

# TEN REASONS FOR AN ADAPTATION PLAN

1

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The Santander Climate Change Adaptation Plan is being developed within the framework of the Santander Capital Natural project, led by the Santander City Council. The document has been prepared with the scientific support of researchers from the Department of Geography, Urban and Regional Planning, led by the CINCc Research Group (City, Infrastructures and Climate Change) of the University of Cantabria (UC), together with the Climate Research Foundation (FIC).

Santander Capital Natural (SCN) is supported by the Fundación Biodiversidad of the Ministry for Ecological Transition and Demographic Challenge (MITECO) in the framework of the Recovery, Transformation and Resilience Plan (PRTR), funded by the European Union - NextGenerationEU. The main objective of the project is to strengthen the role of the network of urban green areas in the conservation of biodiversity at the local level, enhancing environmental services that help to improve the quality of life of the citizens of Santander, and to establish strategies and actions to make Santander a more resilient city. Its partners include Santander City Council, SEO/BirdLife, the Asociación Amica, the Climate Research Foundation, and the University of Cantabria.

This Adaptation Plan is part of the SCN project, being one of the three actions leading to the municipal strategy (A1 SCN Strategy), such that by consolidating the results from the climate adaptation perspective of this Plan (Action A2) and those of the Biodiversity Strategy Update (Action A3), an integrated municipal green infrastructure project (Action A4) can be developed. Specifically, this document adds to the results of the other actions of the SCN project, the analysis of future climate and the risks associated with it, as well as the advisable adaptation measures to avoid it, with solutions based on nature, and largely supported by the municipal green infrastructure.

The Adaptation Plan document is divided into 8 chapters, consisting of the following process and expected results:

- This first, introductory section is articulated around the answers to three key questions about the need for, and the features of this report.
- The second chapter reviews the objectives and approach of the report, while the third chapter develops the general methodology being followed in this document, including the phases that led to the development of the plan, its scope and basic unit of representation.

- Chapters 4 and 5 condense this report's technical analysis, with Chapter 4 assimilating the results of Climate Hazards from a study of past and present climate scenarios and their projection into the future. The fifth chapter, on the other hand, integrates all studies leading to the Risk Indices, which present the results from the study on exposure and vulnerability. Chapter 5 ends with the diagnosis and the strategic adaptation proposals of this research study.
- Chapter 6 includes 85 Adaptation Measures, including a description of the Adaptation Goals and Objectives, as well as the details of all the Measures in the form of fact sheets.
- The last two chapters incorporate the accompanying plans necessary for the elaboration of this plan: the Measure Monitoring Indicators (Chapter 7) and the Participation Plan developed throughout the project (Chapter 8).
- Finally, a cartographic information and risk level tables for the census sections has been included at the end of the document.



## WHAT IS AN ADAPTATION PLAN?

Adaptation plans emerge as planning and action tools for municipalities once the need to adapt to the consequences of expected variations in the local climate has been identified. These are documents that enable adaptation decisions for the risks that the municipality will face as a result of climate change. These changes are accelerating and are already having an impact on cities, which is why municipalities are looking for agile and efficient tools to organise their strategies for adapting to this new situation.

### What is climate change?

The Intergovernmental Panel on Climate Change or IPCC (2022) in its Sixth Assessment Report (AR6)<sup>1</sup> defines climate change as a variation in the state of the climate, which can be identified in the mean and/or variability of its properties, and which persists for an extended period over decades or longer. Due to human action, since the Industrial Revolution, the concentration of Greenhouse Gases (GHG) in the atmosphere has been steadily increasing, which has already led to modifications in physical-biological systems. Despite efforts to mitigate GHG emissions, including CO<sub>2</sub>, the impact of this change is inevitable. Hence, strategies and plans to combat climate change must include mechanisms for anticipation, prevention and preparation to deal with the occurrence of extreme events and climate variability.

### Why are cities key to adaptation?

Cities are particularly sensitive to the effects of climate change, but they are also the best-placed decision domains to address adaptation (Dodman et al., 2022)<sup>2</sup>. The term 'adaptation' is used to describe the process of adjustment to actual or projected climate and its effects, with 'adaptive capacity' defined as the ability of systems, institutions, humans and other organisms to adapt to potential harms, take advantage of opportunities or cope with the consequences<sup>3</sup>. Cities are, therefore, best placed to develop this adaptive capacity, min-

<sup>1</sup> IPCC (2022) Annex II: <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/> IPCC, 2022: Annex II: Glossary [Möller, V., R. van Diemen, J.B.R. Matthews, C. Méndez, S. Semenov, J.S. Fuglestedt, A. Reisinger (eds.)]. En: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2897–2930, doi:10.1017/9781009325844.029.

<sup>2</sup> Dodman, D., B. Hayward, M. Pelling, V. Castan Broto, W. Chow, E. Chu, R. Dawson, L. Khirfan, T. McPhearson, A. Prakash, Y. Zheng, and G. Ziervogel, 2022: Cities, Settlements and Key Infrastructure. En IPCC (2022) Chapter 6.

<sup>3</sup> IPCC (2022). Annex II.

imising negative impacts and taking advantage of the potential opportunities provided by 'this phenomenon'.

