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Spain's Climate Change Risks and Impacts Assessment (ERICC-2025)

Summary for Policymakers

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Spain's Climate Change Risks and Impacts Assessment (ERICC-2025). Summary for Policymakers

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Authors:

Spanish Climate Change Office (OECC), Ministry for the Ecological Transition and Demographic Challenge, MITECO

Coordination:

Patricia Klett Lasso de la Vega and Francisco Heras Hernández

Translated by:

CLINTER Traducciones e interpretaciones, S.A.
in collaboration with Sara Rodríguez Rego and Paula Henry Mantilla (OECC).

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Contents

Key messages

1. The most extreme climate scenarios are becoming reality, with hazards triggering cascading risks. Increasingly frequent and intense heatwaves, torrential rains, and other phenomena are shaping a complex and uncertain landscape that challenges the health, security, and resilience of communities and territories.
2. Most key risks demand immediate action or near-term planning, underscoring the urgency of accelerating the implementation of adaptation measures.
3. Many risks have a direct impact on livelihoods and other fundamental aspects of human well-being. The most critical threats are concentrated in urban and agricultural areas, as well as in fragile ecosystems, where exposure and vulnerability are highest.
4. Climate risks are unevenly distributed across societies and regions. Some communities face heightened vulnerability, requiring adaptive responses that are inclusive, equitable, and sensitive to local contexts.
5. ERICC 2025 identifies **17 risks with low or no reversibility**, potentially causing permanent losses. These risks require urgent preventive measures to avoid irreparable damage.
6. Most identified risks are affected by **underlying non-climatic factors** that may increase the vulnerability and exposure of people, communities, ecosystems or economic systems to climate hazards.
7. Climate change is compromising natural resources, with far-reaching impacts across multiple socioeconomic sectors—including tourism, agri-food systems, and human health—particularly in communities that depend on these resources.
8. Although there are knowledge gaps that make it difficult to fully assess some risks, **available information is sufficient to make informed decisions**. Nevertheless, applied climate research in key sectors should be encouraged.

1. Introduction

Spain's Climate Change Risks and Impacts Assessment (ERICC-2025, by its Spanish acronym) was conducted between 2023 and 2025.

ERICC is the first comprehensive nationwide effort aimed at identifying and characterising climate-related risks in Spain. It aims to facilitate the definition and prioritisation of adaptation measures, considering their social, economic and environmental implications.

The assessment is undertaken in compliance with Article 18 of Act 7/2021 on climate change and energy transition, which requires this exercise to be carried out at least every five years.

The report was prepared between 2023 and 2025 by a scientific-technical consortium comprising the *Environmental Hydraulics Institute of the University of Cantabria (IH Cantabria), Tecnalia Research & Innovation and the Basque Centre for Climate Change (BC3)*, under the coordination of the Ministry for the Ecological Transition and Demographic Challenge.

ERICC builds on the methodological approaches promoted by the Intergovernmental Panel on Climate Change (IPCC) and the European Climate Risk Assessment (EUCRA), adapting them to the national context. Its results will inform the preparation of the new 2026-2030 work programme of the National Climate Change Adaptation Plan (PNACC), as well as adaptation policies and measures.

The nation-wide scope of the assessment provides an aggregated national perspective. This scale enables the identification of general trends and strategic priorities, but entails certain limitations, as significant regional or local risks may fall outside the analysis. Therefore, it is essential to complement ERICC with specific assessments at regional or municipal scale to facilitate adaptation tailored to the concrete characteristics of each territory.

The assessment builds on the available scientific knowledge and on the authors and experts' interpretation, drawing on accessible and existing data.

During the assessment process **knowledge gaps** have been identified, hindering the evaluation of certain risks. These shortcomings, whether methodological in nature or related to data availability, point to key areas for future research. In this regard, ERICC informs where it is necessary to strengthen knowledge generation.

Lastly, it is important to highlight that climate risk assessments are an **essential step within the climate change adaptation cycle**, as they provide a rigorous diagnosis that guides decision-making. While they do not offer closed solutions, they do provide a solid basis on which to build effective policies and measures to reduce vulnerability and manage risks. The interpretation of their results and their translation into concrete actions must be addressed in the next stages of the adaptation process.

As mentioned earlier, ERICC **builds on the IPCC risk concept** (Figure 1), where climate **risks** result from the interaction between three components:

- **Hazards** refer to events or trends of a climatic nature that can cause or intensify impacts.
- **Exposure** refers to the presence of people, resources or economic, social or cultural assets in areas that could be negatively affected by hazards and therefore subject to impacts, losses or damage.
- **Vulnerability** considers the propensity or predisposition to be adversely affected. It includes both sensitivity or susceptibility to harm and capacity to cope and adapt.

The evolution of hazards depends on greenhouse gas emissions, whereas exposure and vulnerability are shaped by social, economic and territorial factors:

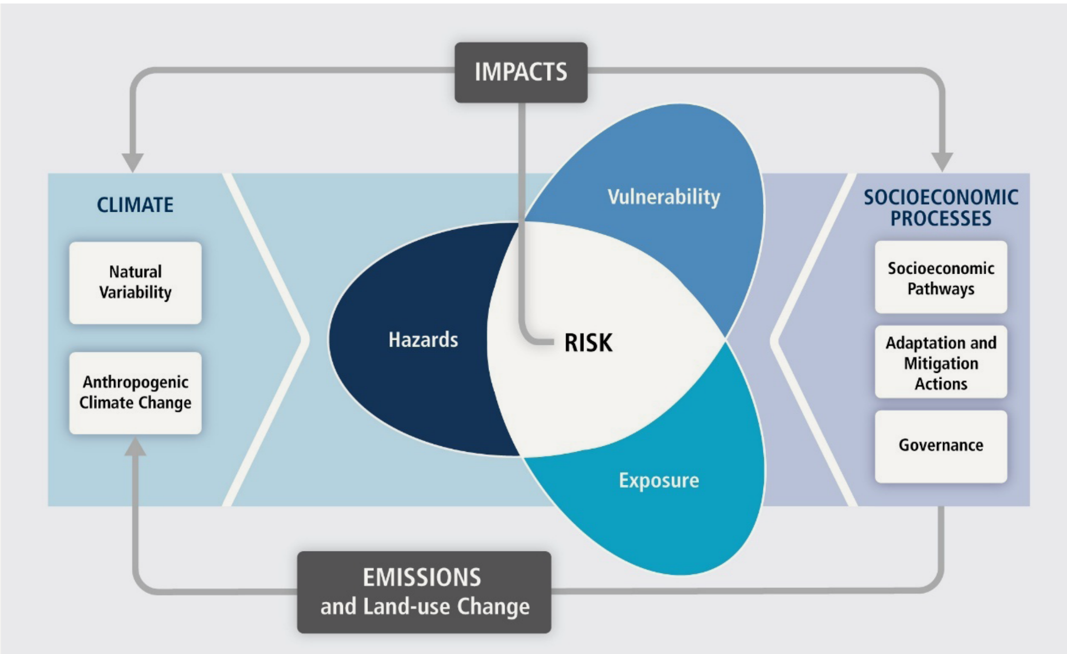

Figure 1. Concept of risk. Source: IPCC, AR5.

1.1. Sectoral perspective on climate related risks

ERICC 2025 has examined the climate risks within **14 thematic areas defined in the National Climate Change Adaptation Plan 2021–2030** (Table 1).

Table 1. Thematic areas analysed in ERICC 2025

1.	Human health	8.	Cultural heritage
2.	Water and water resources	9.	Energy
3.	Natural heritage, biodiversity and protected areas	10.	Mobility and transport
4.	Forestry, desertification, hunting and inland fisheries	11.	Industry and services
5.	Agriculture, livestock farming, fisheries, aquaculture and food	12.	Tourism
6.	Coasts and marine environment	13.	Financial system and insurance sector
7.	City, urban planning and building	14.	Peace, security and social cohesion

The assessment has been conducted from a sectoral rather than a territorial perspective. Nevertheless, this approach allows to draw relevant conclusions on how climate risks unevenly affect different parts of the territory.

For example, thematic blocks 3, 4 and 5 address issues that are particularly relevant for **rural areas**, while 7 and 11 have a greater focus on **urban areas**.

Rural and urban environments are affected differently, given their socioeconomic, geographical and structural differences.

Cities tend to have a more robust infrastructure (hospitals, transport infrastructure, etc.) which makes it easier for them to respond to some threats. However, the concentration of population and significant economic assets increases risk in areas with climate hazards as relevant as heatwaves (the urban heat-island effect exacerbates temperatures) or flooding in an environment with high levels of impermeable surfaces.

On the other hand, sectors that are highly sensitive to climate change, such as agriculture, livestock, forestry, concentrate in **rural areas**, which have a greater dependence on natural resources. This increases the vulnerability of rural populations to processes such as increased soil erosion, loss of biodiversity or changes in rainfall patterns. There are also differences in access to technologies and to the financial resources needed to adapt to climate change.

This territorial diversity demands differentiated approaches to risk management and adaptation planning.

Sectoral risks

A brief summary of the main climate risks and impacts identified in each of the 14 thematic areas analysed is provided below:

HUMAN HEALTH	• In the health sector, the main risks identified are **increased heat-related morbidity and mortality** among vulnerable groups and workers, as well as higher morbidity and mortality linked to the combined effects of rising temperatures and air pollution. • Studies increasingly link climate change to the **transmission of infectious diseases** including those mosquito-borne infections and those arising from higher pathogen levels in water or food. • Climate change also threatens **public health systems** by increasing demand for healthcare services and potentially exceeding system and infrastructure capacity under high-emissions scenarios.

WATER AND WATER RESOURCES

- The potential damage from **extreme prolonged droughts,** which are increasing in frequency and intensity, is a major concern. In addition, long term projections under the worst-case emissions scenario indicate a reduction in precipitation ranging between 30 and 40% — compared to current levels, with substantial temporal and spatial differences. These changes are expected to affect both the quantity and quality of available water resources.
- Increased **flood damage** has also been identified as a key risk. Climate projections indicate a rise in extreme rainfall events, especially along the Mediterranean coast and in the southern part of the Peninsula, during summer and autumn, due to warming of the Mediterranean.

NATURAL HERITAGE, BIODIVERSITY AND PROTECTED AREAS

- ERICC 2025 identifies key risks to natural heritage and biodiversity, including **global biodiversity loss**, resulting from cumulative climate impacts, and **disruption of ecosystem services** due to changes in ecosystem functionality.
- **Changes to ecosystems and essential ecological processes**—both terrestrial and aquatic—driven by variability in precipitation patterns and rising temperatures.
- **Increased desertification and soil erosion** due to arid climates expansion in the Iberian Peninsula, threaten ecosystems stability and their capacity to regulate the hydrological cycle and to cope with other climatic risks such as floods.
- In the marine environment, **ocean acidification and rising sea surface temperature** seriously affect ecosystems and associated fauna.
- Climate change favours the **spread of certain invasive species and pests**, intensifying pressure on natural systems.

FORESTRY, DESERTIFICATION, HUNTING AND INLAND FISHERIES

- In the forestry sector, climate change poses a significant threat to the **structure, composition and functionality of forests.** Changes in temperature, precipitation and other climatic factors, together with anthropogenic pressures, alter species' habitats, modifying forest communities and reducing their resilience.
- Declines in **key ecosystem services** are expected, including forest production, carbon storage, regulation of the hydrological cycle, erosion control, as well as recreational and conservation values.
- An increase **in erosion and loss of soil quality** in forest ecosystems, especially due to rising temperatures, droughts and extreme precipitation, is also expected. Furthermore, the **increased forest fire danger**, intensified by climate change, threatens the conservation of forest stands.

AGRICULTURE, LIVESTOCK FARMING, FISHERIES, AQUACULTURE AND FOOD

- Water is a critical resource for **agricultural production** and plays an essential role in the sector's sustainability and viability. Agriculture faces risks such as crop failure and yield losses due to **water stress, prolonged droughts and reduced water availability**.
- Other extreme weather events such as **heatwaves, heavy rainfall, floods, and forest fires** exacerbate the risk of **crop failures and losses** generating significant economic and social impacts in rural areas.
- Rising temperatures and declining precipitation negatively impact **livestock production and animal welfare and increase mortality.**
- Changes in ocean variables alter the **distribution of species and population stocks, reducing productivity** and jeopardising the sustainability of fisheries.

COASTS AND MARINE ENVIRONMENT

- One of the main risks identified in coastal areas is the **permanent loss of land** caused by shoreline erosion and flooding resulting from sea-level rise.
- A potential increase in **direct damage to people, ecosystems and economic assets** has also been detected, due to the increased intensity and frequency of extreme events. These also compromise the functionality of **port and coastal protection infrastructures**.
- The risk of **displacement or disappearance of marine habitats and species,** due to rising sea surface temperature and acidification, is also critical.

CITY, URBAN PLANNING AND BUILDING

- In urban environments, the **increase in extreme hydrometeorological events** — such as heavy rainfall and flooding — poses a **direct risk to the population**, buildings and critical infrastructure, especially sanitation, drainage, electricity and transport networks, compromising their operability and safety.
- Extreme weather events can also cause **severe disruptions to essential services** such as water and energy supply and communications.
- **High temperatures** generate relevant risks in urban environments, and affect the **habitability of homes, public spaces, workplaces and facilities.**
- The intensification of the urban heat island effect, together with the degradation of green areas, increases the **thermal stress in public spaces**. This restricts the use of outdoor areas, reduces environmental comfort and exacerbates the impacts of extreme heat.

CULTURAL HERITAGE

- Risks have been identified for **underground archaeological sites, cave paintings, frescoes, historic buildings and historic centres**, driven by changes in precipitation, river flooding and moisture content of materials. **Impacts are also expected on ethnographic heritage and cultural landscapes** arising from the increased forest fire danger.
- In coastal areas, heritage of historical value — including buildings, archaeological sites, rock art and underwater heritage — is exposed to coastal flooding, storm surges, rising groundwater levels and coastal erosion.

ENERGY

- In the energy sector, risks are particularly high for **hydropower generation** due to decreased water availability.
- Reduced **efficiency and capacity of electricity transmission and distribution networks** is anticipated due to projected temperature increase. This also affects energy storage due to reduced performance of electric batteries.
- Risks are also expected for supply capacity because of significant changes in **electricity demand patterns**, driven by these same extreme climatic conditions.
- Extreme weather events, such as floods — river, rain and coastal — and intense winds, can affect **electricity generation capacity** and cause supply disruptions due to **physical damage to energy infrastructures**.
- **Oil and gas infrastructure located in coastal areas** could suffer physical damage caused by sea-level rise and extreme events such as coastal flooding and severe storms. This could lead to a risk for primary fossil energy supply.

MOBILITY AND TRANSPORT

- Climate change significantly increases the risks associated with extreme events. These include **damage to and reduced operability** of port infrastructure, damage to road-network **infrastructure**, traffic disruptions, and **suspension of rail services**. All these impacts compromise the transport systems functionality and resilience in the face of more frequent and intense extreme events.

INDUSTRY AND SERVICES

- The key risks include **damage to infrastructure** resulting from extreme events and potential **disruptions or reduced efficiency in industrial operations** and service delivery due to reduced water availability and extreme temperatures.
- There is also a risk of **decreased availability of raw materials and a potential increase in their prices**, particularly when supply depends directly on climatic conditions.

TOURISM

- Tourism faces potentially serious risks from climate change, including potential declines in visitor numbers or shorter stays due to **thermal comfort thresholds being exceeded**; reduced demand linked to the **spread of mosquito-borne diseases; and diminished tourism appeal** caused by the degradation or loss of natural resources.
- Additional risks include reduced tourism due to **competition from more climate-favoured destinations**; loss of tourism capacity from loss or **damage to accommodation and infrastructure** caused by extreme events; and the **decline or disappearance of snow tourism** as temperatures rise and snow cover diminishes.

FINANCIAL SYSTEM AND INSURANCE SECTOR

- Key risks include the risk of **asset price correction**, both tangible (such as real estate) and financial, due to climate impacts and a potential **reduction in financial activity** in areas highly affected by such impacts.
- Another identified risk is the increase in **loan defaults**, especially in sectors dependent on water, affected by phenomena such as drought and aridity.
- In the insurance sector, a potential **increase is expected in compensation for losses in the agricultural sector** caused by droughts, hailstorms, frosts, flooding, heatwaves and pests favoured by climate change.

PEACE, SECURITY AND SOCIAL COHESION

- Climate change causes deterioration of sites used by productive activities, leading to the potential **destruction or degradation of livelihoods and means of subsistence.** The sectors more notably affected include farming, fisheries, tourism and industry.
- Extreme weather events could **damage critical infrastructure** and cause **severe interruptions in the supply of water, energy or food.** This could lead to a security risk of major concern.
- **Severe climate-related impacts on natural resources**, such as water, arable land, agricultural productivity or fisheries, can lead to geopolitical tensions, cross-border disputes and confrontation between states. This poses a risk of **international crises and conflicts**.

1.2. Key findings

1. The assessment has identified **141 relevant risks**[1] across **all** sectors analysed (Annex 1). This confirms that climate change poses a systemic challenge that affects all essential domains in our personal and collective wellbeing: health, natural heritage, economic activities and security.
2. Of the **141 relevant risks** identified, **51** have been classified as **key risks,** which were subject to an in-depth analysis in order to focus attention on those with the highest potential impact and requiring a more urgent response.

[1] In this project, the following definitions apply:

- **Relevant risks:** those that have the potential to generate significant impacts on human or ecological systems in the study area as a result of climate change.
- **Key risks:** a subset of relevant risks, potentially severe, which may translate into impacts at present and increase in severity over time.

