that guarantee the improvement of the adaptive capacity and increase the territory's resilience to the impacts of climate change and applications made under the "Village Condominium", the Integrated Support Programme for Villages located in forest territories, to ensure the management of fuels around settlements in areas of high forest density and increased number and dispersion of small rural settlements (€ 1.1 millions).

The EEA grants Portugal - Environment, Climate Change and Low Carbon Economy Programme is also relevant in Portugal supporting measures and projects that are implemented at the local and regional level. For example, it supported the development of Oporto's Municipal Waterways Valorization and Rehabilitation Plan (grant of €200 million) and the recovery and enhancement of water lines, riparian galleries and wetlands in Vila do Conde (grant of 168 million).

### *Overview of good practice with regard to steps taken to review and update subnational adaptation plans, policies, strategies and measures*

The sub-national strategies and plans are relatively recent. Thus, they were not reviewed yet, but it will be important to establish a regular assessment of their implementation in order to evaluate the need for that revision.

For example, in the Autonomous Region of the Azores, the PRAC has been implemented since 2019, with measures in terms of adapting to climate change still to be concluded and/or implemented. Currently, the revision of this plan is not foreseen in terms of adaptation to climate change.

Nevertheless, the Autonomous Region of Madeira has started in 2022 the revision of Madeira Climate Change Adaptation Strategy adopted in 2015, developing regionalized climate models and mid and long-term climate scenarios, making use of best available science, enabling the re-evaluation of sectoral risks, vulnerabilities, measures and indicators, in line with national, European and International processes.

## **COOPERATION, GOOD PRACTICES, SYNERGIES, EXPERIENCE AND LESSONS LEARNED IN THE FIELD OF ADAPTATION**

*Cooperation with Union Member States, international cooperation, and with regional and international organisations to enhance adaptation action at the sub-national level*

There are no relevant activities to report.

**ANY OTHER INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND  
ADAPTATION**

## Contact

### Any other information related to climate change impacts and adaptation

#### Key contact details of national coordinator and organisation (1)

##### *Organisation*

Agência Portuguesa do Ambiente, I.P. (APA)

##### *Department within the organisation*

Climate Change Department

##### *Role of the organisation*

Coordinating adaptation policies and responsible for reporting

##### *Contact person*

Paula Rodrigues/ Ana Daam

##### *Role of the contact person*

Head of Department/ Head of Unit

##### *Email address*

enaac2020@apambiente.pt

##### *Website*

<https://apambiente.pt/clima/adaptacao>

#### Relevant websites and social media sources used at national level (as appropriate) (11)

##### *Title*

Observatório CLIMA-Madeira

##### *Type*

Website

*Weblink*

<https://observatorioclima.madeira.gov.pt/>

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*Title*

InfoRiscos

*Type*

Website

*Weblink*

<http://www.pnrcc.pt/index.php/geo/>

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*Title*

Spatial Planning and Urbanism Observatory

*Type*

Website

*Weblink*

<https://www.dgterritorio.gov.pt/Observatorio>

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*Title*

National Initiative for Circular Cities (InC2)

*Type*

Website

*Weblink*

<https://cidadescirculares.dgterritorio.gov.pt/>

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*Title*

adapt.local - Network of Municipalities for Local Adaptation to Climate Change

*Type*

Website

*Weblink*

<https://www.adapt-local.pt/>

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*Title*

National Roadmap for Adaptation 2100 website

*Type*

Website

*Weblink*

<https://rna2100.apambiente.pt/en>

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*Title*

National Programme for Spatial Planning Policies (PNPOT)

*Type*

Website

*Weblink*

<https://pnpot.dgterritorio.gov.pt/>

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*Title*

National Landscape Transformation Programme (PTP)

*Type*

Website

*Weblink*

<https://www.dgterritorio.gov.pt/paisagem/ptp>

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*Title*

Climate Portal

*Type*

Website

*Weblink*

<http://www.portaldoclima.pt/>

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*Title*

COSMO - Coastal Monitoring Programme of Continental Portugal

*Type*

Website

*Weblink*

<https://cosmo.apambiente.pt/>

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*Title*

SNIRH - Water Resources Information National System

*Type*

Website

*Weblink*

<https://snirh.apambiente.pt/>

## **Adaptation portals and platforms (1)**

*Name*

Portuguese Environment Agency Portal (Adaptation)

*Status*

Established

*Focus of the portal or platform*

Climate change adaptation (measures and solutions); Climate change hazards, impact and/or vulnerability