## **What is the background?**

Many municipalities have already developed adaptation action plans. More than 900 cities, towns and villages across Europe have committed to adaptation by joining the Covenant of Mayors for Climate and Energy. Many others participate in other networks and initiatives (e.g. 100 Resilient Cities, C40 Cities or ICLEI Resilient Cities), which provide them with knowledge and opportunities to exchange experiences or support in adaptation planning.

Also, participation in EU-funded projects –Life, Interreg or research projects– can also help cities to access adaptation funding, learn from other experiences or obtain much needed local climate knowledge from researchers. In the autonomous community of Cantabria, other adaptation initiatives have been promoted in nearby municipalities such as Suances, Polanco, Miengo, Arnuelo or Noja, among others, which, despite not having local adaptation plans, have joined the group of signatories of the Global Covenant of Mayors for Climate and Energy, as is also the case of Santander, which has been a member since 2008.

## **What is the structure of Local Adaptation Plans?**

The general structure of Local Adaptation Plans is based on the creation of future climate scenarios, detecting the future climate scenarios and detecting climate extremes to identify the hazards that this situation might entail. After identifying such hazards, the focus is on identifying the risk<sup>4</sup> of damage due to hazards in different urban areas.

The process of identifying risk varies across different methodologies. The result is more refined when the databases from which exposure and vulnerability are calculated are comprehensive, and exposure and vulnerability are complete and comprehensive. In most Spanish background plans, the future scenario is limited to climate. However, in the case of Santander, a methodological advance is proposed wherein the future climate scenarios are added to the exposure and vulnerability scenarios for the time horizons. For this, it is necessary not only to understand the current state of society, the productive structure and the urban fabric, but also to project their characteristics and morphology into the future.

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<sup>4</sup> In the context of climate change, risks can arise from the potential impacts of climate change, as well as from human responses to climate change. Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards and the exposure and vulnerability of the affected human or ecological system to the hazards. Risk can be minimised by a fourth factor: adaptive capacity. IPCC, 2022, Annex II.

## WHY DOES SANTANDER NEED AN ADAPTATION PLAN?

The municipality of Santander is in a privileged situation with respect to other municipalities where the consequences of climate change are already leaving traces of drought or severe flooding. Even so, the results obtained on the future climate in the municipality project a certain level of risk, both due to the climate and the factors derived from these changes in the urban fabric, infrastructures, biodiversity and the health of the population.

In addition to this external change, the particular social, physical and economic conditions of the city projected for the future show an increasing vulnerability to the risks detected. Aspects such as heat waves, which are projected to increase in duration and intensity, will pose an even greater risk in a scenario where the weight of people over 75 years of age will increase significantly. This is just one example of the importance of knowing the risks that Santander will face in a future climate scenario and, hence, of designing a plan to begin to tackle the situation.

In the light of the scientific studies carried out, and considering the environmental, urban, social and economic variables of the municipality, there are at least 10 reasons for developing an Adaptation Plan in Santander:

### 1.2.1. There is scientific evidence of climate risks

The studies show a moderate increase in temperatures for the years 2050 and 2100 in Santander, both in winters and summers, along with special effects in the summers, which will



**Figure 1.1.** Exposure to intense wave events

Source: CINCC (UC), 2023.

see a notable increase in the number of heat wave days and tropical nights. A change in the precipitation regime is also foreseen, spacing out over time and increasing the probability of extreme rainfall.

### 1.2.2. Infrastructures and the urban fabric will be affected

Climate change is putting significant pressure on Santander's infrastructure and urban fabric, and this trend appears to be intensifying over time. Extreme weather events such as flash floods and more intense storms are already impacting the city, highlighting the vulnerability of its existing infrastructure. In addition, the urban fabric faces challenges in terms of storm-water management and drainage, with more frequent and severe urban flooding threatening the habitability and safety of its population. Other extreme weather events, such as more intense and prolonged heat waves, are also putting pressure on urban infrastructure, from energy systems to water supply and sanitation networks. Increasing urbanisation increases soil sealing and reduces the absorption capacity of urban areas, contributing to increased risk of flooding and landslides. To address these challenges, it is crucial to implement adaptation measures that build on the city's green infrastructure and sustainable water management practices.



**Figure 1.2.** *Impacts on urban infrastructure due to extreme weather events*

Source: CINCc (UC), 2024.

### 1.2.3. The health of citizens will be affected

Rising temperatures due to climate change may increase the incidence and severity of respiratory diseases in Santander due to the proliferation of allergens and air pollutants, such as pollen and smoke from forest fires, which can trigger or worsen conditions such as asthma and allergic rhinitis. In addition, extreme heat can make breathing more difficult and increase the risk of exacerbations for people with chronic respiratory diseases such as COPD.

In addition, heat waves, tropical and sultry nights can have a significant impact on the health of Santander's citizens and their general well-being.

Some extreme events of this nature can increase the risk of heat-related illnesses such as heat stroke, dehydration, exhaustion and aggravation of pre-existing health conditions such as cardiovascular and respiratory diseases. Also, hot nights, characterised by unusually high night-time temperatures, make it difficult to get adequate rest and can lead to sleep disturbances, which negatively affect mental health and daytime performance. For vulnerable populations, such as the elderly, children and people with chronic illnesses, the impact of these extreme conditions can be even more severe.