3. Each key risk has been analysed considering **its specific components** (hazards, exposure and vulnerability). This facilitates a better understanding of its impact mechanisms and the design of more effective adaptive responses.

4. Each of the 14 areas and sectors analysed is illustrated by a **conceptual model** that synthesises the relationships of risks with risk components within the sector. In addition, these diagrams show the underlying non-climatic risk drivers identified, which may increase the vulnerability and exposure of people, communities, ecosystems or economic systems to climatic hazards.

5. **More than 1,700 interrelations between risks** have been identified through a complex-risk analysis. This demonstrates that climate risks do not operate in isolation, reinforcing the idea that coordinated, multisectoral public policies are required in response to climatic risks.

6. Where data availability permitted, **critical thresholds** have been identified for each key risk. These thresholds indicate the point at which risks tend to intensify significantly, potentially exceeding the adaptive capacity of the affected systems or communities.

ERICC also examines the imminence, severity, and reversibility of impacts, key dimensions that support decision-making by helping to assess the urgency of action and providing criteria for policy design and the prioritization of adaptation measures (Annex 2).

1.3. Interconnected risks and resilience: keys to climate adaptation

1. The analysis of **risk interactions**, using graph theory, has provided a structural and relational perspective of the overall risk system. Findings reveal a highly interconnected network where cascading effects can spread rapidly.

2. The **risks** related to *water and water resources*, together with those affecting *natural heritage and forestry sector* **have the greatest potential to directly trigger other risks**. These risks act as system drivers, generating impacts that spill over into multiple sectors. Identifying these risks is critical for prioritising measures to address them, as interventions here can significantly reduce the spread of negative effects throughout the system.

3. These risks hold a central position within the network, functioning as critical indicators of the overall state of the risk system. Their strategic relevance makes them essential for early crisis detection and for implementing rapid, coordinated responses.

4. The most dependent risks, with high potential to be triggered by others, are concentrated in the fields of *peace, security and social cohesion, the financial system and insurance sector*, and to a lesser extent in the *natural heritage sector*. These sectors not only accumulate impacts but can also amplify them if not properly managed. Their structural vulnerability makes them critical points for system resilience and therefore they should receive particular attention in adaptation strategies.

5. Risks related to natural heritage, agriculture and livestock farming, peace, security and social cohesion, water and urban environments are key in the propagation of impacts. They act as bridges between different parts of the system, facilitating or blocking transmission of impacts.

Overall, these findings highlight the need for a systemic approach to climate risk management, prioritizing those risks with the greatest potential to destabilize the entire system.

2. Changing climate: recent observations and projections[2]

Changes and trends of the main climate variables confirm that our climate is changing, indicating even an accelerating transformation. In short, in the absence of new adaptation policies and measures, the evolution of climate hazards in Spain will continue to exacerbate risks.

The information presented in this section is primarily drawn from the *CLIVAR-SPAIN Report, 2024*, produced by the CLIVAR Spain network in collaboration with national scientific institutions. This is the most up-to-date, rigorous and consensus-based source on Spain's climate. In addition, other sources that have been used include the *Reports on the state of the climate in Spain* (AEMET, 2024) and the *Guide to regionalised climate change scenarios for Spain* (AEMET, 2017).

2.1. Recent observations

Temperatures

According to data collected by AEMET, the **average temperature** in Spain increased by 1.69 °C between 1961 and 2024. Since 1980, the average temperature has increased at a rate of +0.28 °C per decade, with higher increases in Mediterranean areas (Clivar-Spain, 2024).

One of the most obvious consequences of climate change has been the **increase in warm days and decrease in cold days**. In the decade between 2015 and 2024, 209 records of warm days were documented (AEMET, 2024).

In mainland Spain and in Ceuta, Melilla and the Balearic Islands, an increase of 0.20 °C/decade for **maximum temperatures** and 0.21 °C/decade for **minimum temperatures** was estimated for the period 1961-2018. Temperature increases have not been spread evenly throughout the year, but have been concentrated in certain months, in particular March and December, as well as June and July to a lesser extent, for the maximum temperature; and August and October for the minimum temperature (Clivar-Spain, 2024).

[2] Figures 1, 2 and 3 are taken from the national adaptation plan indicator programme (to be published).

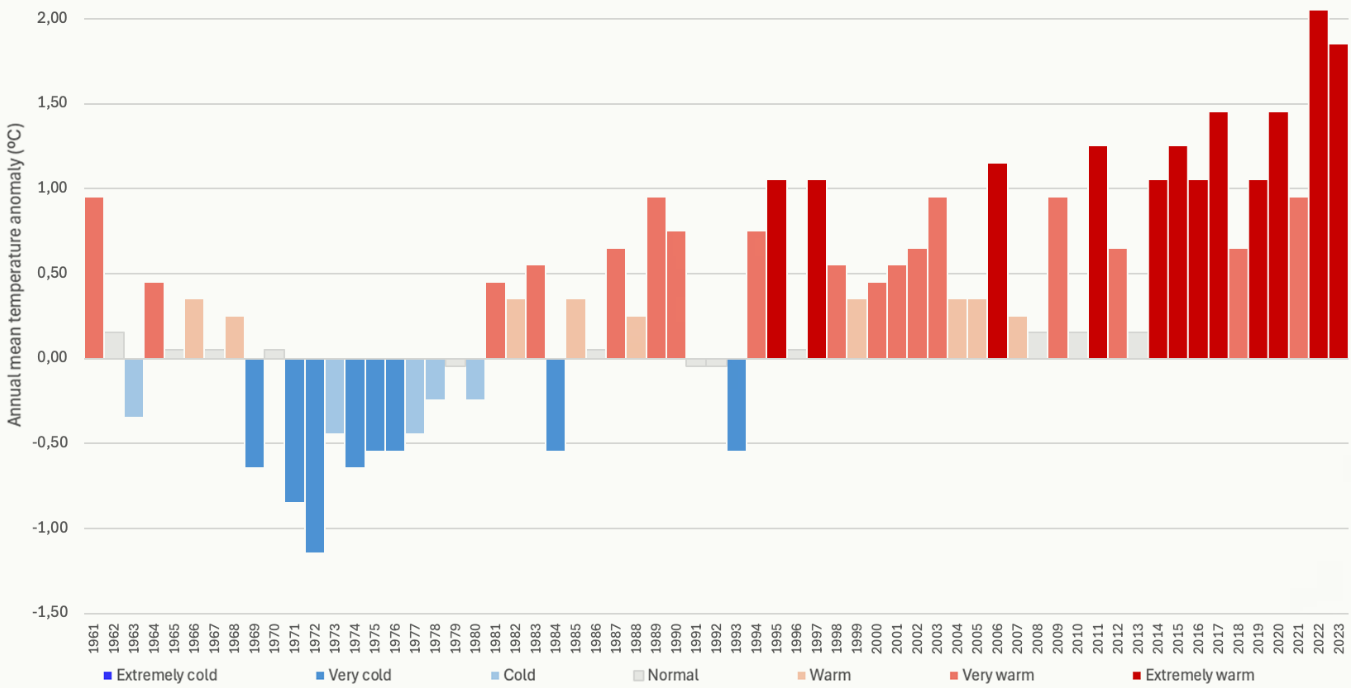

Figure 2. Evolution of annual mean temperature in Spain since 1961 (annual mean temperature anomaly compared to the period 1961-1990). Source: Spanish Climate Change Office (OECC) using data from the State Meteorological Agency (AEMET).

Heatwaves

Since the 1950s, heatwaves tend to be more frequent (+0.3 events/decade), intense (+0.1°C /decade), longer (+0.9 days/decade for the maximum annual duration) and covering a wider geographical area (+1.3% of the Iberian Peninsula/decade) during the period 1951-2019. However, analysis of more recent periods reveals sharper increases in the number of heatwaves, reaching a trend of +1.0 to +2.6 events per decade during the period 1979–2017 (CLIVAR-Spain, 2024).

In addition, the onset of the heatwave season has been brought forward (4 days/decade), resulting in a longer warm season. In terms of spatial impacts, the highest frequency occurs in the central region of the Iberian Peninsula, while the northern and south-eastern Mediterranean regions experience the greatest intensity, and the southern and north-eastern regions of the Peninsula endure the longest duration (Clivar-Spain, 2024).

Annual precipitation and extreme precipitation events

Although **annual precipitation** shows no clear trend, there is consensus on a decline in March and June and a slight increase in October. At the same time, the intensity of **extreme precipitation events** has increased, especially in the eastern region of the peninsula, with the Mediterranean area being the most sensitive, with an increase in extreme torrential rainfall events (≥ 200 mm/day), both in magnitude and frequency. Extreme precipitation trends are not clear for the whole territory or time period, but there is an increase in convective events, leading to a rise in heavy precipitation events, especially in late autumn, probably related to a warmer Mediterranean Sea (Clivar-Spain, 2024).

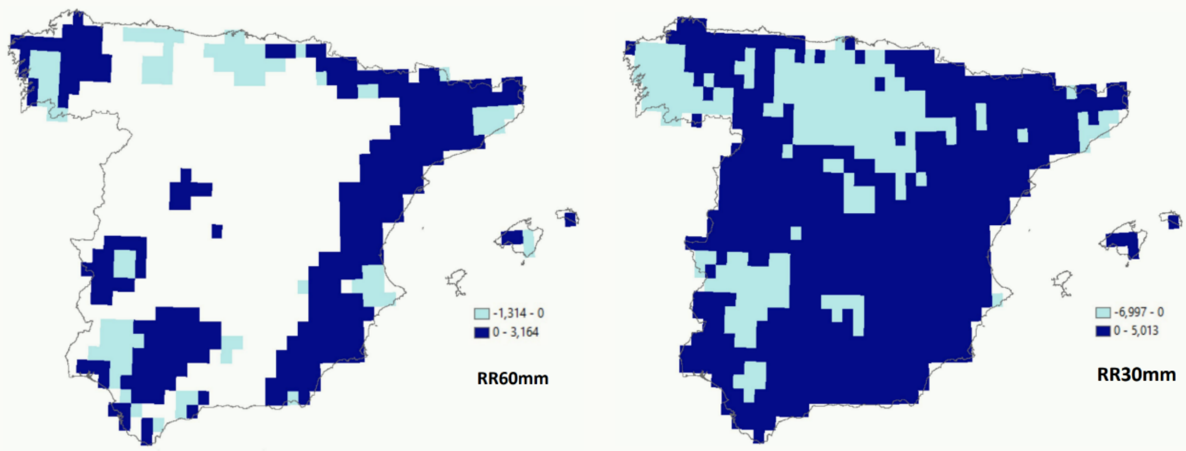

Figure 3. Evolution of extreme rainfall (>30 mm/day) and torrential rainfall (>60 mm/day) in the period 1971-2022. Areas in dark blue show an increase in the occurrence of torrential rainfall, while areas in light blue show a decrease. No rainfall exceeding 60 mm/day is recorded in the blank areas. Source: UPM (2024).

Meteorological droughts

The 21st century has experienced the highest frequency of severe droughts in the last 150 years. While precipitation amounts have been around average values, higher temperatures led to higher atmospheric evaporative demand, resulting in longer and more intense droughts (Clivar-Spain, 2024).

Expansion of arid climates

Since the 1950s, arid climates have expanded at the expense of temperate ones. A recent study by AEMET estimated that the area with arid climates, according to the Köppen classification, in peninsular Spain was 10.4% (period 1951–1980) and has expanded to 21.6% in the period 1990-2020[3] (see Figure 4).

The estimated expansion of arid climates in Spanish territory is about 1,517 km²/year, while temperate and cold climates have receded at a rate of 1,392 km²/year and 125 km²/year, respectively.

Arid climate is spreading rapidly across mainland Spain: in the last decade, Almería has seen an increase of 3,025 km² of arid land (a third of its total surface area), while Murcia another 2,983 km² over the same period.

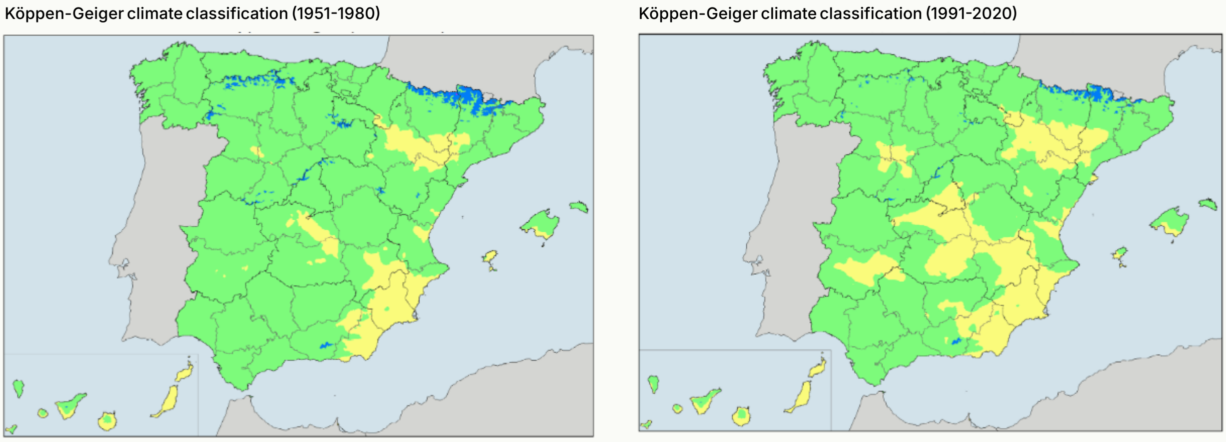

Figure 4. Map of climates in Spain in the period 1951-1980 (left) and 1991-2020 (right); the expansion of arid climates (yellow) and the contraction of cold climates (blue) can be clearly seen. Source: AEMET.

[3] Chazarra, A, *et al.* (2022). *Evolución de los climas de Köppen en España en el periodo 1951-2020* [Evolution of Köppen climates in Spain over the period 1951–2020]. Nota técnica 37 de AEMET. https://www.aemet.es/documentos/es/conocermas/recursos_en_linea/publicaciones_y_estudios/publicaciones/NT_37_AEMET/NT_37_AEMET.pdf

Rising sea temperatures in the Mediterranean

Since the early 1980s, the warming observed in the Mediterranean Sea has been two to three times greater than that observed in the rest of the world's oceans and has been accompanied by increased heatwave frequency, intensity and duration as well as rising salinity of surface waters. This process of warming and salinisation has affected the entire water column. (Clivar-Spain, 2024).

Upwelling regions along the western and northern coasts of the Iberian Peninsula and the upwelling system of the Canary Islands appear to be a "refuge" from global warming and, depending on the area, even show cooling trends. (Clivar-Spain, 2024).

Sea-level rise

The combined effect of melting of polar ice sheets and thermal expansion of the oceans, due to increased sea temperature, continues to drive mean sea-level rise, intensifying coastal erosion and beach retreat.

Cryosphere

Since 1980, Pyrenean glaciers have lost more than 60% of their surface area, and many of them are close to disappearing. This retreat is due to sustained increase in temperatures and a reduction in winter snow accumulation. High-mountain permafrost, especially in the central Pyrenees, is also showing clear signs of degradation, while in Sierra Nevada it is already considered functionally non-existent.

A significant decrease in snow cover duration, with losses of between 1 and 2 days per decade, is affecting mountain ecosystems, recreational activities and water management. Ice caves, valuable natural archives of past climate, are losing thickness at a rate of 30–40 cm per year. Overall, it is estimated that the minimum altitude for the persistence of cold processes has risen by between 100 and 150 metres since 1990, further restricting the spatial distribution of these processes.

Table 2. Main observed trends of climate variables identified in the sectoral assessment

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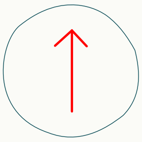
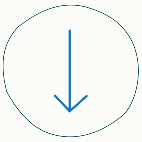
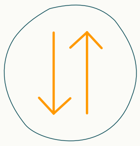
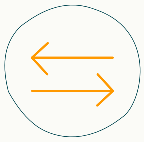
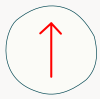
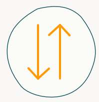
					
Sustained growth	Sustained decrease	Strong increase	Rapid decrease	No clear trend	Mixed: significant regional variability

	Climate variable	Observed period	Indicator used	Trend
ATMOSPHERE	Annual mean temperature	1961-2024	Annual mean	
	Maximum and minimum temperatures	1961-2018	Annual mean, annual maximum and minimum	
	Warm days	2015-2024	Number of days	
	Cold days	2015-2024	Number of days	
	Heat waves	1951-2019 1979-2017	Frequency, intensity, duration and extent	
	Frost days	1975-2018	Events/year	
	Annual mean precipitation	1951-2021	Annual mean	
	Extreme precipitation	1951-2021	Rx1day (max. daily) ≥200 mm/day	
	Hail	1980-2020	Intensity	

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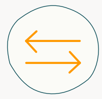
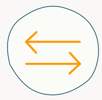
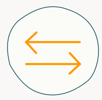
	Climate variable	Observed period	Indicator used	Trend
ATMOSPHERE	Snow	1960-2020	Duration and accumulation of snow cover	
	Meteorological droughts	1980-2020	SPEI	
	Surface wind speed	1961-2010	Annual mean speed	
OCEAN	Sea surface temperature	1940-2024	Annual mean temperature	
	Marine heatwaves	Recent decades	Frequency, duration, spatial extent	
	Mean sea-level	1993-2023	Annual increase	
	Storm surge	1948-2024	Point value	
	Subsidence	1990-2020	Annual mean	
	Waves	1948-2024	Significant height, peak period, predominant direction	
	Ocean pH (acidification)	1995-2024	pH variation	
	Dissolved oxygen	1990-2024	Concentration variation	
	Thermal and saline stratification	Recent decades	Surface-bottom temperature difference	

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	Climate variable	Observed period	Indicator used	Trend
CRYOSPHERE	Glaciers (Pyrenees)	1980-2020	Glacier surface area and thickness	↓
	Permafrost	Ongoing	Presence and ground temperature	↓
	Snow cover	1970-2020	Snow-cover duration and accumulation	↘
	Ice caves	1980-2020	Ice thickness and volume	↓
	Altitude of cold processes	1980-2020	Minimum altitude of persistent snow / frozen ground	↗

2.2. Future climate

2.2.1. Atmospheric projections

Temperatures

Maximum and minimum temperatures show a clear progressive increase throughout the 21st century, stronger in summer and under the highest-emissions scenario. Summer and autumn maximum and minimum temperatures show a more intense increase than those in winter and spring, with warming greater in inland and eastern areas than in northern areas.