*Weblink*

<https://apambiente.pt/clima/adaptacao>

## **Key reports and publications at national level (10)**

*Title*

Project Catalogue of the RIAAC-AGRI Project - Network on Impact and Adaptation to Climate Change in Agriculture, Agro-Food and Forestry

*Year of publication*

2020

*FPublisher*

UNAC - União da Floresta Mediterrânica

*WebLink*

<https://www.unac.pt/index.php/projetos/concluidos/riaac-agri-pdr-2020-rrn-2018-2020>

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*Title*

Measures for the Protection and Resilience of Electronic Communications Infrastructure

*Year of publication*

2018

*FPublisher*

ANACOM

*WebLink*

[https://www.anacom.pt/streaming/ReportFireReducedVersion2018.pdf?contentId=1461073&fileId=ATTACHED\\_FILE](https://www.anacom.pt/streaming/ReportFireReducedVersion2018.pdf?contentId=1461073&fileId=ATTACHED_FILE)

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*Title*

"emRede" Magazine - No 8 - Climate Change Answers - Agriculture, Forestry and Territories

*Year of publication*

2019

*FPublisher*

Directorate-General for Agriculture and Rural Development/National Rural Network

*WebLink*

[http://www.rederural.gov.pt/images/Noticias/2019/RRrural\\_n8\\_final\\_26jul.pdf](http://www.rederural.gov.pt/images/Noticias/2019/RRrural_n8_final_26jul.pdf)

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*Title*

Algarve Regional Water Efficiency Plan

*Year of publication*

2020

*FPublisher*

MAAC, MA and SET

*WebLink*

<https://apambiente.pt/agua/planos-regionais-de-eficiencia-hidrica>

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*Title*

National Risk Analysis

*Year of publication*

2019

*FPublisher*

ANEPC

*WebLink*

<http://www.prociv.pt/bk/RISCOSPREV/AVALIACAONACIONALRISCO/PublishingImages/Paginas/default/ANR2019-vers%C3%A3ofinal.pdf>

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*Title*

Good Practice Guides and Resilient Cities in Portugal

*Year of publication*

2016

*FPublisher*

ANEPC - NATIONAL PLATFORM FOR DISASTER RISK REDUCTION

*WebLink*

<https://www.pnrrc.pt/index.php/publicacoes/>

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*Title*

Lisbon Metropolitan Area Climate Change Adaptation Plan (PMAAC-AML)

*Year of publication*

2019

*FPublisher*

Lisbon Metropolitan Area

*WebLink*

[https://www.aml.pt/susProjects/susWebBackOffice/uploadFiles/wt1wwpgf\\_aml\\_sus\\_pt\\_site/componentPdf/SUS5E6B9B74C34BC/PMAAC\\_AML\\_P069\\_BROCHURA\\_INSTITUCIONAL\\_ENG\\_PMAAC-AML\\_30NOV2019\\_\(1\).PDF](https://www.aml.pt/susProjects/susWebBackOffice/uploadFiles/wt1wwpgf_aml_sus_pt_site/componentPdf/SUS5E6B9B74C34BC/PMAAC_AML_P069_BROCHURA_INSTITUCIONAL_ENG_PMAAC-AML_30NOV2019_(1).PDF)

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*Title*

Intermunicipal Climate Change Adaptation Plan of Central Alentejo (PIAAC-AC)

*Year of publication*

2020

*FPublisher*

Intermunicipal Community of Central Alentejo

*WebLink*

[https://www.cimac.pt/wp-content/uploads/2020/12/PIAAC\\_AC-Relatorio-Final.pdf](https://www.cimac.pt/wp-content/uploads/2020/12/PIAAC_AC-Relatorio-Final.pdf)

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*Title*

Spatial Planning responding to Climate Change: Contribution to the PDMs

*Year of publication*

2019

*FPublisher*

Lisbon and Tagus Valley Coordination and Regional Development Commission

*WebLink*

[https://www.ccdr-lvt.pt/wp-content/uploads/2022/02/relatorio-OT\\_respostas-alteracoes-climaticas\\_contributo-PDM.pdf](https://www.ccdr-lvt.pt/wp-content/uploads/2022/02/relatorio-OT_respostas-alteracoes-climaticas_contributo-PDM.pdf)

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*Title*

PDM GO Good practices for Municipal Master Plans

*Year of publication*

2021

*FPublisher*

National Land Commission

*WebLink*

[https://cnt.dgterritorio.gov.pt/sites/default/files/Guia\\_PDM-GO.pdf](https://cnt.dgterritorio.gov.pt/sites/default/files/Guia_PDM-GO.pdf)

*If necessary, you can upload here an additional document*

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