Other climate-related threats, such as the transmission of a wide range of diseases, is a trend that has already been observed in Europe, and will continue to be present in the coming decades (EEA, 2021)<sup>5</sup>. Through the Urban Heat Island and other microclimatic conditions, urban environments increase the exposure of their populations to vector-borne diseases that are associated with the increasing presence of exotic species migrating northwards due to climate change. The *Aedes albopictus* (tiger mosquito) has become a common species in southern Europe and transmits diseases such as Zika, dengue and Chikungunya. As climatic suitability for the tiger mosquito depends on factors such as sufficient rainfall, high summer temperatures and mild winters, climate change is expected to further facilitate the spread of the tiger mosquito across Europe with changing temperature and rainfall patterns, thereby increasing suitable habitat for its proliferation (EEA, 2021).

### 1.2.4. Local biodiversity will be compromised by climate variations

In addition to other factors of global change, climate is also creating a significant impact on Santander's biodiversity. Rising temperatures and changes in precipitation patterns are altering natural habitats and displacing many plant and animal species to more climatically favourable areas.

The consequence is a loss of biodiversity, as some species may not be able to adapt quickly enough or find new habitats suitable enough. Some studies show that marine ecosystems off

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<sup>5</sup> See: <https://www.eea.europa.eu/data-and-maps/indicators/vector-borne-diseases-2/assessment>



the coast of Santander are experiencing changes in species distribution due to rising water temperatures, which could affect the food chain and local fisheries in the long term.



**Figure 1.3.** *Water stress under new climatic conditions*

*Source: CINCc (UC), 2024.*

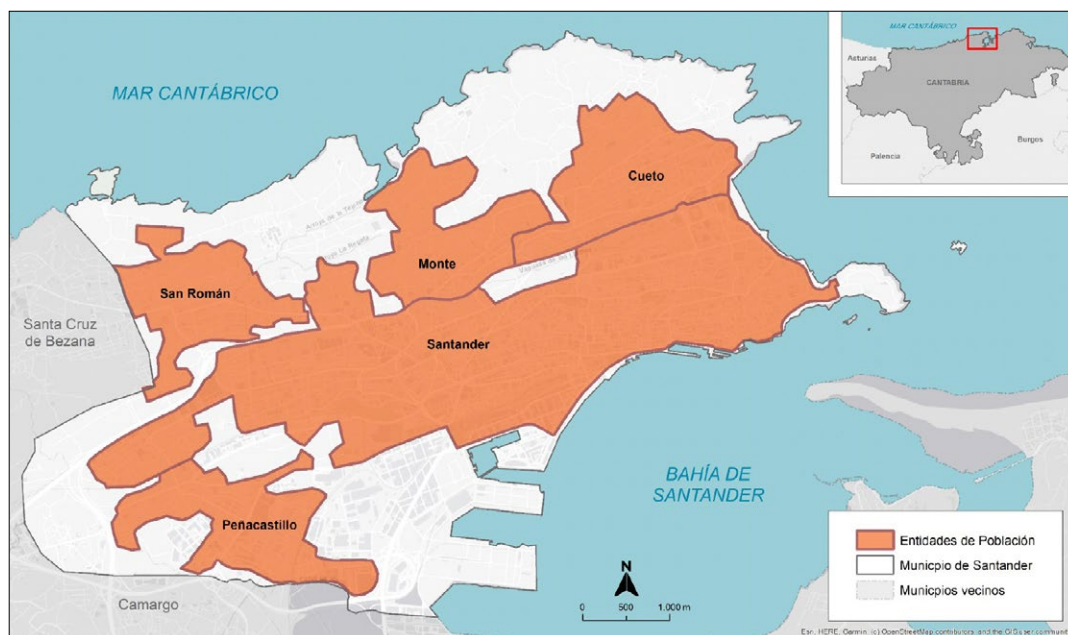
Climate change may also have impacts on Santander's terrestrial biodiversity, such as the loss of natural habitats due to desertification and soil degradation, as well as an increase in the frequency and intensity of forest fires. Some changes may lead to a decrease in the diversity of plant and animal species, as well as the loss of vital ecosystem services, such as pollination and local climate regulation. Biodiversity conservation in Santander becomes even more crucial in this context, with the need to implement adaptation measures to protect local ecosystems and ensure their resilience to the impacts of climate change.

Other reasons why Santander should have an Adaptation Plan is attributed to its **differential characteristics**. In addition to the frequency and magnitude associated with adverse climate events, local characteristics linked to demographics, socio-economics and the environment constitute what are known as differential risks of climate change. This reality gives rise to the following reasons, described below, why Santander needs a Climate Change Adaptation Plan.



### 1.2.5. The eminently urban character of the municipality

Urban environments face higher risks of damage from climate change than rural areas due to the high concentration of population, economic activities and critical infrastructure.



**Figure 1.4.** *Population entities (residential) that make up the municipality of Santander.*

Source: CINc (UC) - FIC, 2024 based on *Population Entities of the National Geographic Institute*.