All temperature variables are projected to increase under the SSP5-8.5 scenario[4], mainly in summer, with increases of 2-3 °C by mid-century and 5-6 °C by the end of the century (Clivar-Spain, 2024).

[4] To understand the concept of scenarios, see the project glossary.

Heatwaves

Regarding the duration of **heatwaves**, there is agreement among all projections and regionalisation techniques that heatwaves will last longer, with the greatest increase occurring under the highest-emissions scenario (RCP8.5) and at the end of the 21st century. On average, the duration of the longest heatwave would be 15 to 50 days longer than its average in the reference period for mainland Spain. The magnitude of the change in this index differs from one autonomous region to another, with smaller changes in Galicia, the regions along the Cantabrian coast and La Rioja, and larger changes in Murcia, the Balearic Islands and above all in the Canary Islands (Guide to Regionalised Scenarios. AEMET, 2017).

Annual precipitation and extreme precipitation events

For mainland Spain, slight decreases of **precipitation** are projected throughout the second half of the century, although the estimates vary widely. A reduction in average precipitation in mainland Spain is expected in the last twenty years of the 21st century, with values relative to the reference period (1961-1990) ranging between 16% and 4%. In spring this reduction would range between 24% and 0%, while in autumn the range would go from -4% to 4% (Guide to Regionalised Scenarios. AEMET, 2017).

As for **intense precipitation**, systems of isolated precipitation that generate extreme events are expected to become larger and more intense as temperature increases. For the Iberian Peninsula, the largest precipitation systems are expected to increase in number, intensity and size, while medium-sized systems would decrease in number (CLIVAR-Spain, 2024).

Expansion of arid climates

Alongside rising temperatures and decreasing precipitation, water scarcity will worsen in areas that are already dry. A trend towards more arid climates is projected over the Iberian Peninsula and southern Europe. A marked reduction in **relative humidity** is foreseen across the Iberian Peninsula in all seasons and under all climate scenarios, but especially in summer, mainly due to increased ocean evaporation. A projected reduction in precipitation in the south of the Iberian Peninsula, combined with a greater increase in atmospheric evaporative demand, may lead to reduced surface evapotranspiration and increased **aridity**. Changes in **drought conditions** are also expected to increase in both frequency and severity, with results from global and regional studies being consistent (Clivar-Spain, 2024).

Forest-fire danger

Changes in rainfall patterns (greater irregularity) and rising temperatures create **favourable conditions for forest fires** to become more virulent and extensive, given the increased difficulty in extinguishing them due to a larger volume of fuel exposed to increasingly prolonged drought periods. Climate projections point to an increase in fire-danger conditions, with fires becoming more frequent (heat-induced fire frequency is projected to increase by 14% by the end of the century (2071–2100) under scenario RCP4.5, and by 30% under RCP8.5 in the Mediterranean basin), with more extreme events and longer danger seasons (expected to extend into June and, to a lesser extent, September). The Mediterranean region is particularly vulnerable to meteorological fires, and this vulnerability will increase in the near future, especially under the high-emissions scenario (RCP8.5). Overall, an increase in the Fire Weather Index (FWI) is expected in central and eastern parts of the Iberian Peninsula, along with a lengthening of the fire season (CLIVAR-Spain, 2024).

2.2.2. Ocean projections

Under high-emission scenarios (such as SSP5-8.5), substantial changes are projected throughout the 21st century in sea surface temperature, mean sea level, acidity, dissolved oxygen concentration, and ocean circulation.

- **Sea-level:** An average rise of between 50 and 60 cm is projected by 2100, with increases being greater in the Atlantic than in the Mediterranean. This rise is the result of thermal expansion of water, melting of glaciers and ice sheets, and regional variations due to currents and mass redistribution.

- **Sea Surface Temperature (SST):** The Mediterranean Sea is warming faster than the Atlantic. By 2100, an increase of up to 3 °C is expected in the Mediterranean and 2 °C in the Atlantic, with consequences for biodiversity and the intensity of extreme marine events.

- **Acidification:** The decrease in ocean pH could reach −0.3 to −0.4 units by 2100, particularly affecting calcifying organisms such as molluscs, corals and plankton.

- **Dissolved oxygen:** Oxygen loss affects marine productivity. A reduction of 2% to 4% is estimated, especially in the Atlantic and the Cantabrian Sea.

- **Ocean circulation (AMOC):** The Atlantic Meridional Overturning Circulation (AMOC), which regulates the European climate, could weaken by up to 25%, affecting the rainfall pattern in the western peninsular regions, sea-level in the Atlantic and marine biological connectivity.

2.2.3. Cryosphere projections

Climate projections concur that the cryosphere in Spain will continue to undergo a marked retreat throughout the 21st century, driven by rising temperatures and changes in precipitation patterns. Glaciers, seasonal snow, high-mountain permafrost and altitude-dependent processes all show high sensitivity to the projected warming, with accelerated losses under the higher-emissions scenarios.

Snow in the Pyrenees:

- A **significant reduction** in snow duration and thickness is expected.
- Under scenario **RCP4.5** (moderate emissions), snow cover could decrease by between **25% and 40%** by mid-century.
- Under scenario **RCP8.5** (high emissions), losses would reach **50% to 70%** at mid altitudes.
- Towards the end of the century, the snow season would shorten by **1 to 2 months**, affecting spring and autumn in particular, with implications for water-resource availability.

Pyrenean glaciers:

- Under **RCP8.5**, they could **almost completely disappear before 2050** (with losses exceeding 95% of their current surface area).
- Under **RCP4.5**, only small relict glaciers would remain at very high elevations (>3,000 m).

High mountain permafrost:

- In pronounced retreat, especially in the central Pyrenees.
- Under **RCP8.5**, **its near-total disappearance** is projected before **2050**.
- Under scenario **RCP2.6** (the most optimistic), it could persist in residual and discontinuous form.

Altitude of snow:

- **A progressive upward shift** is expected, exceeding **300 m per century** under high-emissions scenarios.
- This would lead to more irregular and less persistent snowfall in low- and mid-mountain areas.

3. An integrated approach to climate-risk analysis

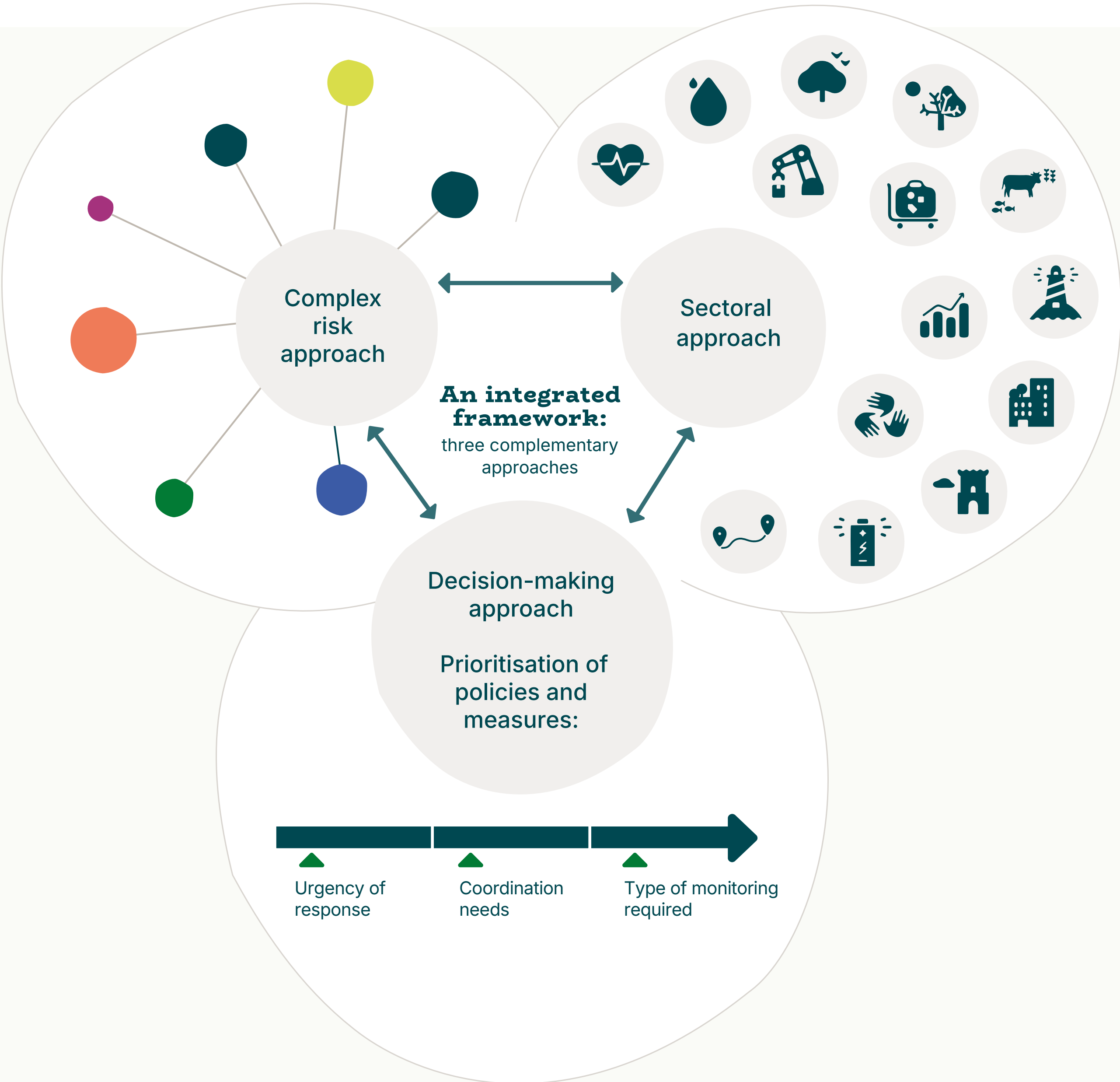

Figure 5. General project framework. Source: prepared by authors.

ERICC-2025 introduces an integrated framework for climate-risk analysis that combines **three complementary approaches**. An overview of these approaches is provided below.

Sectoral Approach

The analysis begins with a sector-based perspective, assessing climate risks across 14 areas defined by the National Climate Change Adaptation Plan (PNACC), including health, water resources, energy, biodiversity, and agriculture, among others (see full list in **Table 1**).

This approach enables the identification and characterization of key impacts and risks within each sector. However, it has limitations in capturing cross-sector interactions and systemic effects, which are addressed through a complementary approach.

For each sector, the main climate-related risks have been evaluated under different scenarios and time horizons.

Systemic Approach: Analysis of Risk Interactions

A major methodological advance of ERICC is the integration of **complex risk analysis**. Climate risks do not occur in isolation; they are deeply interconnected. A purely sector-based approach limits the understanding of these interactions and hinders the identification of cascading effects across sectors. This systemic perspective is consistent with growing scientific evidence and international frameworks such as those of the IPCC.

The analysis of complex risks builds on the **51 key risks** previously identified across the 14 sectors. These risks arise from interactions among multiple factors and sectors and can be amplified through cascading effects or feedback loops. This approach provides critical insight into the connections between risks, supporting more coherent, integrated, and cross-sectoral planning.

Strategic Approach: Guidance for Decision-Making

The third approach is aimed at facilitating the formulation of adaptation policies and measures. It is based on three pillars:

- **Urgency Assessment:** Determining the need for action based on estimated damage severity, imminence of impacts, and recovery capacity once impacts occur.
- **Confidence Evaluation:** Assessing the reliability of impact severity estimates and identifying monitoring requirements.
- **Risk Interactions:** Considering interdependencies revealed by complex risk analysis and addressing the need for coordinated management.

All together, these three approaches offer a more comprehensive and practical perspective for shaping public policy and advancing climate action in Spain.

4. Methodology applied

This project has developed a dedicated methodology, structured into a sequence of steps designed to systematically identify and analyse climate risks across 14 key sectoral domains, while also examining the interconnections among them.

One of the main objectives of this methodological proposal is to ensure a scalable, traceable, transparent and replicable approach, facilitating its adaptation to different territorial levels and sectoral contexts, and application in future analyses.

The main stages of the methodology are outlined below (see Figure 6):

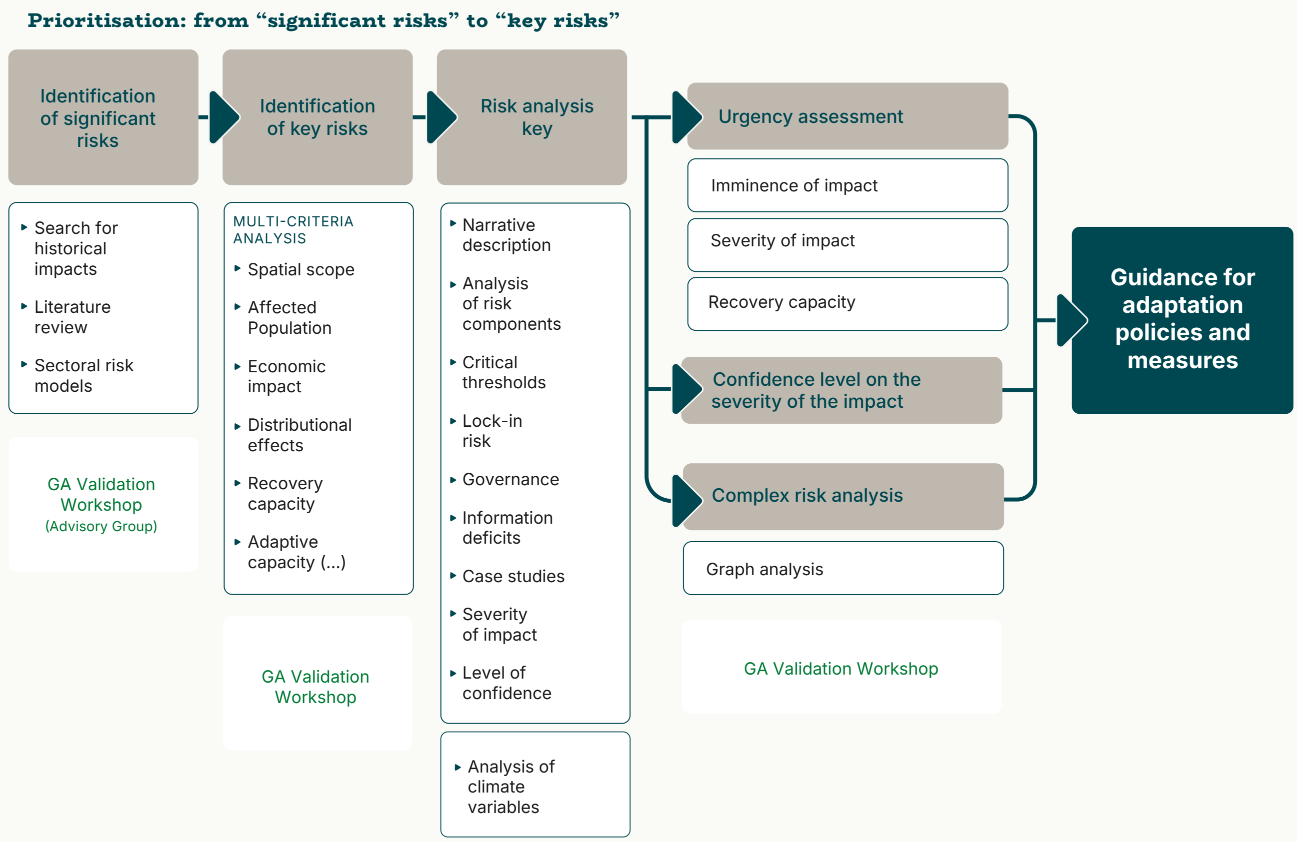

Figure 6. Summary of the methodology followed. Source: prepared by authors.

Identification of relevant risks (RR)

The first phase of the assessment involved an extensive literature review, which identified a total of **141 Relevant climate-related Risks** (RR) in Spain. Key sources included the "Report on Impacts and Risks of Climate Change in Spain" (MITECO 2021) and the European Climate Risk Assessment (EUCRA, 2024).

Identification of key risks (KR)

Next, a **Multi-Criteria Analysis (MCA)** was applied to identify and select **51 Key Risks** (KR). This selection was based on nine criteria designed to assess the significance and complexity of each risk: (1) spatial extent , (2) the potentially affected population, (3) the associated economic impact or burden, (4) the temporal characteristics , (5) presence of severe negative distributional effects, (6) potential to trigger cascading impacts, (7) likelihood of exceeding critical thresholds, (8) resilience to the risk, and (9) capacity to adapt or reduce the risk.

Key Risk Analysis

For each key risk, the three core components of climate risk —hazard, exposure and vulnerability— were analysed in detail.