The municipality of Santander covers an area of approximately 36 km<sup>2</sup> in the heart of the region's coastal strip. In addition to encompassing the city, which is the capital of the Autonomous Community, the municipality includes the towns of Cueto, Monte, Peñacastillo and San Román de la Llanilla, creating an urban continuum with a complex spatial division. The Municipal Register of Inhabitants for 2022 puts the number of residents in the municipality at 171,657, the base value for subsequent calculations; although the national institute of statistics (INE) puts the figure at 171,693 inhabitants (INE, 2023). In Santander, as in other cities, the replacement of natural vegetation by artificialised surfaces and buildings alters temperature, humidity, wind direction and rainfall patterns<sup>6</sup>. Impervious surfaces prevent excessive amounts of rainwater from seeping into the ground and raise temperatures in cities compared to the surrounding region by storing heat and creating the so-called 'urban heat island effect', among others.

<sup>6</sup> Only 37.73% of the municipal land is permeable.

### 1.2.6. An increasingly ageing population will be increasingly vulnerable

Currently, the municipality of Santander falls into the category of intermediate cities<sup>7</sup> where demographic and economic development have left a mark in several areas of territorial planning. Since 1900, with a population of nearly 55,000 inhabitants, the municipality of Santander has experienced constant residential and industrial growth until almost the end of the last century, when it reached about 200,000 inhabitants in 1995. Thereafter began a period of population decline, with certain fluctuations leading to the current population of under 175,000 inhabitants.

According to the last 10-yearly Population and Housing Census of the INE in 2021, the total population of the municipality of Santander was estimated at 172,002 people (INE, 2023), of which approximately 12% were under 16 years of age, 62% were between 16 and 64 years of age, both included, and almost 26% were over 64 years of age.

In the future projection of the distribution of the population of Santander in 2050 and 2100, the official assumptions (ICANE population projections) of birth rates, migration and current demographic trends have been considered, as well as foreseeable medical and health care improvements. For both horizons, an increase in the proportion of older people in Santander has been observed, in line with the overall demographic trend of an ageing Spanish population, given that advances in medical care and quality of life are expected to contribute to greater longevity. This significant increase in the number of older people highlights an increase in the municipality's vulnerability to risks related to rising temperatures and extreme events, both cold and intense heat.

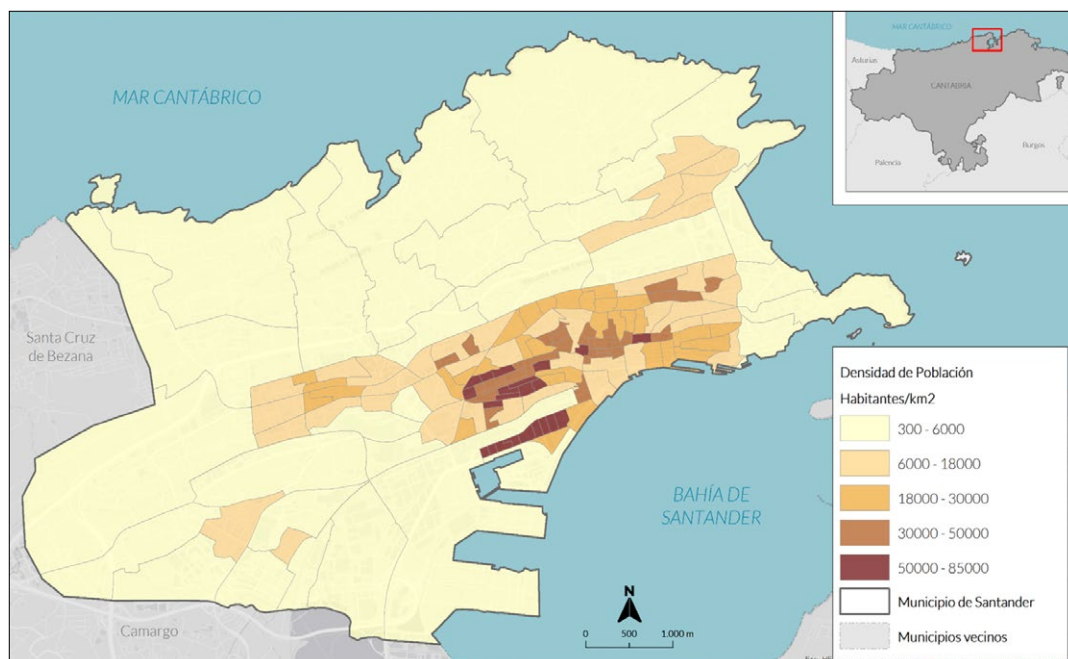
### 1.2.7. A large floating population will continue to grow

The current average population density for the municipality of Santander is 4,914 inhabitants/km<sup>2</sup>. The census sections with the highest population density are mainly concentrated in the centre of the urban area. It should be noted that, although this population is permanent throughout the year, during the holiday season, mainly in summer, the volume of inhabitants increases considerably, as the city and the region are great tourist destinations. According to ICANE<sup>8</sup> data, the total number of overnight stays in the city of Santander in 2022 was 1,066,050, very similar to the pre-pandemic period. It should be borne in mind that the greatest pressure is being exerted by extra-hotel tourism models, which are not accounted for in these figures. This population also increases in the academic period, without necessarily being reflected in either the national census or the local census.

<sup>7</sup> "An intermediate city is one that possesses and provides infrastructure and public services that allow it to be a platform for the integration of its territory and at the same time guarantees the intermediation of flows, whether of goods or people; it has a political and/or administrative function to facilitate territorial management and guarantee citizen participation; its economic function or economic activities contribute a higher percentage to gross value added compared to the surrounding urban agglomerations and it has a population between 50,000 and 1 million inhabitants." (GIZ, 2016).

<sup>8</sup> In: <https://www.icane.es/data/viajeros-pernoctaciones-estancia-ocupacion-plazas-categorias-zonas>

Today, there is an exponential trend in the growth of holiday homes. In the coming years, this trend is expected to continue, with the already significant floating population continuing to increase in a context of climate change and a trend towards deseasonalisation, which implies the need to strengthen the tourism sector with measures covering climate change adaptation, mitigation and awareness.



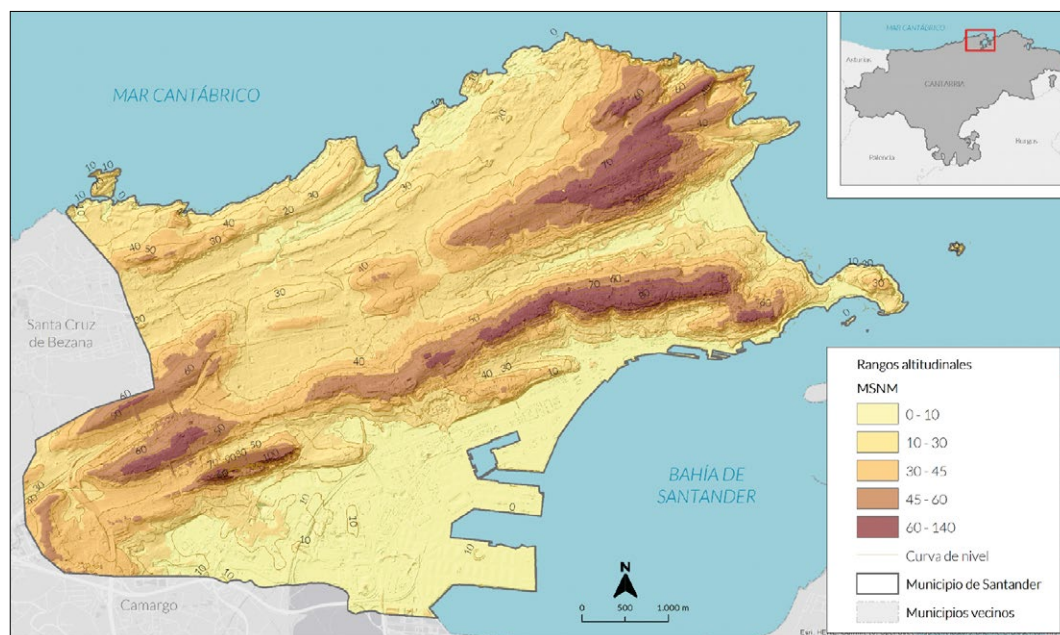
**Figure 1.5.** Population density (inhabitants/km<sup>2</sup>) by census section in the municipality of Santander  
Source: CINcc (UC) - FIC, 2024 based on INE's 2021 Population and Housing Census.

### 1.2.8. A physical structure will need to adapt to reduce climate impacts

The physical structure of the municipality is characterised by an alternation of parallel elevations and depressions arranged along a north-east to south-west axis. Differences in orography and solar orientation in some places accentuate the vulnerability to certain climatic hazards. The municipality has been developed around the Bay of Santander by filling in and draining the land corresponding to the marshes and estuary areas, mainly for the installation of port and industrial activity.

From a morphological point of view, the whole municipality is characterised by its location on old platforms of marine abrasion, today raised to different levels. In the inner area of the Bay of Santander, the waters flow into several rivers. Also worthy of note is the wetland formed

by the Las Llamas stream in the watercourse of the same name and other small streams and marshy areas in the Bay, such as the wetlands of the Raos Canal to the south of the municipality. The morphology of the territory reveals sectors vulnerable to water impoundment that need to be analysed. Likewise, the rise in sea level poses the risk of the beaches receding, with consequent economic and social impacts.



**Figure 1.6. Orography of Santander municipality**

Source: CINc (UC) - FIC, 2024 based on the Digital Terrain Model at 2 m resolution from LIDAR data of the Military Geographic Institute and contour lines from the National Topographic Base at 1.25.000 scale.

### 1.2.9. An economic system that will need to adapt

In Santander's current productive structure, the tertiary sector is the driving force of the municipal economy. In addition to the administrative sector, and other minor sectors such as the secondary industrial and repair sector, the set of activities linked to the tourism sector has a very high relative weight, with commerce, hotels and restaurants clearly standing out. The business structure is characterised by a predominance of small and medium-sized enterprises (SMEs), although large companies, to a lesser extent, represent a very relevant aspect with respect to the volume of employment in the municipal economy (Ayuntamiento de Santander, 2016). The tourism sector needs to adapt to a new demand as well as to new climatic conditions, minimising their effects on visitors and involving them in the local Adaptation Plan.