Figure 7 illustrates an example in the Tourism sector, where the visitor numbers or average length of stay might be affected due to comfort thresholds being exceeded. The diagram highlights:

- **Climate hazards** (top).
- **Exposure factors** (left).
- **Vulnerability factors** (right).
- **Associated impacts and potential cascading risks** (bottom).

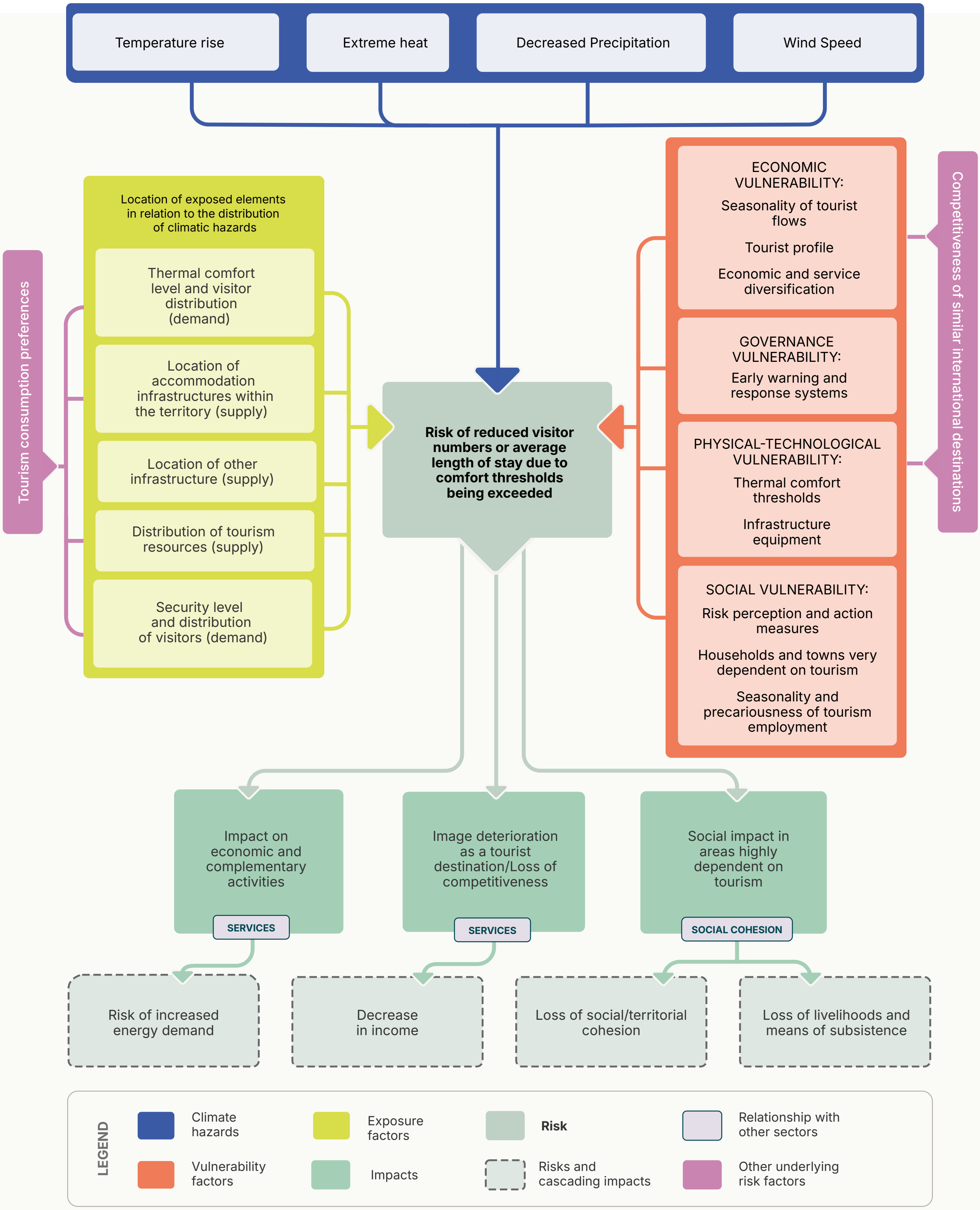

Figure 7. Example of an impact chain and component analysis for the "Risk of reduced visitor numbers or the average length of stay due to comfort thresholds being exceeded". Source: Tourism chapter.

Guidance on priorities

To ensure the process supports the design of adaptation policies and measures, a methodology structured around three core pillars has been developed, as illustrated in **Figure 8**:

1. **Urgency assessment:** The urgency to address each risk is assessed, considering the severity of the expected impact, the imminence or temporal proximity of the risk — and the capacity to recover once impact occurs (**Annex 2**).
2. **Confidence evaluation:** The level of certainty about the risks' potential effects is assessed. The lower the confidence in the analysis, the greater the need for detailed **monitoring and assessment**.
3. **Risks interactions:** Interdependencies among risks were examined through a complex risk analysis, guiding management strategies that address these interactions.

When a risk meets any of these three criteria —its urgency is very high; the estimate of its severity carries a low level of confidence; or it is strongly interrelated with other risks— **the measures to address it should be prioritised.** This means that such measures should receive preferential attention in planning and be managed in a coordinated and integrated manner.

Each risk is therefore described in terms of three dimensions that guide general management recommendations (**Annex 3**): urgency of the response; level of confidence in the analysis of the severity of its impacts; and its potential to participate in cascading processes, either triggering or receiving additional risks and impacts.

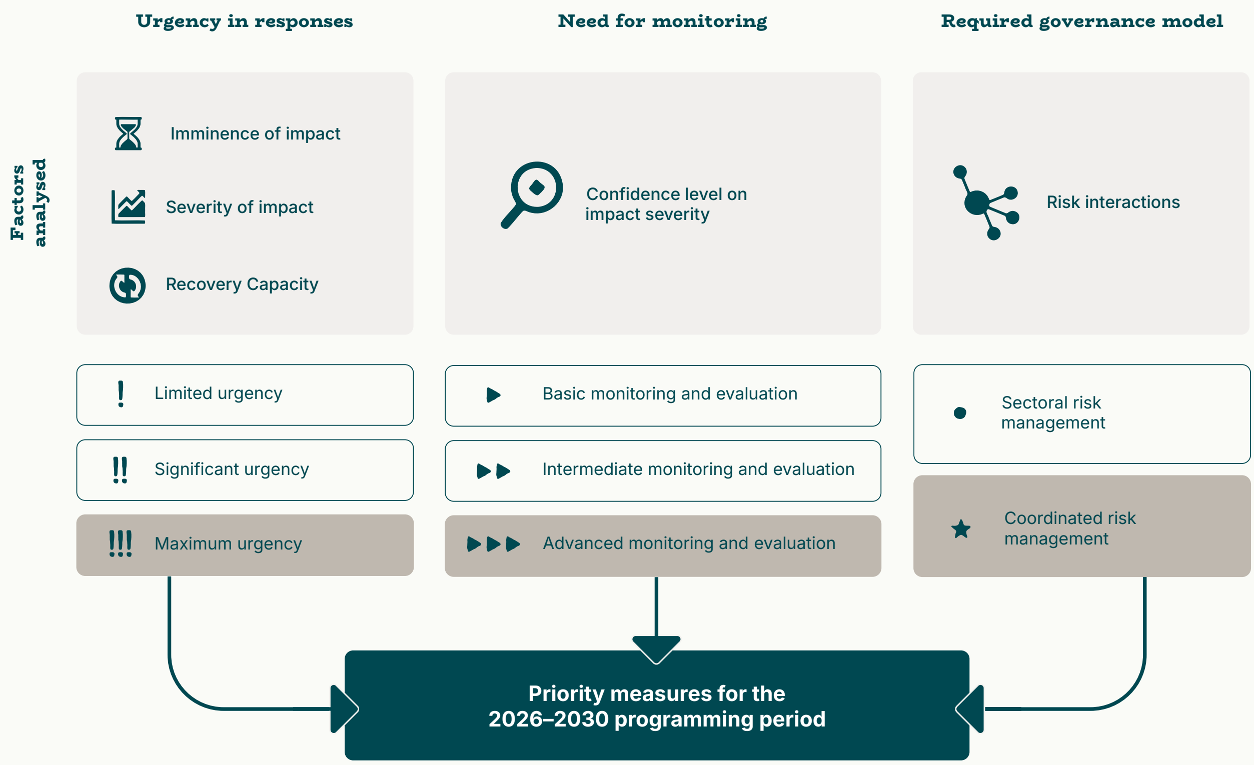

Figure 8. Framework to guide the prioritisation of adaptation measures and policies. Source: prepared by authors.

The entire process has been supported by an advisory group of **23 experts from diverse fields** —including public administration, academia, and the private and third sectors— who validated the main stages, provided feedback on the content and actively contributed to the analysis of complex risks.

5. Urgency assessment: severity, imminence, and recovery capacity

5.1. Level of urgency

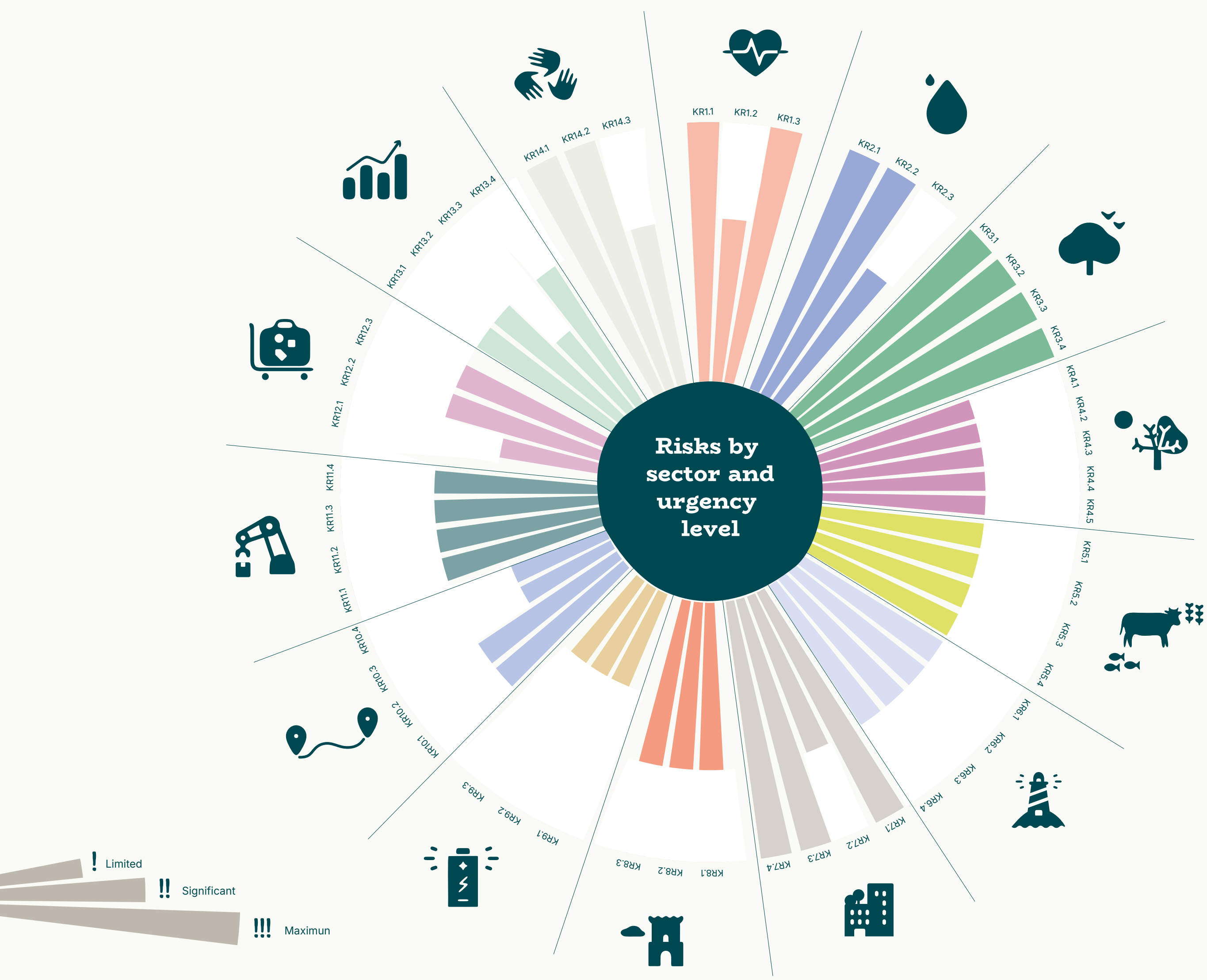

Figure 9. Risks by sector and urgency level. Source: prepared by authors.

The **urgency of each climate risk** was assessed combining three factors analysed in earlier phases of the project, following the established methodology (see **Figure 8**):

1. Severity of the expected impact.
2. Imminence or temporal proximity of the risk.
3. Recovery capacity after the impact.

Based on this combination, each risk was classified into one of the three urgency levels: **limited**, **significant** or **maximum.** This categorization enables the prioritisation of policies and measures to address them.

The aggregated results of the analysis (n=51) are presented below:

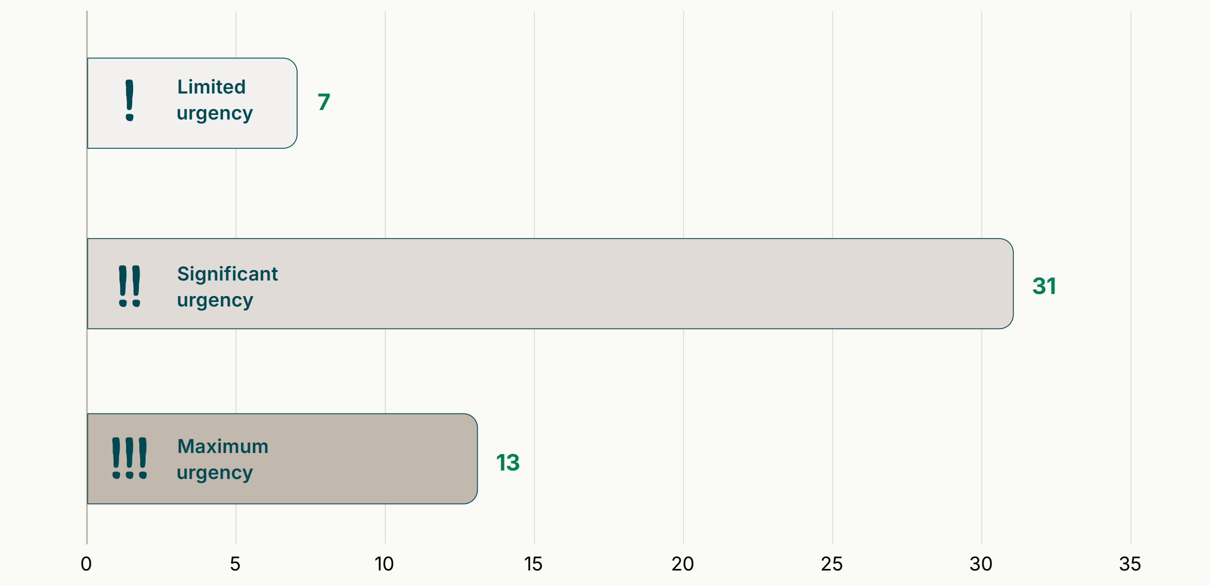

Figure 10. Levels of urgency. Source: prepared by authors.

Maximum urgency: These account for 25.5% of key risks. They involve severe impacts, high imminence and low resilience. They require **immediate responses** and must be prioritised in decision-making.

Significant urgency: Representing 60.8% of key risks, these produce relevant and foreseeable impacts in the short to medium term. They require **planned and timely responses** within a near-term horizon.

Limited urgency: Comprising 13.7% of key risks, these are neither imminent nor severe, or they present a strong capacity for response and recovery. They do not require immediate additional action;

however, measures should be evaluated and scheduled if necessary, and the risks should **remain under observation** to assess their evolution.

The urgency assessment shows that most of the key risks identified (around 86%) require short-term planning and preparation, while the most critical cases demand immediate action.

The analysis highlights a set of 13 risks that require priority attention:

- **Health risks**, such as increased mortality and morbidity linked to the synergistic effect of heat and air pollution.
- **Water cycle risks**, associated with extreme and prolonged droughts and floods caused by changes in precipitation patterns and snowmelt.
- **Biodiversity risks**, related to biodiversity loss and disruption of essential ecological processes (food webs, pollination, reproduction, migration) and the loss or degradation of ecosystem services critical to human well-being.
- **Urban environment risks**, related to reduced comfort and habitability in homes and public spaces due to increased thermal stress from the "urban heat island" effect.
- **Security risks**, associated with severe disruptions to water, energy, or food supplies and damage to critical infrastructure. These risks are particularly relevant because of their **high impact severity** and systemic nature, making them critical nodes in risk management.

5.1.1. Severity of impacts

The severity of impacts was analysed for two-time horizons:

- **Short term** (period 2021-2040, scenario 1.5 °C).
- **Medium term** (period 2024-2060, scenario 2 °C).

As shown in Figure 11, the proportion of high-severity risks is expected to increase over time compared to those of lower severity.

A notable finding is the increase in critical risks between the two scenarios analysed, rising from 17 in the short term to 28 in the medium term, while catastrophic risks double.

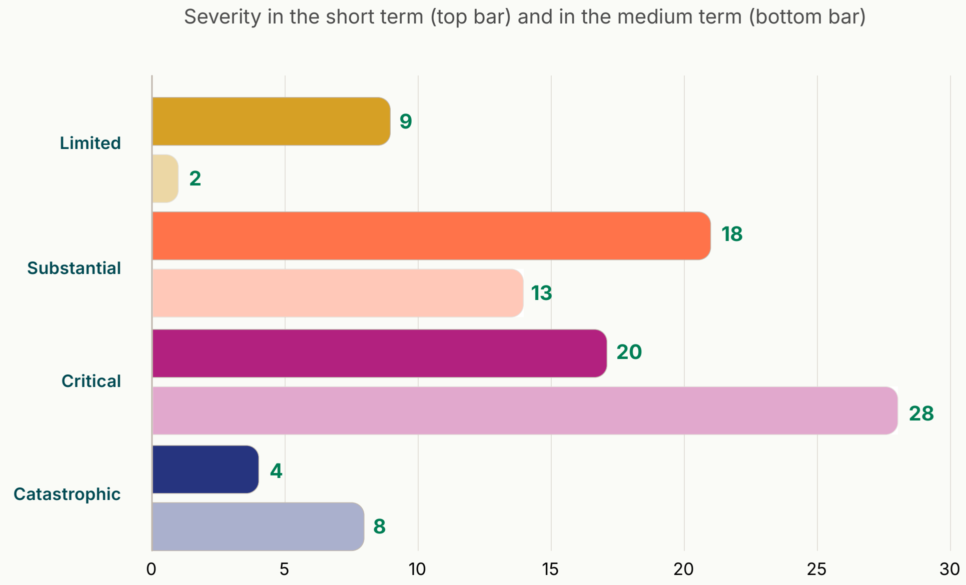

Figure 11. Severity of impacts. Source: prepared by authors.

5.1.2. Imminence of impacts

The temporal proximity or imminence of impacts is another factor in determining the urgency of addressing the risks. It refers to the time estimated from the reference period until the risk materialises in a significant way. The time scales considered are:

- Imminent or short-term impacts: <10 years.
- Near or medium-term impacts: 10-30 years.

Since the risk analysis will be updated every five years, it is reasonable for the urgency assessment to focus on risks likely to materialise in the short and medium term, as these are the most pressing. However, the multi-criteria analysis also considers risks that may materialise in the long term, but require immediate action due to their severity, irreversibility, or the need for early planning.

As shown in Figure 12, impacts of most of the assessed risks are expected to materialise imminently, underscoring he need for a rapid response.

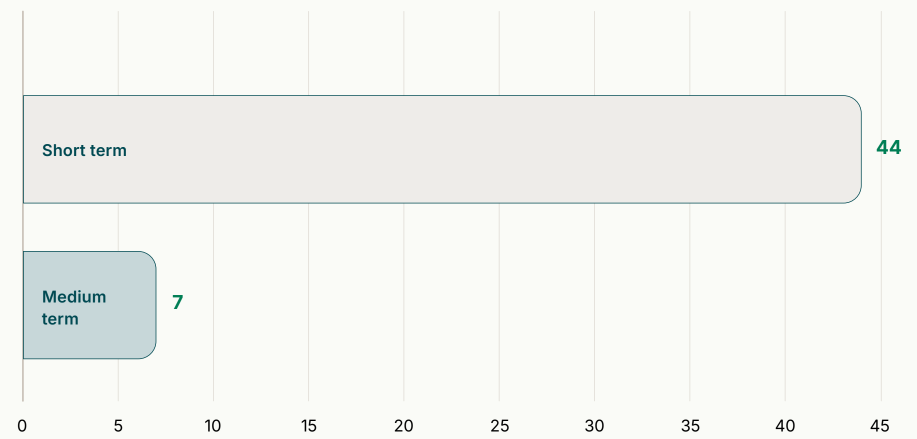

Figure 12. Imminence of impacts. Source: prepared by authors.

5.1.3. Recovery capacity

This concept refers to the difficulty or ease of returning to the pre-impact state.

Climate impacts have been assessed according to their degree of reversibility:

- Irreversible or low-reversibility impacts, or impacts with very slow recovery, where restoration may take decades or prove unfeasible.
- Partially reversible impacts, which can recover with sustained effort and medium- to long-term planning.
- Reversible impacts, where recovery is achievable through relatively quick and low-complexity responses.

Recovery capacity varies based on the **time horizon** and **available resources**, particularly in natural systems, where regeneration processes may be slow or uncertain. Because these characteristics are specific to each risk receptor, **there is no common recovery scale**; instead, recovery must be evaluated according to the ecological, social or economic features of each affected system.

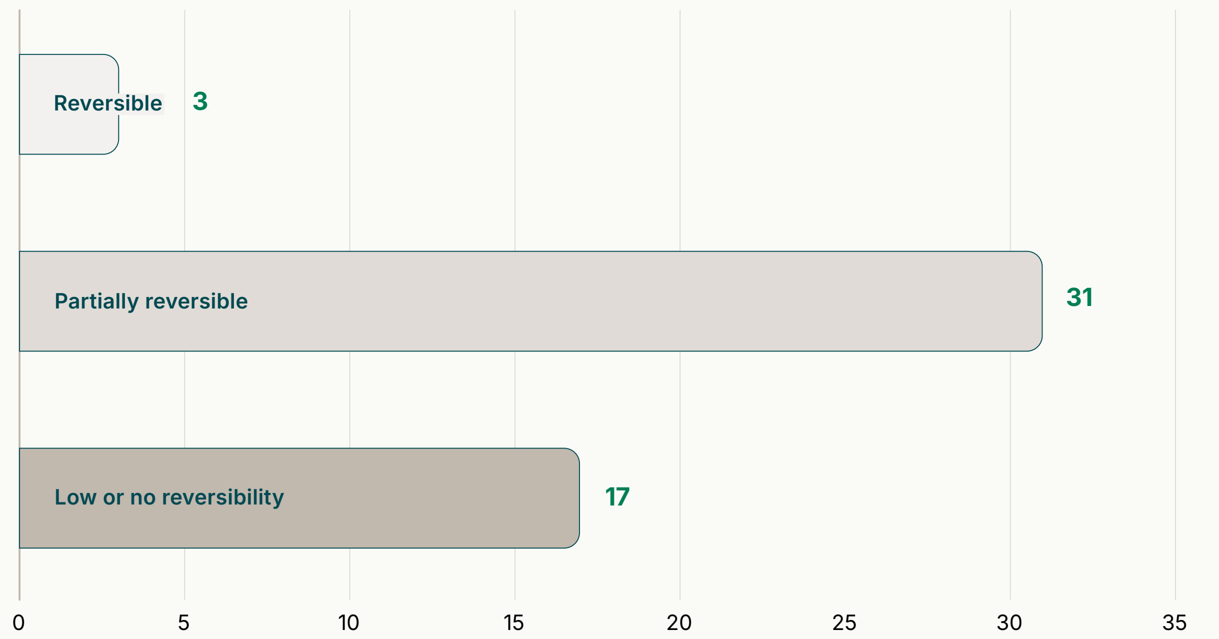

Figure 13. Recovery capacity. Source: prepared by authors.

Below are examples of risks identified as having low recovery capacity or low reversibility, many of which also demand urgent responses:

- Increased **mortality and morbidity** associated to heat, particularly among vulnerable groups, or resulting from the combined effect of air pollution and high temperatures.
- **Damage** caused by extreme, prolonged **droughts** as well as by pluvial and fluvial **floods**.
- **Global biodiversity loss**, population decline and **local extinctions**.
- **Alteration of ecological processes**: disruptions in food webs, pollination, reproduction, and migration; worsening aridity, increased forest fire risk, and **loss or degradation of ecosystem services.**

- **Permanent coastal land loss** due to flooding and erosion associated with rising relative mean sea-level.

- **Displacement or disappearance of marine habitats and species** due to surface warming and ocean acidification.

- **Damage to people, buildings, and infrastructure** (sewerage, drainage, electricity, transport) from extreme **hydrometeorological events**; thermal stress and reduced comfort due to the urban heat-island effect, and degradation of green spaces.

- **Severe supply disruptions** of water, energy or food, and damage to critical infrastructure with systemic consequences.

5.2. Level of confidence and recommended monitoring

A second analysis is based on the **level of confidence** in relation to the analysis of **the severity of impacts**[5], which directly influences the intensity of **recommended monitoring**, classified into three levels:

- Advanced monitoring: 18 risks (35.3%) present a low or very low level of confidence, due to information gaps, high variability, or the complexity of the phenomenon. They require considerable effort in data collection and analysis, as well as continuous and specialised monitoring.

- Intermediate monitoring: 24 risks (47%) show uncertainty regarding aspects such as impact magnitude or exposure. Although some analytical basis exists, complementary studies and more detailed evaluations to improve diagnostic accuracy are needed.

- Basic monitoring: 9 risks (17.6%) have sufficient and validated available information, enabling periodic monitoring with a high level of confidence in the results.

[5] The list of risks is mainly based on already observed impacts. The level of confidence —whether high or low— refers to the quantity and quality of studies analysing the behaviour of these risks over time. The uncertainty does not lie in whether the risk exists —that is already confirmed by the available evidence— but in when its impacts will occur and with what intensity. Although uncertainties remain, the accumulated knowledge on the evolution of climate hazards allows informed conclusions to be drawn on the possible future evolution of risk.

This certainty-based analysis supports the **design of tailored monitoring and evaluation strategies** adjusted to the degree of confidence available, thereby optimising decision-making and resource allocation for climate change adaptation.

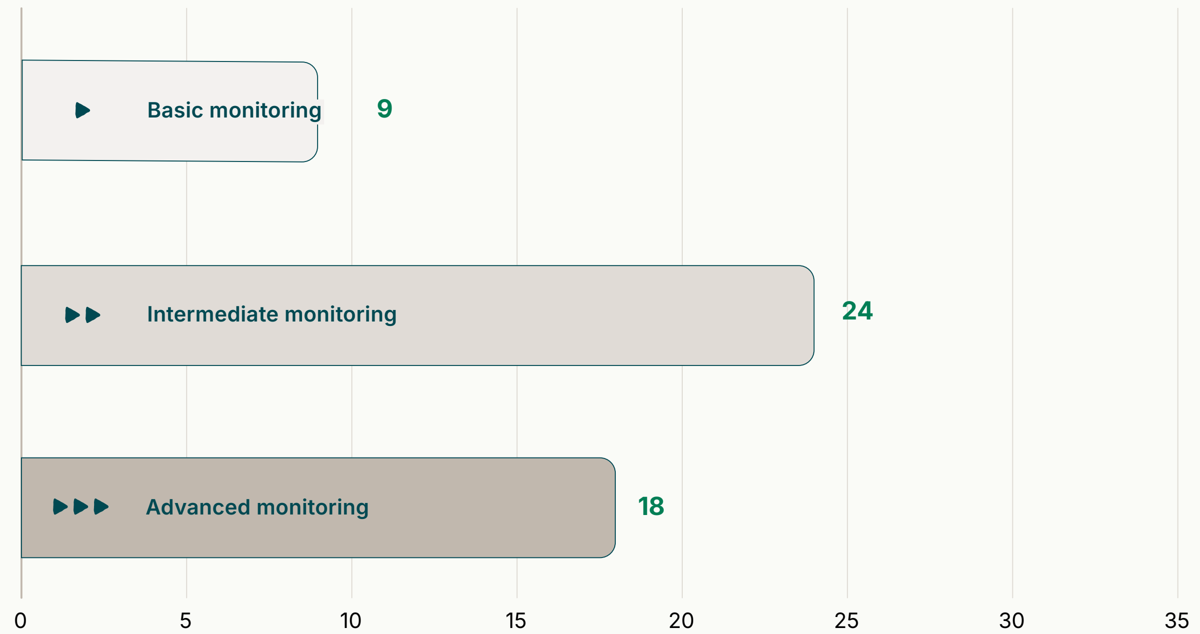

Figure 14. Level of confidence and recommended monitoring. Source: prepared by authors.

5.3. Interactions and risk management modalities

The complex risks assessment has enabled the identification of most appropriate type of **management approach** for each risk, based on its level of interconnection with other areas. This approach avoids an exclusively sectoral perspective, which could obscure cascading effects and amplification dynamics across sectors.

- **Integrated management**: 24 risks (47%) are embedded in a dense network of interactions. They require cross-sectoral governance structures, shared decision-making, and joint planning across sectors. These are systemic risks that require coordinated, inter-institutional responses.

- **Sectoral management**: 27 risks (53%) can be addressed within a single area of public management, without generating relevant effects in other sectors. The recommended measures are sector-specific but should be coordinated with the broader system to prevent inconsistencies.

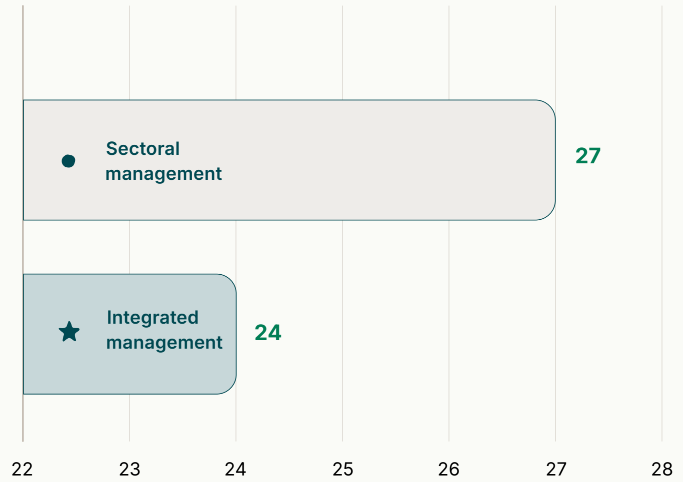

Figure 15. Management approach. Source: prepared by authors.

Furthermore, this analysis enables the **design of governance strategies tailored to the complexity of each risk**, fostering coordination across sectors and levels of decision-making for more effective and resilient management.

As noted earlier, assessing complex risks is a core component of this project and has been developed through a participatory approach. A key strength of the process has been the broad involvement of stakeholders from different fields, bringing multiple perspectives to the discussion. This diversity has been crucial for enriching the analysis and enhancing both the validity and robustness of the results.

To understand the dynamics and significance of each risk within the system, several metrics were calculated to characterise its behaviour and interactions:

- **Out-degree**: identifies risks with the greatest capacity to generate cascading effects on other parts of the system.

- **In-degree**: identifies those risks most vulnerable to external influences.

- **Closeness centrality**: reflects how quickly a risk can be affected by the rest of the system, based on distances within the network of interdependencies.

- **Betweenness**: identifies risks acting as bridging nodes in the propagation of effects, playing a critical role in system connectivity.

Below are some of the most notable conclusions regarding the **in-degree** and **out-degree** of the analysed risks:

Out-degree

Risks with a high out-degree occupy a structural position in the overall risk system, and their management can generate positive multiplier effects.

Risks with a high out-degree are those capable of triggering multiple cascading impacts across economic sectors as well as ecological and social systems. Prioritising their management can substantially reduce systemic exposure:

- **Damages caused by prolonged extreme droughts** stand out for their **potential to trigger more than 26 key risks,** including the loss of ecosystem services and reduced surface-water availability for multiple uses and demands due to declining water resources.

- **Damages caused by pluvial and fluvial flooding** act as **drivers of 18 key risks**, including essential risks affecting people's lives such as the destruction or degradation of livelihoods, severe disruptions in the supply of basic services (particularly water, energy and communications), and damage to critical infrastructure as well as transport infrastructure and mobility.

- **Global biodiversity loss** is a high out-degree risk, reflecting the accumulation of climate change impacts across multiple levels (loss of genetic, species and ecosystem diversity). This risk directly influences 17 key risks, most notably the degradation of ecosystem services.

- **Loss or degradation of ecosystem services** caused by disruptions to ecosystem functioning due to changes in climatic variables acts as a driver of major sectoral impacts. The most significant effects include decreased agricultural productivity, reduced carbon absorption and storage in forest ecosystems, and disruption of essential ecological processes such as pollination.

In-degree

In-degree reflects the extent to which a given risk depends on other risks within the system. Risks with a high in-degree are influenced by multiple drivers and therefore become critical points where impacts accumulate. Identifying them makes it possible to anticipate potential stress or collapse points and is essential for designing effective adaptation and resilience strategies.

Among the risks with the highest in-degree the following are highlighted:

- **Risk of destruction or degradation of livelihoods and means of subsistence.** With an in-degree of 29[6], this risk is highly vulnerable to multiple climate threats, particularly in socially and economically fragile contexts.

- **Risk to security due to severe interruptions in water, energy or food supply and damage to critical infrastructure**. It has an in-degree of 20. This risk, within the sector of peace, security and social cohesion, is highly sensitive to cascading impacts.

- The **risk of severe disruptions in the supply of basic services** (water, energy, communications) **in urban areas**, caused by extreme events such as floods, droughts or extreme temperatures has an in-degree of 14. It also functions as a **transmitter of impacts**, with an out-degree of 13, making it a doubly significant node.

- The **risk of loss or degradation of ecosystem services** caused by disruptions to ecosystem functionality has an in-degree of 17, in addition to a high out-degree of 16, positioning it as a strategic node within the risk network.

- In the financial sector, risks such as **asset price corrections** and **reduced financial activity** due to lower investment and savings in areas highly disrupted by extreme climate events have in-degrees of 22 and 19, respectively Both act as receivers of systemic impacts.

- Sectors such as tourism also appear as major **receivers of climate impacts**, given their dependence on stable environmental conditions and on sensitive infrastructure.

[6] The in-degree and out-degree values indicate the number of relationships identified with other key risks — incoming or outgoing, as applicable —.