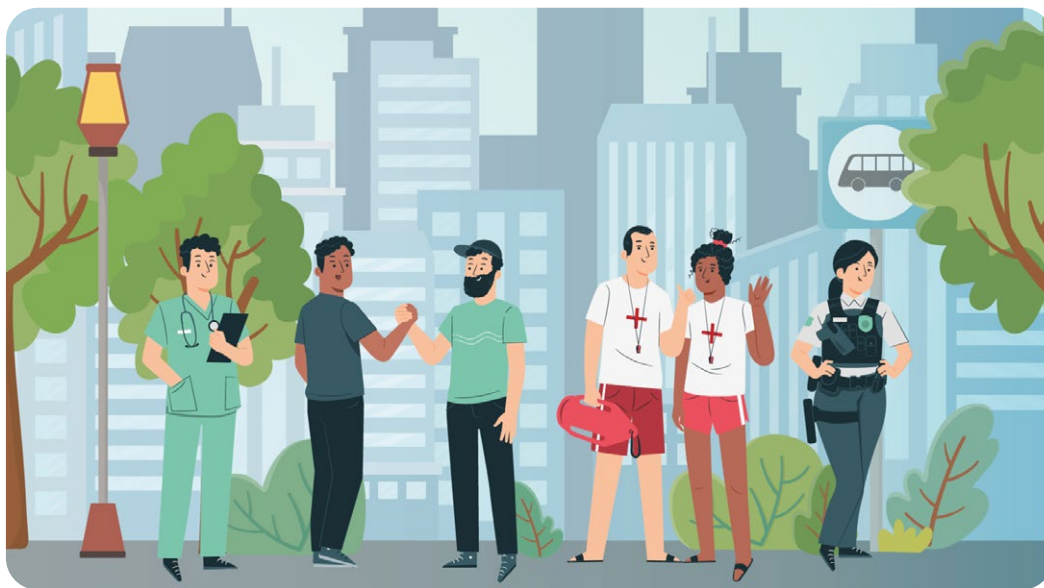
The industrial sector, of great historical relevance, has undergone changes in its location within Santander; its original spaces have been swallowed up by the growth of the city centre. To the southwest, Santander's industrial space currently maintains a notable presence, focusing mainly on the Port and the industrial estates of La Albericia, Candina, Campón-Peñacastillo, Nueva Montaña-Isla de Óleo, Parayas, Mercasantander, Nueva Montaña, Primero de Mayo-Faustino Cavadas, Ciudad del Transporte and Raos. There are also isolated industries and relatively recent developments such as the Parque Científico y Tecnológico de Cantabria, a business deployment area located in the district of Adarzo. These large industrial areas represent impermeable platforms with a strong impact on urban heat islands. Plans to revert and consolidate Santander's green infrastructure necessarily involve identifying these spaces and planning their future in order to help municipal resilience.

#### 1.2.10. Urgency of a Guidance Document

Climate change is already a fact. Data from the last few years on rising temperatures and the floods suffered in some areas, together with some reports of health effects, alert us to the urgency of putting measures in place. These measures, in the short, medium and long term, need to be defined in order to initiate the process of urban adaptation. Santander has a General Urban Development Plan dating from 1997, and despite recent efforts to activate the approval of a new Plan, these urban planning instruments do not have the agility of an Adaptation Plan, which is necessary to incorporate the uncertainty of the reality we are facing.

Finally, Santander needs a Plan that allows society, institutions and all local stakeholders involved to know the future projection of the implications of climate change, with a solid scientific basis. Only with such a document, in which various aspects of each census section have been carefully calculated to identify future vulnerability, will it be possible to make the right decisions. This Plan will also help in raising awareness, one of the main objectives identified in the National Plan and the European strategy, as well as in rigorous monitoring (through indicators) of the improvement of the municipality's adaptive capacity.

A review of these 10 reasons makes it abundantly clear why Santander needs a **Plan**, with **adaptation** measures that optimise the renaturalisation strategy of **Santander Capital Natural**. Moreover, the Plan needs to be implemented in such a way that the increase in the city's biodiversity and improvement of its quality of life is realised under a sustainable framework in time, based on robust projections of future climate, urban and social scenarios for the years 2050 and 2100.



### 1.3

## WHAT FRAMEWORK GOVERNS THIS ADAPTATION PLAN?

This document has been developed on the basis of the **regulatory and methodological frameworks** recognised by scientific and political institutions at different scales.

First, the methodological framework of this document is located at three different scales: it starts from international and European Union (EU) bodies and, in coherence with these supra-national guidelines, develops the national and regional frameworks.

**The European legislation** on climate change and adaptation has been mainly driven by the EU Strategy for Adaptation to Climate Change and the Energy and Climate Union Governance Framework. The EU Strategy for Adaptation to Climate Change (European Commission, 2013), subsequently updated in 2021, focuses on ensuring that adaptation measures are integrated into various sectoral policies. More recently, the European Commission's Communication on guidelines for Adaptation Strategies and Plans (Unión Europea, 2023) details and updates the policy framework for ensuring 'Transformative Adaptation', drawing attention to aspects such as 'maladaptation', fair climate resilience and the promotion of nature-based solutions. Although the directive is designed for National Level Plans, all these aspects have been taken into consideration in the definition of Santander's adaptation measures.