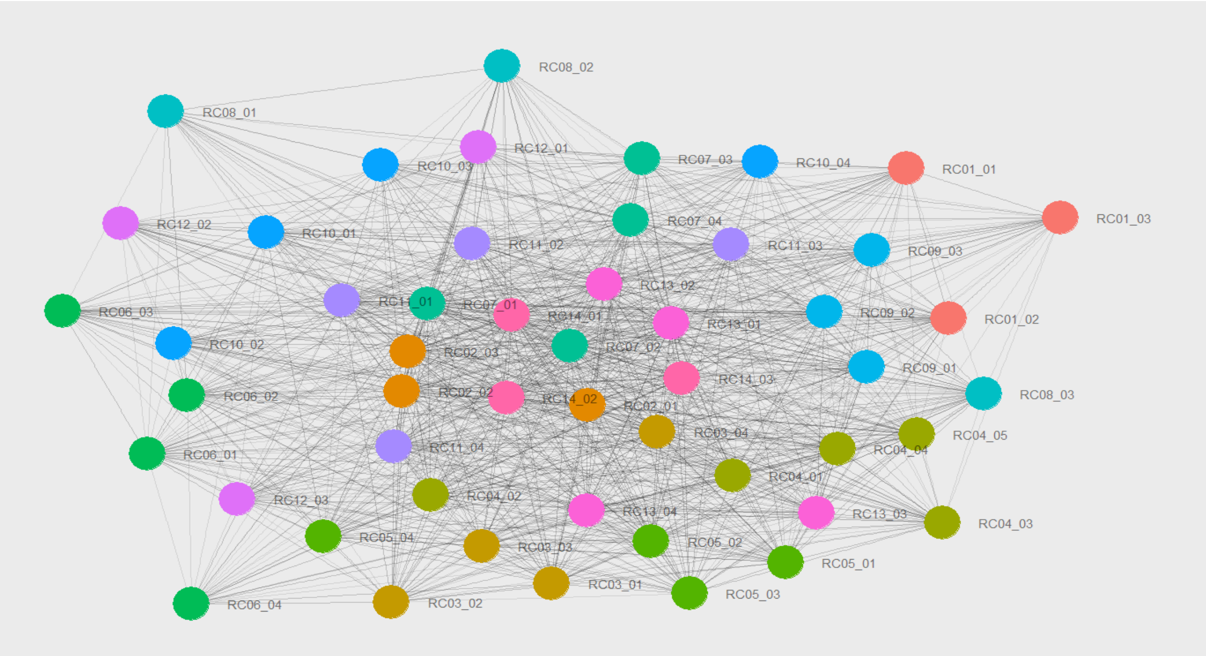

Figure 16. Complex-risk model representing the 1,700 relationships identified by experts. Source: Complex-risks chapter.

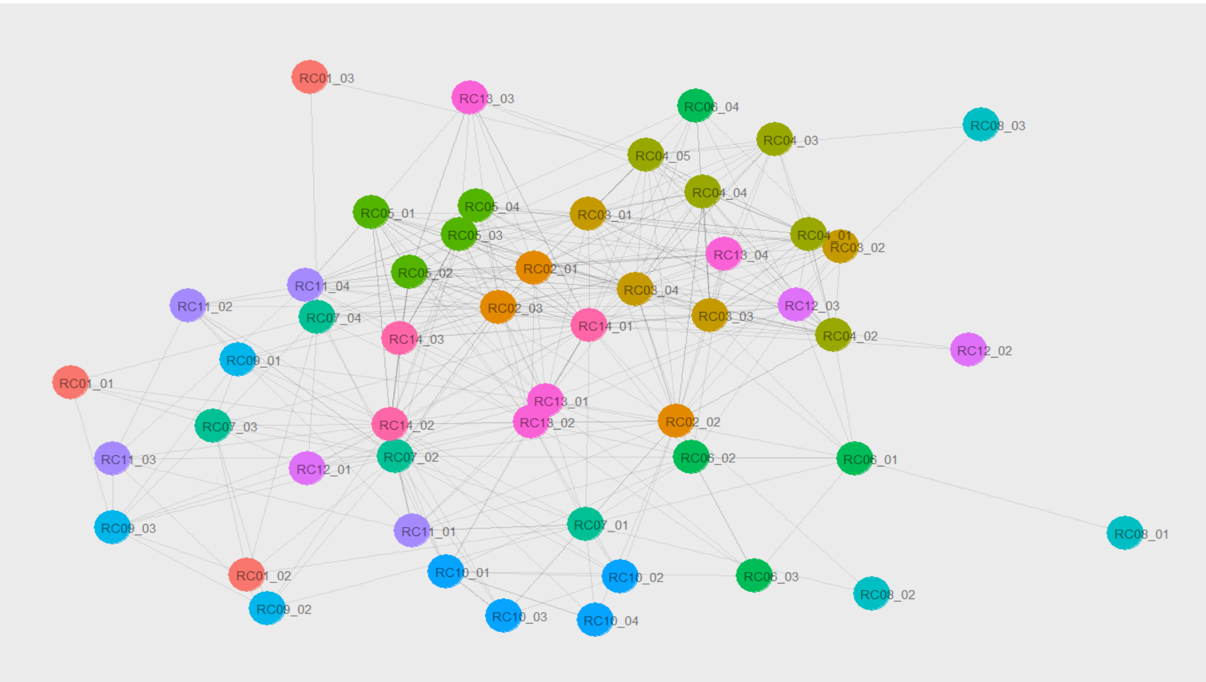

Figure 17. Selected complex-risk model representing the 372 relationships with the highest level of agreement across assessments. Source: Complex risks chapter.

6. Sectoral highlights

Some of the most relevant findings from the analysis are summarized below, providing an overview of the priorities to take into consideration for the 14 sectoral areas assessed:

HUMAN HEALTH	• Climate change impacts on health include **physical harm, the worsening of pre-existing conditions and, in some cases, fatalities** particularly during extreme events such as heatwaves and floods. **Mental health impacts** are also a major concern linked to stress and psychological disorders triggered by extreme weather events and their consequences. • **Extreme heat** stands out as one of the most critical hazards for human health and is the main connecting factor among the key risks identified in this sector. A clear example is heat-related mortality, which, according to MoMo system data[7], exceeded 24,000 people in the period 2015-2024. • The three key risks identified in this area are **closely interrelated**. Their formal separation largely reflects the fact that they are monitored and managed by different public-administration domains (high-temperature prevention, occupational health, air-pollution control). Assessing them separately can obscure their interactions, particularly the combined effects of climate change and air pollution. • These risks **particularly affect** older people (over 65 years old) and individuals with high exposure, such as outdoor workers.
WATER AND WATER RESOURCES	• Risks in this sector are associated with increased **torrential rainfall** and **flood** hazards; reductions in mean precipitation (with major regional differences); more frequent and **prolonged droughts**; and rising mean sea-level in coastal areas. • Significant **flood-related impacts** are already evident, including loss of life, damage to homes and infrastructure, soils and water contamination, crop and livestock loss, impacts on natural and cultural heritage, and severe disruption to transport, energy and telecommunications networks. • Expected impacts are likely to generate **cascading effects** across nearly all economic sectors. • **Prolonged droughts** compromise both water availability and quality, affecting recreational uses, urban supply and agricultural productivity. They also have an impact on hydropower generation, industrial activity and natural heritage. Furthermore, declining soil and vegetation moisture significantly increases the risk of forest fires. • Relevant **underlying factors** exacerbate climate risks in this sector, such as overexploitation and pollution of water resources driven by intensified urban, agricultural and industrial development.

[7] MoMo: The MoMo system estimates heat-attributable mortality based on temperature thresholds above which mortality increases sharply.

NATURAL HERITAGE, BIODIVERSITY AND PROTECTED AREAS

- Spain is among the European countries with the greatest biodiversity, with around 36.2% of its land area and 21.3% of its marine area under some form of protection figure. This natural wealth is **highly exposed** to climate change, which alters biological cycles, shifts species' distribution ranges and transforms ecosystem dynamics. Consequently, the conservation of species, habitats and ecosystems is severely threatened.
- Rising temperatures, shifts in precipitation patterns, increased frequency of heatwaves, and the greater incidence and severity of forest fires are the main climate drivers behind the deterioration and loss of natural heritage.
- **Climate change exacerbates pre-existing pressures** such as resource overexploitation, habitat fragmentation, and the introduction of invasive alien species, increasing ecosystem and species susceptibility and hindering their recovery after impacts.
- **Key risks** —including global biodiversity loss, degradation of ecosystem services, and disruption of ecosystems, species, and essential ecological processes— are not only interrelated but also have a high potential to generate **cascading impacts** on other sectors dependent on natural resources. This interconnection is particularly critical for the risk of **ecosystem service loss**, whose effects may amplify and extend across multiple socioeconomic domains.

FORESTRY, DESERTIFICATION, HUNTING AND INLAND FISHERIES

- Forests cover more than 28 million hectares, accounting for 55.8% of Spain's land area, making them **highly exposed systems**.
- Hazard conditions in forestry are intensifying due to **rising temperatures, declining precipitation and atmospheric humidity**, and the increasing frequency and intensity of extreme events, particularly **heatwaves and droughts**.
- Forest stands are **vulnerable to climate aridification**, which can alter their composition and structure, reduce productivity, and even compromise their persistence.
- Climate change **heightens conditions conducive to forest fires ignition and spread**: extreme temperatures, prolonged droughts, strong winds and the accumulation of highly flammable dry biomass. As a result, both the frequency and duration of high-risk periods increase, as do the areas simultaneously affected.
- Socioeconomic factors such as **forest ownership** — around 70% of forest land is privately owned — **and rural depopulation, influence forest system vulnerability**. Depopulation reduces local management capacity, while the high proportion of private ownership requires specific mechanisms to facilitate the implementation of climate risk reduction measures.
- Desertification in Spain is an escalating risk in the context of climate change. Arid and semi-arid regions with poor soils, severe water stress and pressures such as high wildfire recurrence or intensive agriculture are particularly vulnerable.

AGRICULTURE, LIVESTOCK FARMING, FISHERIES, AQUACULTURE AND FOOD

- Climate change increasingly compromises the **essential ecosystem services** on which the agricultural sector depends -such as soil fertility, pollination, water regulation and natural pest control. These services rely directly on biodiversity within agro-ecosystems; when biodiversity is altered, the capacity of these systems to adapt and respond to climatic disturbances is reduced.
- Among the **main impacts** associated with agriculture and livestock, crop damage or loss due to water stress and extreme weather events such as heatwaves or torrential rains, stand out for their severity.
- Other major risks include reduced livestock production as well as declining fisheries productivity caused by shifts in species distribution driven by changing oceanic conditions.
- Additional risks that warrant close monitoring in future assessments include the **loss of optimal agricultural areas**, the emergence of **new pests and diseases**, **soil degradation and/or loss due to** extreme weather events, and reduced food security resulting from climate impacts on agricultural production and supply chains at both national and international levels.
- The **vulnerability** of the agricultural sector is further amplified by **non-climatic structural factors** such as rural depopulation, the lack of generational renewal, and the declining of extensive farming models in favour of intensive systems.
- Risks associated with agriculture, livestock and fisheries can generate **cascading impacts** on food security, water security and the rural economy.

COASTS AND MARINE ENVIRONMENT

- With nearly 8,000 km of coastline, Spain faces growing threats such as **sea-level rise, intensified storms, and coastal erosion.** Combined with local processes like subsidence, these phenomena are causing cumulative impacts including **coastal land loss, salinisation of aquifers and agricultural soils, and degradation of ecologically valuable coastal habitats**.
- **Critical infrastructure,** -such as certain transport, energy, sewerage or supply networks- often located in coastal areas for functional reasons, may suffer major disruptions due to extreme events.
- **Coastal areas exhibit high social and economic vulnerability:** over 40% of the population live in these zones, many of which are densely urbanised and heavily dependent on coastal and marine ecosystems.
- **Climate impacts on the coast generate cascading effects across multiple sectors:** Coastal flooding and extreme storms affect public health, access to basic services, urban mobility and food security. Additionally, the degradation of marine and coastal ecosystems impacts fisheries, tourism, agriculture and cultural heritage, extending far beyond the coastal system itself.
- **Strengthening green infrastructure** —such as restoring dunes, wetlands and saltmarshes— and implementing nature-based solutions creates synergies with biodiversity, facilitates valuable coastal habitats conservation, and reduces erosion risk and flood damages.
- **Underlying non-climatic factors**, such as urbanisation in coastal zones, further increase communities and economic sector exposure in these areas, leading to increased climate-related risks.

CITY, URBAN PLANNING AND BUILDING

- In Spain, **88% of the population lives in urban areas**, which face different climate hazards depending on their geographic location, including **heatwaves and fluvial, pluvial and coastal flooding.**
- Over the past five decades, material damage from severe urban-flooding episodes has tripled. The increasing frequency and intensity of extreme hydrometeorological events have intensified damage to urban infrastructure, particularly buildings and essential service networks.
- Climate impacts in urban environments generate severe **cascading impacts on people's health and safety** and on economic activity, and disproportionately affect the most vulnerable social groups, exacerbating pre-existing inequalities.
- **Risks in urban environments** from both loss of comfort and habitability in housing and excessive heat in public spaces- are considered of maximum urgency, as their impacts are expected to be very high in the short term.

CULTURAL HERITAGE

- Despite its importance for society, there are **significant knowledge gaps** regarding the impacts of climate change on cultural heritage.
- The territorial distribution of impacts, up-to-date and detailed information on vulnerable heritage, and risk projections under different warming scenarios remain largely unknown These **shortcomings** are particularly critical for intangible heritage.
- The sector is exposed to a wide range of climate hazards **— especially fluvial, pluvial and coastal flooding, as well as fire danger.** Current impacts appear limited; however, the lack of studies and analyses makes it **urgent to advance sector-specific research**.

ENERGY

- Spain´s energy sector is **highly interdependent on water resources (water-energy nexus)**, which heightens its vulnerability to climate change. Reduced water availability affects hydropower production and cooling of thermal and nuclear facilities, while energy is essential for water supply and management.
- **Rising temperatures and more frequent heatwaves** could **substantially increase electricity demand**, particularly for cooling. This effect is more pronounced in urban areas, where high population density multiplies consumption and the urban heat-island effect further intensifies demand.
- Energy transmission, distribution and storage infrastructures face greater stress during peak consumption periods, increasing vulnerability to demand spikes and extreme events. This scenario calls for energy planning geared towards strengthening supply resilience and incorporating adaptation measures.
- Hydroelectric power production is affected by declining water resources, while wind and solar power generation are exposed to variations in wind speed and temperature extremes, affecting the efficiency of the systems. Energy-storage capacity is also compromised by rising temperatures, which reduce battery efficiency.
- Disruptions in the energy sector have **cascading effects across multiple sectors.** Sustained supply disruption can **severely impact** essential services, public health, industry, tourism, security and social cohesion.
- **The energy sector´s strong interconnections make it a strategic node whose vulnerability can amplify cross-sectoral risks.** Evaluating these indirect effects is essential to design adaptation strategies and contingency plans that ensure the energy system continuity and stability under adverse climate scenarios.

MOBILITY AND TRANSPORT

- Spain´s mobility and transport sector includes road, rail, air and maritime modes—**each with its own specific exposure and vulnerability** to climate change. A single phenomenon can generate differentiated impacts.
- **High temperatures** affect road surfaces and safety, while **sea-level rise** or **storm events** compromise ports and navigation. **Extreme hydrometeorological events**, such as floods, can damage essential infrastructure, significantly reduce transport operability and cause service disruptions.
- **Direct damage to infrastructure hampers its functioning**, affects the mobility of people and goods, and compromises system continuity.
- **Interruptions in logistics chains** can trigger cascading effects across strategic sectors —food supply, energy, industry and healthcare.
- Dependence on a complex and globalised logistics system amplifies vulnerability, underscoring the need for contingency planning and diversification of routes and transport modes. Ensuring operational continuity is essential for economic and social stability under climate change scenarios.

INDUSTRY AND SERVICES

- The industrial and services sector in Spain faces a **dual transformation** in the coming decades: on the one hand, the transition towards a low-carbon economy, and on the other, increasing exposure to risks derived from climate change. To ensure its competitiveness and sustainability, the sector must strengthen its resilience to extreme events such as floods, heatwaves, droughts and storms, which are already affecting infrastructures and production processes.
- Between 2017 and 2022, 86.8% of the claims processed by the *Consorcio de Compensación de Seguros* (Spain's Insurance Compensation Consortium) —including industrial facilities, retail premises and offices— were due to floods and atypical cyclonic storms; and accounted for 87.9% of compensation payments.
- A total of 99.8% of Spanish businesses are **SMEs**, — with between 0 and 269 employees — of which 53.6% have no employees and generate less than €2 million a year. While SMEs are known for their flexibility in adapting to new markets, their limited financial resources reduce their adaptation capacity.
- Climate change may significantly alter the **availability and cost of certain raw materials**, directly affecting strategic sectors such as agriculture, food production and tourism. These impacts not only undermine economic stability but may also exacerbate socio-economic inequalities, particularly in the most vulnerable regions and communities.

TOURISM

- **Tourism** is one of Spain's most important economic sectors, contributing over **12% to GDP**, and at the same time one of the most vulnerable to climate change, due to its **strong dependence on exposed natural resources and climatic conditions** that directly influence comfort and destination attractiveness.
- The tourism sector faces multiple climate-related risks that could **significantly affect demand**. Among the most significant potential impacts are reduced visitor numbers due to the deteriorating thermal comfort, loss of attractiveness caused by the degradation or disappearance of natural resources, and declining demand linked to the spread of mosquito-borne infectious diseases — which could reach considerable severity in the long term.
- Tourism is an expanding sector where climate impacts are not yet fully visible, and some risk drivers are expected to intensify in the coming years.
- However, available information for risk assessment is limited, requiring major effort in monitoring and data generation.
- Tourism is a major recipient of cascading impacts from other sectors, which heightens its vulnerability. Loss of destination attractiveness due to the degradation or disappearance of natural resources could trigger knock-on effects across multiple economic sectors.

FINANCIAL SYSTEM AND INSURANCE SECTOR

- The Spanish economy is **particularly sensitive** to the impacts of climate change due to its productive structure, with strong dependence on vulnerable sectors such as tourism, real estate and energy.
- The financial system and the insurance sector can act as **catalysts for climate change adaptation** by identifying investment opportunities and measures that encourage risk prevention. The insurance sector plays a critical role in risk management, as it enables losses to be absorbed, thereby increasing recovery capacity and resilience.
- This sector has numerous interconnections: it **receives impacts** from many others, and disruptions within it generate significant **cascading effects**. For example, the lack of financial resources reduces the response capacity of vulnerable sectors.
- There is a **significant information gap** regarding physical climate-related risks for the financial system and insurance activity in Spain. Moreover, limited disclosure by institutions about their exposure and vulnerability further complicates a comprehensive analysis.
- Relevant risks have been identified across exposed elements, including those affecting operational continuity, assets, savings and investment, credit, liquidity and insurance coverage.

PEACE, SECURITY AND SOCIAL COHESION

- **This is a highly exposed and strategically critical domain in the context of climate change.** Its cross-cutting nature and its interconnection with multiple areas make it particularly complex. It receives impacts from numerous sectors, and, in turn, generates and amplifies many of them.
- Climate change may lead to displacement and conflicts due to unequal impacts worldwide, affecting social cohesion and generating tensions both nationally and internationally.
- Risk analysis in this area faces major limitations, primarily due to its complexity and scarcity of specific information. It is therefore essential to deepen associated understanding as climate impacts in this sector can trigger profound and prolonged social imbalances.

7. Process for drafting ERICC-2025 and Stakeholder engagement

Initial phase

From the outset, ERICC has actively engaged a wide range of stakeholders to ensure an inclusive and representative approach.

During the first quarter of 2023, three meetings were held to help define the scope and methodological framework of the assessment:

1. Workshop with social stakeholders, bringing together representatives from the business sector, trade unions, NGOs, youth and consumer associations.

2. Technical workshop with experts from Spain autonomous regions, organized within the Working Group on Impacts and Adaptation (WGIA), which coordinates climate change adaptation issues at regional level.

3. Seminar with scientific and technical community experts, focused on the contents and methodology of the assessment.

Development phase

Throughout the project, numerous participants have contributed at different stages:

- Each chapter was led and coordinated by one a consortium member, working closely with internal teams from participating organisations.

- External thematic experts, appointed by the consortium, reviewed individual chapters.

- The Spanish Climate Change Office (OECC) set up an expert advisory group of 23 professionals from public administration, academia, the private sector and other fields. This group validated key stages of the process, provided feedback on the contents, and actively participated to the analysis of complex risks.

- More than 50 climate-risk experts contributed to the complex risks analysis.

- The project coordination group has been composed of members of the consortium, the OECC and Fundación Biodiversidad (Biodiversity Foundation).

- Additionally, in October 2024, a dedicated workshop focusing on vulnerable groups[8] was held. The aim was to identify risks that disproportionately affect these populations, analyse specific adaptation measures, address barriers to information access, and share best practices. This exercise helps integrate social and equity criteria into adaptation planning.

[8] The summary report can be accessed at: https://adaptecca.es/sites/default/files/documentos/informe_seminario_pn-acc_seminario_grupos_en_situacion_de_vulnerabilidad_social.pdf

Annex 1. List of Relevant risks (RR) and Key Risks (KR)

Key risks are marked in bold

HUMAN HEALTH		
RR1.1	**Risk of increased mortality and morbidity associated with heat, especially in vulnerable groups.**	KR1.1
RR1.2	Risk of reduced thermal comfort in homes and in public spaces due to rising temperatures.	
RR1.3	**Risk of increased mortality and morbidity among workers from worsening climatic conditions.**	KR1.2
RR1.4	Risk of increased zoonotic/vector-borne diseases transmitted by mosquitoes due to changes in climatic variables.	
RR1.5	Risk of increased duration and severity of allergic diseases such as asthma, rhinitis, allergic conjunctivitis or certain dermatitis due to changes in climatic variables.	
RR1.6	Risk of increased diseases arising from the rise in water or food-borne pathogens due to changes in climatic variables.	
RR1.7	Risk of increased direct and indirect harm to people's health due to extreme meteorological and climatic events.	
RR1.8	Risk of impacts on mental health as a result of extreme meteorological and climatic events.	
RR1.9	Risk of increased pressure on the public health system caused by climate change.	
RR1.10	**Risk of increased morbidity and mortality linked to the synergistic effect of rising air pollution and temperature.**	KR1.3

WATER AND WATER RESOURCES		
RR2.1	**Risk of damage caused by extreme prolonged droughts.**	KR2.1
RR2.2	**Risk of damage from pluvial and fluvial flooding.**	KR2.2
RR2.3	**Risk to different uses and demands due to reduced availability of water resources in sufficient quantity and quality.**	KR2.3
RR2.4	Risk to the safety and functionality of hydraulic infrastructure from extreme meteorological events.	
RR2.5	**Risk to natural heritage and biodiversity resulting from climate change impacts on the water cycle.**	(*)

(*) The analysis of this risk is integrated into several key risks in the area of Natural Heritage, biodiversity and protected areas, including KR3.2, *Risk of population decline and local extinctions in aquatic ecosystems due to alterations in climatic variables (changes in precipitation patterns, water temperature, etc.).* For this reason, it is not analysed independently.

NATURAL HERITAGE, BIODIVERSITY AND PROTECTED AREAS		
RR3.1	**Risk of global biodiversity loss from the accumulation of climate change impacts at all levels.**	KR3.1
RR3.2	Risk of erosion, alteration and loss of unique geological formations due to different climatic threats.	
RR3.3	**Risk of population decline and local extinctions in aquatic ecosystems due to alterations in climatic variables (changes in precipitation patterns, water temperature, etc.).**	KR3.2
RR3.4	Risk of population decline and local extinctions in land ecosystems due to alterations in climatic variables.	
RR3.5	Risk to the stability of marine ecosystems (structure and functioning) and loss of associated species due to increases in marine heatwaves, rising water temperature and ocean acidification.	
RR3.6	**Risk of disruption of essential ecological processes (food webs, pollination, reproductive and migratory patterns) due to phenological changes and other factors caused by alterations in climatic variables.**	KR3.3
RR3.7	**Risk of loss or degradation of ecosystem services due to alterations in ecosystem functionality due to changes in climatic variables.**	KR3.4
RR3.8	Risk of impacts on ecosystem-structuring species due to alterations in climatic variables.	
RR3.9	Risk of habitat loss due to alterations in climatic variables.	
RR3.10	Risk of climate-induced entry and spread of invasive alien species (IAS) in terrestrial, marine and freshwater ecosystems.	
RR3.11	Risk of increases in pests and diseases due to alterations in climatic variables.	

FORESTRY, DESERTIFICATION, HUNTING AND INLAND FISHERIES		
RR4.1	Risk of loss of suitable habitat for forest species and forest biodiversity (genetic and species diversity) as a result of changes in mean and extreme climate values.	
RR4.2	**Risk of alterations in forest composition and structure from average and extreme changes in climate.**	KR4.1
RR4.3	Risk of declining forest health due to increases in pathogenic species and pests favoured by climate change, as well as by greater stress conditions for plant species.	
RR4.4	**Risk of erosion and loss of soil quality in forest ecosystems due to changes in temperature and, particularly, precipitation, especially extreme precipitation.**	KR4.2 (*1)
RR4.5	**Risk of reduced productivity and carbon absorption and storage capacity of forests due to changes in climatic variables.**	KR4.3
RR4.6	Risk of reduced wood and fibre production capacity due to changes in climatic variables.	
RR4.7	Risk of reduced production of non-timber forest products due to changes in climatic variables.	
RR4.8	**Risk of desertification due to worsening aridity conditions from increasing temperatures, frequency and intensity of droughts, more torrential rainfall and increased forest fire risk.**	KR4.4
RR4.9	**Risk of forest stands loss due to increased danger of fire caused by climate change.**	KR4.5
RR4.10	**Risk of ecosystem services loss (regulation of the hydrological cycle, protection against erosion, recreational and conservation values) provided by forests due to changes in climate.**	(*2)
RR4.11	Risk of loss of game resources and inland fishery resources derived from the loss of terrestrial plant productivity and changes in aquatic habitat due to climate change.	

(*1) The analysis of this risk (coded as KR4.6 in the sectoral chapter) is integrated into KR4.4 *Risk of desertification due to worsening aridity conditions from increasing temperatures, frequency and intensity of droughts, more torrential rainfall and increased forest fire risk*. For this reason, it is not analysed independently.

(*2) The analysis of this risk is integrated into *KR3.4 Risk of loss or degradation of ecosystem services due to alterations in ecosystem functionality due to changes in climatic variables*. For this reason, it is not analysed independently.

AGRICULTURE, LIVESTOCK, FISHERIES AND AQUACULTURE AND FOOD		
RR5.1	Risk of declining optimal areas for agricultural crop production due to changes in climatic variables.	
RR5.2	**Risk of crop damage or losses due to water stress, increased dry spells and reduced water availability.**	KR5.1
RR5.3	**Risk of crop damage and/or losses due to extreme weather events.**	KR5.2
RR5.4	Risk of crop damage and/or losses due to the emergence of new pests and diseases.	
RR5.5	Risk of greater variability in agricultural production and less stability in the sector due to climate fluctuations.	
RR5.6	Risk of soil degradation and/or loss resulting from extreme meteorological events.	
RR5.7	Risk of arable land loss due to saltwater intrusion into aquifers and/or due to sea-level rise.	
RR5.8	**Risk of losses in livestock production, animal welfare and even mortality due to rising temperatures, heatwaves and reduced precipitation.**	KR5.3
RR5.9	Risk to livestock due to increased pests, pathogens and changes in vector distribution, including zoonotic vectors, due to rising temperatures.	
RR5.10	Risk to livestock production due to reduced availability and quality of forage and pastures due to droughts and high temperatures.	
RR5.11	**Risk of reduced fisheries productivity due to changes in species distribution or population stocks resulting from changes in ocean-climate variables.**	KR5.4
RR5.12	Risk of reduced food security due to climatic impacts on agricultural production and supply chains at national and international level.	
RR5.13	Risk of food loss due to disruptions along the food chain resulting from extreme weather events.	

COASTS AND MARINE ENVIRONMENT		
RR6.1	**Risk of permanent coastal land loss due to flooding and erosion resulting from relative sea-level rise.**	KR6.1
RR6.2	Risk of salinisation of aquifers or land due to the rise in relative mean sea-level and due to increased intensity and frequency of extreme sea-level and wave events.	
RR6.3	**Risk of direct damage to people, natural assets and economic assets due to flooding caused by increased intensity and frequency of extreme sea-level, wave and wind events.**	KR6.2
RR6.4	**Risk of reduced functionality or operability of protective and port infrastructures due to increased intensity and frequency of extreme sea-level, wave and wind events.**	KR6.3
RR6.5	**Risk of displacement or disappearance of marine habitats and/or species due to rising sea-surface temperature and ocean acidification**	KR6.4
RR6.6	Risk of increased harmful algal blooms or the emergence of invasive species due to rising sea-surface temperature.	
RR6.7	Risk of coastal habitats loss and associated ecosystem services due to the rise in relative mean sea-level.	

CITY, URBAN PLANNING AND BUILDING		
RR7.1	**Risk of damage to people, buildings and urban infrastructure (mainly sewerage, drainage, electricity and transport networks) due to the increased frequency and intensity of extreme hydrometeorological events.**	KR7.1
RR7.2	**Risk of severe disruptions in supply or shortages in basic services, especially water, energy and communications, due to extreme weather events (floods, droughts, extreme temperatures).**	KR7.2
RR7.3	**Risk of reduced comfort and habitability in homes, public facilities, workplaces, etc. due to high temperatures.**	KR7.3
RR7.4	**Risk of thermal stress and reduced thermal comfort in public spaces due to intensification of the urban heat-island effect and/or loss of functionality in urban green areas.**	KR7.4
RR7.5	Risk of wildfires in the urban-forest interface.	

CULTURAL HERITAGE		
RR8.1	**Risk of damage to historic buildings, archaeological sites, underwater heritage and rock art located on the coast due to coastal flooding, storm surges, rising groundwater table and coastal erosion.**	KR8.3
RR8.2	**Risk of damage to subsurface archaeological sites, rock paintings, frescoes, buildings and historic centres due to changes in precipitation, fluvial flooding and changes in material moisture content.**	KR8.1
RR8.3	Risk of loss and alterations of intangible heritage (traditions, festivals, rituals, knowledge, traditional ways of life, techniques and practices) associated with climate change.	
RR8.4	**Risk of damage to ethnographic heritage and cultural landscapes due to fires.**	KR8.2
RR8.5	Risk of damage to cultural property due to degradation of materials caused by increased air temperature and direct sunlight.	
RR8.6	Risk of damage to built heritage due to extreme winds.	
RR8.7	Risk of abandonment and deterioration of tangible heritage associated with traditional practices in cultural landscapes (e.g. agricultural landscapes, terracing, dry-stone walls, irrigation and water-conveyance infrastructure, etc.) due to desertification.	

	ENERGY	
RR9.1	Risk to the environment and to the supply of primary fossil energy due to physical damage to oil and gas infrastructure in coastal areas (midstream and downstream) due to flooding and marine events (storms, cyclonic tempests, sea-level rise, etc.).	
RR9.2	Risk to electricity generation capacity or supply interruptions due to physical damage to energy infrastructure as a result of extreme events.	
RR9.3	Risk of reduced biomass energy production due to available resource declines caused by reduced water supply or increased fire risk.	
RR9.4	**Risk to the capacity and operational flexibility of the electricity system due to decreased hydropower production due to reduced availability of water resources.**	KR9.1
RR9.5	Risk to electricity generation capacity due to reduced wind energy production caused by changes in wind speed.	
RR9.6	Risk to electricity-generation capacity due to reduced photovoltaic production as a result of extreme temperatures, changes in solar radiation and Saharan dust intrusions.	
RR9.7	Risk to thermal power generation capacity due to reduced low-temperature geothermal energy production caused by falling groundwater levels.	
RR9.8	Risk to power generation capacity in thermal power plants due to reduced efficiency of cooling systems caused by decreasing inland water resources, increasing water temperature and/or increasing atmospheric temperature.	
RR9.9	**Risk of reduced efficiency and transmission capacity of transmission and distribution power lines due to increased atmospheric temperature.**	KR9.2
RR9.10	Risk to energy storage due to reduced performance caused by increased atmospheric temperature.	
RR9.11	Risk of reduced green hydrogen production due to reduced availability of water resources.	
RR9.12	**Risk of reduced supply capacity due to rising energy consumption and/or demand peaks due to high temperatures.**	KR9.3

MOBILITY AND TRANSPORT		
RR10.1	**Risk of damage to and reduced operability of port infrastructure due to extreme events.**	KR10.1
RR10.2	Risk of maritime transport trade routes being affected by extreme maritime events.	
RR10.3	Risk of disruption to supply chains due to disruptions in shipping operations caused by extreme events.	
RR10.4	Risk of isolation due to disruption of maritime transport due to extreme maritime events.	
RR10.5	**Risk of damage to road network infrastructure due to extreme events.**	KR10.2
RR10.6	**Risk of road traffic being affected by extreme events.**	KR10.3
RR10.7	Risk of disruption to supply chains due to disruptions in road transport operations caused by extreme events.	
RR10.8	Risk of damage to rail network infrastructure due to extreme events.	
RR10.9	**Risk of rail service disruption due to extreme events.**	KR10.4
RR10.10	Risk of disruption to supply chains due to interruptions in rail transport operations caused by extreme events.	
RR10.11	Risk of increased cooling requirements due to higher temperatures.	
RR10.12	Risk of damage to airport network infrastructure due to extreme events.	
RR10.13	Risk of reduced airport operations due to extreme events.	
RR10.14	Risk of economic losses due to variation in aircraft capacity and runway length for take-off due to increased temperatures.	

INDUSTRY AND SERVICES		
RR11.1	**Risk of damage to industrial and service infrastructures due to extreme events.**	KR11.1
RR11.2	**Risk of reduction and/or interruption of industrial processes operability and services due to reduced water supply.**	RC11.2
RR11.3	Risk of reduced operability and/or interruption of industrial processes due to disruptions or lack of energy supply resulting from changes in climate.	
RR11.4	**Risk of reduction and/or interruption of industrial processes operability and services due to extreme temperatures.**	KR11.3
RR11.5	Risk of increased energy consumption or changes in demand patterns due to rising temperatures.	
RR11.6	Risk of decreased labour productivity due to high temperatures.	
RR11.7	**Risk of reduced raw materials availability and increase in prices, when raw materials depend on climatic conditions.**	KR11.4
RR11.8	Risk of disruption of supply chains due to alterations in transport, logistics and product-distribution operations caused by extreme events.	
RR11.9	Risk of declining sales due to changes in consumption trends as a result of climate change.	