The European Commission's 2023 'Guidelines for Member States' adaptation strategies and plans<sup>9</sup>, provides guidance to EU countries on how to develop climate change adaptation strategies and plans. Some of the key aspects of these climate change adaptation policies include:

- 1 Developing a common framework for action:** The guidelines establish a common framework for Member States to develop their adaptation strategies and plans ensuring coherence and harmonisation in the response to climate change across the European Union.
- 2 Risk-based approach:** A risk management approach is promoted that identifies and assesses the specific climate risks faced by each region or sector, enabling informed decision-making on necessary adaptation measures.
- 3 Public participation and consultation:** The importance of public participation and stakeholder consultation in the development of adaptation strategies and plans is emphasised. This ensures that policies are inclusive and reflect the needs and concerns of civil society, the private sector and other relevant stakeholders.
- 4 Integrated approach:** Member States are encouraged to integrate climate change adaptation into all relevant policies, such as urban planning, water management, agriculture and public health, among others. In short, a holistic and coordinated response to the challenge of climate change.
- 5 Monitoring and evaluation:** Requirements are set out for monitoring and evaluating adaptation strategies and plans, allowing adjustments to be made as necessary, and ensuring that the measures implemented are effective in reducing vulnerability to climate change.

The Santander Adaptation Plan has been adjusted to each of these key aspects developed in the communication. Likewise, and following the criteria developed in the document, in this section we make special mention of the criteria established in the definition and prioritisation of the adaptation options. Thus, according to the third phase of the Guidelines to be developed for the Adaptation Plans established in the document, the following should be undertaken once the risks have been identified:

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<sup>9</sup> See the following link: <https://www.boe.es/buscar/doc.php?id=DOUE-Z-2023-70034>



**Define adaptation options**



**Assess and prioritise adaptation options**



**Avoid maladaptation**



**Address uncertainty regarding the effects of climate change**

Adaptation strategies and actions should also contribute as far as possible to the reduction of greenhouse gases. On 26 November 2019, the European Parliament adopted a resolution declaring a 'Climate and Environment Emergency' in Europe. The European Commission is, therefore, proposing a framework for EU climate and energy policies for the period 2020-2030 that builds on the progress made in meeting greenhouse gas emissions, renewable energy and energy savings targets. In addition, the European Commission has adopted a set of proposals to adapt EU climate, energy, transport and taxation policies for reducing net greenhouse gas emissions by at least 55% by 2030. The European Green Pact (2019) (European Commission, 2021), ratified by Regulation (EU) 2021/1119 of the European Parliament and of the Council establishing the framework for achieving climate neutrality, which also indicates the need to enhance adaptive capacity and resilience across sectors, takes into account the UN Sustainable Development Goals to help minimise the consequences of climate change and address its unavoidable impacts.

The PRTR funds that finance this project are committed to the adaptation of cities to climate change and are based on principles that promote a comprehensive, participatory and risk-based approach. It emphasises the importance of community participation in identifying climate risks and formulating adaptive solutions, as well as building resilience and sustainability

into urban planning. It highlights the need for coordination and cooperation between various actors, including local, regional and national governments, to ensure an effective and coordinated response to the challenges of climate change in cities.

**Spanish legislation** related to climate change and adaptation is primarily developed in the Law on Climate Change and Energy Transition (Gobierno de España, 2021a). This law sets ambitious targets for the reduction of greenhouse gas emissions, with the aim of achieving climate neutrality by 2050. Title V of the Law states that effective adaptation actions reduce the exposure and vulnerability of social, economic and environmental systems to climate change and can also improve their capacity to recover and re-establish themselves after a climate-related disturbance. Consequently, adaptation brings economic and social benefits that justify it.

The law establishes the National Plan for Adaptation to Climate Change (PNACC; Gobierno de España, 2020a) as the basic planning instrument to promote coordinated and coherent action to address the effects of climate change. The current PNACC defines the objectives, criteria, areas of application and actions to promote resilience and adaptation, prioritising ecosystem-based adaptation to climate change. Other reference documents are the National Strategy for Green Infrastructure and Ecological Connectivity and Restoration. Also, although not exclusively focused on climate change, the Spanish Circular Economy Strategy (Gobierno de España, 2020b) holds significant implications for emissions reduction and climate change adaptation.

At the **regional level**, on 12 December 2019, the Government of Cantabria approved the **Declaration of Climate Emergency** in Cantabria to fight against climate change at the regional level, adopting measures to mitigate its effects and promoting strategies in the economic field that contribute to the same ends. With regard to the ordinances on adaptation to climate change, the Interdepartmental Commission on Climate Change of the Government of Cantabria approved the Strategy for Action against Climate Change in Cantabria 2018-2030 in a session held on 4 April 2018, whose priority objective is to promote action against climate change in line with the commitments made by Spain under the Paris Agreement (included in the Energy and Climate Change Policy Framework 2021-2030).

The Government of Cantabria is currently promoting the updating of the **Climate Change Strategy**, which will be one of the tools to guide and facilitate the transition towards a low-carbon economy. This will in turn act as a key lever to achieve the Sustainable Development Goals of the 2030 Agenda as well as the commitments regarding greenhouse gas emissions, and in general the adoption of adaptation and mitigation measures in the face of the effects of climate change, in line with the 2015 Paris Agreement 'Climate Action' and objectives of the aforementioned European Green Pact and the latest IPCC reports.

In addition, the methodological framework that has served as a reference for the elaboration of this Plan is strongly influenced by the Intergovernmental Panel on Climate Change, as well as by some national reference guidelines for the elaboration of Adaptation Plans, as well

as some previous documents on municipal risks. The formulation of results in the context of adaptation to climate change must be adjusted to universal reference frameworks for globalising the understanding of these results and adapting the procedures to standards endorsed by the scientific institutions of reference.

The **Intergovernmental Panel on Climate Change** (IPCC) plays a strategic role in understanding and communicating the science of climate change. By bringing together thousands of scientists from around the world to comprehensively and objectively assess the available scientific information, the IPCC provides a solid evidence base for understanding the impacts of climate change, its causes and possible mitigation and adaptation options. Its importance lies in its ability to translate the complexity of climate science into accessible language and regular reports that are essential for informing climate policy at global, national and local levels, as well as for the methodological development of projects such as this. For this Plan, the precepts contained in the methodological documents for the analysis<sup>10,11</sup> of climate vulnerability and risk published by the IPCC in its fifth and sixth reports have been applied.

These IPCC reports, in turn, are synergistic with the methodological supports used for the development of local strategies and plans derived from various international institutions, such as the United Nations<sup>12</sup>, the World Bank<sup>13</sup>, the European Commission<sup>14</sup> and its specific planning guidelines for urban areas and municipalities<sup>15</sup>. This global framework is considered to be aligned with the precepts contained in official territorial and institutional work guides and plans, through which a practical and operative approach to risk is achieved that focuses on social perception and considers the diverse casuistry that can occur in urban areas and municipalities.

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<sup>10</sup> IPCC (2014). Climate Change 2014; Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

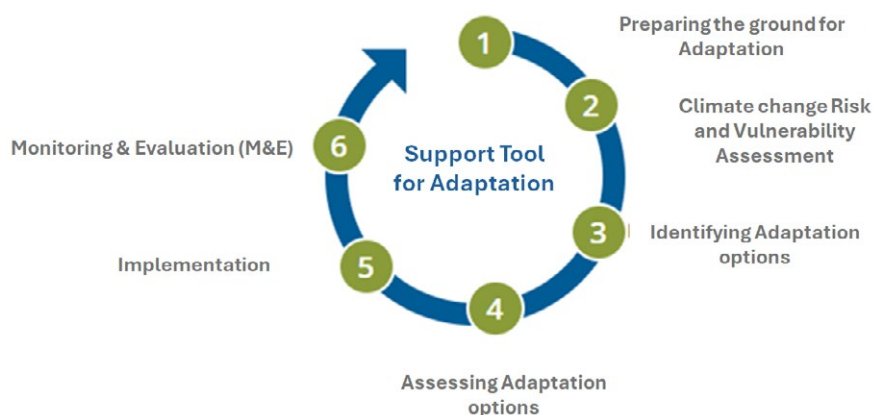
<sup>11</sup> IPCC (2022). Summary for Policymakers. In: Climate Change 2021: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

<sup>12</sup> United Nations (2010). How to develop more resilient cities. A Guide for Local Government Leaders. [http://www.unisdr.org/files/26462\\_manualparalideresdelosgobiernosloca.pdf](http://www.unisdr.org/files/26462_manualparalideresdelosgobiernosloca.pdf)

<sup>13</sup> World Bank (2011). Guide to Climate Change Adaptation in Cities. Accesible in <https://openknowledge.worldbank.org/bitstream/handle/10986/27396/653590WP0v200B0Urban0Handbook0Final.pdf?sequence=1>

<sup>14</sup> European Comission (2013). EU Climate Change Adaptation Strategy. Brussels, 16.4.2013 COM(2013) 216 final. Accesible in: <http://ec.europa.eu/transparency/regdoc/rep/1/2013/ES/1-2013-216-ES-F1-1.Pdf>

<sup>15</sup> For further information: <https://climate-adapt.eea.europa.eu/en/metadata/guidances/planning-for-adaptation-to-climate-change-guidelines-for-municipalities>



**Figure 1.7.** *Adaptation support tool Climate-ADAPT*

Source: Climate-ADAPT, 2023. <https://climate-adapt.eea.europa.eu/#t-adap>

At the **national level**, the methodological supports derived from the **National Plan for Adaptation to Climate Change**<sup>16</sup> have been considered, which establishes a general framework of reference for activities to assess impacts, vulnerability and adaptation to climate change, and which are likewise included in the precepts of regional ordinances, specifically in the Strategy for Action against Climate Change in Cantabria 2018-2030 (Gobierno de Cantabria, 2018).

Finally, with regard to the official plans currently in force in the municipality of Santander, the **Santander Municipal Emergency Plan** - PEMUSAN - (Ayuntamiento de Santander, 2016) is of particular relevance. Its objective is to plan the necessary actions to provide a rapid and effective response to any emergency that may occur within the territorial scope of the municipality, and which, in turn, follows the general guidelines of the Territorial Emergency Plan for Civil Protection of the Autonomous Community of Cantabria (PLATERCANT, 2018).

<sup>16</sup> MITECO (2015). Guide for the preparation of Local Climate Change Adaptation Plans. Ministry of Agriculture, Food and Environment. Available at: [https://www.miteco.gob.es/content/dam/miteco/es/cambio-climatico/publicaciones/publicaciones/guia\\_local\\_para\\_adaptacion\\_cambio\\_climatico\\_en\\_municipios\\_espanoles\\_tcm30-178446.pdf](https://www.miteco.gob.es/content/dam/miteco/es/cambio-climatico/publicaciones/publicaciones/guia_local_para_adaptacion_cambio_climatico_en_municipios_espanoles_tcm30-178446.pdf)