TOURISM		
RR12.1	Risk of reduced visitor numbers or average length of stay during peak season due to extreme events.	
RR12.2	**Risk of reduced visitor numbers or average length of stay due to comfort thresholds being exceeded.**	KR12.1
RR12.3	Risk of reduced tourism due to the comparative improvement of other tourist destinations.	
RR12.4	Risk of disruption of tourist activity due to comfort thresholds for outdoor recreational activities being exceeded.	
RR12.5	**Risk of reduced tourism demand due to the proliferation of mosquito-borne infectious diseases.**	KR12.2
RR12.6	**Risk of reduced tourist appeal due to the disappearance or degradation of natural resources caused by climate impacts.**	KR12.3
RR12.7	Risk of reduced tourism due to environmental degradation, loss of species, or an increase in invasive species.	
RR12.8	Risk of reduced tourism due to disappearance or degradation of accommodation and other tourism infrastructure due to extreme events.	
RR12.9	Risk of inability to meet tourist demand due to the disappearance or degradation of water and thermal resources as a result of climate impacts.	
RR12.10	Risk of reduction or even disappearance of snow tourism due to higher temperatures and reduced snow cover.	
RR12.11	Risk of reduced tourism due to damage to transport infrastructure and access to tourism resources.	
RR12.12	Risk of reduced tourist appeal due to cultural resources disappearance or degradation caused by climate impacts.	

FINANCIAL SECTOR AND INSURANCE ACTIVITY		
RR13.1	Risk of damage to financial infrastructure due to extreme weather events.	
RR13.2	Risk of damage to supply networks and exposed elements of financial institutions due to extreme weather events.	
RR13.3	**Risk of asset-price correction due to climate change impacts.**	KR13.1
RR13.4	**Risk of reduced financial activity due to lower investment and savings in areas highly disrupted by climate change impacts.**	KR13.2
RR13.5	Risk of mortgage default due to flooding.	
RR13.6	Risk of default on mortgage-backed securities in cases of geographic concentration in areas affected by extreme climatic events.	
RR13.7	Risk of default on loans granted to companies whose activity is disrupted by high-temperature scenarios (reduced labour productivity, falling revenues, rising mortality, and increasing OPEX and CAPEX).	
RR13.8	**Risk of loan defaults due to reduced agricultural productivity and other water-dependent productive sectors because of drought and aridity.**	KR13.3
RR13.9	Risk of immediate need for liquidity due to catastrophes caused by extreme climatic events.	
RR13.10	Risk of refinancing needs due to catastrophes caused by extreme climatic events.	
RR13.11	Risk of increased compensation under employment insurance policies due to higher occupational accident rates caused by extreme heat.	
RR13.12	**Risk of increased insurance compensations for insured losses in the agricultural sector resulting from droughts, hailstorms, frosts, floods, extreme heat and pests favoured by climate change.**	KR13.4
RR13.13	Risk of increased compensation for insured losses under multi-peril insurance due to high-intensity storms.	
RR13.14	Risk of increased compensation for insured losses in the agriculture and forestry sector due to forest fires.	
RR13.15	Risk of increased compensation for insured losses due to flooding.	
RR13.16	Risk of increased premium costs due to higher claims caused by extreme weather events.	

PEACE, SECURITY AND SOCIAL COHESION		
RR14.1	Risk of crises and conflicts at national level due to severe climate change impacts on natural resources and competition for those resources.	
RR14.2	**Risk of destruction or degradation of livelihoods and means of subsistence due to climate change impacts.**	KR14.1
RR14.3	Risks arising from increased internal displacement due to worsening quality of life and loss of livelihoods in places of origin due to climatic hazards such as droughts or floods.	
RR14.4	Risk on social, political and humanitarian aspects arising from international migration forced by the worsening quality of life and loss of livelihoods in places of origin caused by climate change.	
RR14.5	Risk of loss of social/territorial cohesion due to unequal distribution of impacts resulting from climate change.	
RR14.6	**Risk to security due to severe interruptions in the supply of water, energy or food, or to damage to critical infrastructure resulting from climate change.**	KR14.2
RR14.7	**Risk of international crises and conflicts due to severe climate change impacts on natural resources and competition for those resources.**	KR14.3
RR14.8	Risk of social polarisation around public policies to combat climate change.	

Annex 2. Urgency assessment— imminence, severity and recovery capacity —

Code by analysed factors

Imminence		Severity		Recovery capacity		Urgency	
Medium term	»»»»	Limited		Reversible	⟷	Limited	!
Short term	»»	Substantial		Partially reversible	↮	Significant	!!
		Critical		Irreversible	→	Maximum	!!!
		Catastrophic					

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
1. HEALTH	KR1.1	Risk of increased mortality and morbidity associated with heat, especially in vulnerable groups (older people, children, or those with pre-existing conditions).	»»			→	!!!
1. HEALTH	KR1.2	Risk of increased mortality and morbidity among workers from worsening climatic conditions.	»»			↮	!!
1. HEALTH	KR1.3	Risk of increased morbidity and mortality linked to the synergistic effect of rising air pollution and temperature.	»»			→	!!!

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
2. WATER	KR2.1	Risk of damage caused by extreme prolonged droughts.	»			→	!!!
	KR2.2	Risk of damage from pluvial and fluvial flooding.	»			→	!!!
	KR2.3	Risk to different uses and demands due to reduced availability of water resources in sufficient quantity and quality.	»			↮	!!
3. NATURAL HERITAGE	KR3.1	Risk of global biodiversity loss from the accumulation of climate change impacts at all levels.	»			→	!!!
	KR3.2	Risk of population decline and local extinctions in aquatic ecosystems due to alterations in climatic variables (changes in precipitation patterns, water temperature, etc.).	»			→	!!!
	KR3.3	Risk of disruption of essential ecological processes (food webs, pollination, reproductive and migratory patterns) due to phenological changes and other factors caused by alterations in climatic variables.	»			→	!!!
	KR3.4	Risk of loss or degradation of ecosystem services due to alterations in ecosystem functionality due to changes in climatic variables.	»			→	!!!

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
4. FORESTRY	KR4.1	Risk of alterations in forest composition and structure from average and extreme changes in climate	»			→	!!
4. FORESTRY	KR4.2	Risk of erosion and loss of soil quality in forest ecosystems due to changes in temperature and, particularly, precipitation, especially extreme precipitation	»			↮	!!
4. FORESTRY	KR4.3	Risk of reduced productivity and carbon absorption and storage capacity of forests due to changes in climatic variables	»			↮	!!
4. FORESTRY	KR4.4	Risk of desertification due to worsening aridity conditions from increasing temperatures, frequency and intensity of droughts, more torrential rainfall and increased forest fire risk	»			→	!!
4. FORESTRY	KR4.5	Risk forest stands loss due to increased danger of fire caused by climate change	»			↮	!!
5. AGRICULTURE AND LIVESTOCK	KR5.1	Risk of crop damage or losses due to water stress, increased dry spells and reduced water availability.	»			↮	!!
5. AGRICULTURE AND LIVESTOCK	KR5.2	Risk of crop damage and/or losses due to extreme weather events.	»			↮	!!
5. AGRICULTURE AND LIVESTOCK	KR5.3	Risk of losses in livestock production, animal welfare and even mortality due to rising temperatures, heatwaves and reduced precipitation	»			↮	!!
5. AGRICULTURE AND LIVESTOCK	KR5.4	Risk of reduced fisheries productivity due to changes in species distribution or population stocks resulting from changes in ocean-climate variables	»			↮	!!

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
6. COASTS	KR6.1	Risk of permanent coastal land loss due to flooding and erosion resulting from relative sea-level rise.	»»»»			→	!!
	KR6.2	Risk of direct damage to people, natural assets and economic assets due to flooding caused by increased intensity and frequency of extreme sea-level, wave and wind events.	»»			↮	!!
	KR6.3	Risk of reduced functionality or operability of protective and port infrastructures due to increased intensity and frequency of extreme sea-level, wave and wind events.	»»			↮	!!
	KR6.4	Risk of displacement or disappearance of marine habitats and/or species due to rising sea-surface temperature and ocean acidification	»»			→	!!

Key risks			Imminence	Severity: Short term	Severity: Medium term	Recovery capacity	Urgency
7. CITY	KR7.1	Risk of damage to people, buildings and urban infrastructure (mainly sewerage, drainage, electricity and transport networks) due to the increased frequency and intensity of extreme hydrometeorological events.	»»»»			→	!!!
7. CITY	KR7.2	Risk of severe disruptions in supply or shortages in basic services, especially water, energy and communications, due to extreme weather events (floods, droughts, extreme temperatures).	»»»»			↮	!!
7. CITY	KR7.3	Risk of reduced comfort and habitability in homes, public facilities, workplaces, etc. due to high temperatures.	»»»»			↮	!!!
7. CITY	KR7.4	Risk of thermal stress and reduced thermal comfort in public spaces due to intensification of the urban heat-island effect and/or loss of functionality in urban green areas.	»»»»			→	!!!
8. CULTURAL HERITAGE	KR8.1	Risk of damage to subsurface archaeological sites, rock paintings, frescoes, buildings and historic centres due to changes in precipitation, fluvial flooding and changes in material moisture content.	»»»»			↔	!!
8. CULTURAL HERITAGE	KR8.2	Risk of damage to ethnographic heritage and cultural landscapes due to fires.	»»			↔	!!
8. CULTURAL HERITAGE	KR8.3	Risk of damage to historic buildings, archaeological sites, underwater heritage and rock art located on the coast due to coastal flooding, storm surges, rising groundwater table and coastal erosion.	»»»»			↔	!!

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
9. ENERGY	KR9.1	Risk to the capacity and operational flexibility of the electricity system due to decreased hydropower production due to reduced availability of water resources.	»»»»			↮	!
	KR9.2	Risk of reduced efficiency and transmission capacity of transmission and distribution power lines due to increased atmospheric temperature.	»»			↮	!
	KR9.3	Risk of reduced supply capacity due to rising energy consumption and/or demand peaks due to high temperatures.	»»»»			↮	!
10. TRANSPORT	KR10.1	Risk of damage to and reduced operability of port infrastructure due to extreme events.	»»»»			↮	!!
	KR10.2	Risk of damage to road network infrastructure due to extreme events.	»»»»			→	!!
	KR10.3	Risk of road traffic being affected by extreme events.	»»»»			↮	!
	KR10.4	Risk of rail service disruption due to extreme events.	»»»»			↮	!

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
11. INDUSTRY AND SERVICES	KR11.1	Risk of damage to industrial and service infrastructures due to extreme events.	»»»»			↮	!!
11. INDUSTRY AND SERVICES	KR11.2	Risk of reduction and/or interruption of industrial processes operability and services due to reduced water supply.	»»»»			↮	!!
11. INDUSTRY AND SERVICES	KR11.3	Risk of reduction and/or interruption of industrial processes operability and services due to extreme temperatures.	»»»»			↮	!!
11. INDUSTRY AND SERVICES	KR11.4	Risk of reduced raw materials availability and increase in prices, when raw materials depend on climatic conditions.	»»»»			↮	!!
12. TOURISM	KR12.1	Risk of reduced visitor numbers or average length of stay due to comfort thresholds being exceeded.	»»			↮	!
12. TOURISM	KR12.2	Risk of reduced tourism demand due to the proliferation of mosquito-borne infectious diseases.	»»			↮	!!
12. TOURISM	KR12.3	Risk of reduced tourist appeal due to the disappearance or degradation of natural tourism resources caused by climate impacts.	»»			→	!!

Key risks			Imminence	Severity		Recovery capacity	Urgency
				Short term	Medium term		
13. FINANCIAL	KR13.1	Risk of asset-price correction due to climate change impacts.	››››			←/→	!!
	KR13.2	Risk of reduced financial activity due to lower investment and savings in areas highly disrupted by climate change impacts.	››››			←/→	!!
	KR13.3	Risk of loan defaults due to reduced agricultural productivity and other water-dependent productive sectors because of drought and aridity.	››			←/→	!
	KR13.4	Risk of increased insurance compensations for insured losses in the agricultural sector resulting from droughts, hailstorms, frosts, floods, extreme heat and pests favoured by climate change.	››››			←/→	!!
14. PEACE, SECURITY AND SOCIAL COHESION	KR14.1	Risk of destruction or degradation of livelihoods and means of subsistence due to climate change impacts.	››››			←/→	!!!
	KR14.2	Risk to security due to severe interruptions in the supply of water, energy or food, or to damage to critical infrastructure resulting from climate change.	››››			→	!!!
	KR14.3	Risk of international crises and conflicts due to severe climate change impacts on natural resources and competition for those resources.	››››			←/→	!!

Annex 3. Guidance on priorities

Code by analysed factors

Urgency		Monitoring needs		Management needs	
Limited	!	Basic	▶	Sectoral	●
Significant	!!	Intermediate	▶▶	Coordinated	★
Maximum	!!!	Advanced	▶▶▶		

Key risks			Urgency	Monitoring needs	Management needs
1. HEALTH	KR1.1	Risk of increased mortality and morbidity associated with heat, especially in vulnerable groups (older people, children, or those with pre-existing conditions).	!!!	▶	●
1. HEALTH	KR1.2	Risk of increased mortality and morbidity among workers from worsening climatic conditions.	!!	▶▶	●
1. HEALTH	KR1.3	Risk of increased morbidity and mortality linked to the synergistic effect of rising air pollution and temperature.	!!!	▶	●
2. WATER	KR2.1	Risk of damage caused by extreme prolonged droughts.	!!!	▶	★
2. WATER	KR2.2	Risk of damage from pluvial and fluvial flooding.	!!!	▶▶	★
2. WATER	KR2.3	Risk to different uses and demands due to reduced availability of water resources in sufficient quantity and quality.	!!	▶▶	★

Key risks			Urgency	Monitoring needs	Management needs
3. NATURAL HERITAGE	KR3.1	Risk of global biodiversity loss from the accumulation of climate change impacts at all levels.	!!!	▶	★
	KR3.2	Risk of population decline and local extinctions in aquatic ecosystems due to alterations in climatic variables (changes in precipitation patterns, water temperature, etc.).	!!!	▶▶	●
	KR3.3	Risk of disruption of essential ecological processes (food webs, pollination, reproductive and migratory patterns) due to phenological changes and other factors caused by alterations in climatic variables.	!!!	▶▶	★
	KR3.4	Risk of loss or degradation of ecosystem services due to alterations in ecosystem functionality due to changes in climatic variables.	!!!	▶▶	★
4. FORESTRY	KR4.1	Risk of alterations in forest composition and structure from average and extreme changes in climate	!!	▶	★
	KR4.2	Risk of erosion and loss of soil quality in forest ecosystems due to changes in temperature and, particularly, precipitation, especially extreme precipitation	!!	▶▶	★
	KR4.3	Risk of reduced productivity and carbon absorption and storage capacity of forests due to changes in climatic variables	!!	▶▶	●
	KR4.4	Risk of desertification due to worsening aridity conditions from increasing temperatures, frequency and intensity of droughts, more torrential rainfall and increased forest fire risk	!!	▶▶	★
	KR4.5	Risk forest stands loss due to increased danger of fire caused by climate change	!!	▶▶	★

Key risks			Urgency	Monitoring needs	Management needs
5. AGRICULTURE AND LIVESTOCK	KR5.1	Risk of crop damage or losses due to water stress, increased dry spells and reduced water availability.	‼	▶▶	★
	KR5.2	Risk of crop damage and/or losses due to extreme weather events.	‼	▶▶	★
	KR5.3	Risk of losses in livestock production, animal welfare and even mortality due to rising temperatures, heatwaves and reduced precipitation	‼	▶▶	★
	KR5.4	Risk of reduced fisheries productivity due to changes in species distribution or population stocks resulting from changes in ocean-climate variables	‼	▶▶	●
6. COASTS	KR6.1	Risk of permanent coastal land loss due to flooding and erosion resulting from relative sea-level rise.	‼	▶	●
	KR6.2	Risk of direct damage to people, natural assets and economic assets due to flooding caused by increased intensity and frequency of extreme sea-level, wave and wind events.	‼	▶	★
	KR6.3	Risk of reduced functionality or operability of protective and port infrastructures due to increased intensity and frequency of extreme sea-level, wave and wind events.	‼	▶▶	●
	KR6.4	Risk of displacement or disappearance of marine habitats and/or species due to rising sea-surface temperature and ocean acidification	‼	▶▶	●

Key risks			Urgency	Monitoring needs	Management needs
7. CITY	KR7.1	Risk of damage to people, buildings and urban infrastructure (mainly sewerage, drainage, electricity and transport networks) due to the increased frequency and intensity of extreme hydrometeorological events.	!!!	▶	★
	KR7.2	Risk of severe disruptions in supply or shortages in basic services, especially water, energy and communications, due to extreme weather events (floods, droughts, extreme temperatures).	!!	▶▶	★
	KR7.3	Risk of reduced comfort and habitability in homes, public facilities, workplaces, etc. due to high temperatures.	!!!	▶▶▶	●
	KR7.4	Risk of thermal stress and reduced thermal comfort in public spaces due to intensification of the urban heat-island effect and/or loss of functionality in urban green areas.	!!!	▶▶▶	●
8. CULTURAL HERITAGE	KR8.1	Risk of damage to subsurface archaeological sites, rock paintings, frescoes, buildings and historic centres due to changes in precipitation, fluvial flooding and changes in material moisture content.	!!	▶▶▶	●
	KR8.2	Risk of damage to ethnographic heritage and cultural landscapes due to fires.	!!	▶▶▶	●
	KR8.3	Risk of damage to historic buildings, archaeological sites, underwater heritage and rock art located on the coast due to coastal flooding, storm surges, rising groundwater table and coastal erosion.	!!	▶▶▶	●

Key risks			Urgency	Monitoring needs	Management needs
9. ENERGY	KR9.1	Risk to the capacity and operational flexibility of the electricity system due to decreased hydropower production due to reduced availability of water resources.	!	▶	●
	KR9.2	Risk of reduced efficiency and transmission capacity of transmission and distribution power lines due to increased atmospheric temperature.	!	▶▶▶	●
	KR9.3	Risk of reduced supply capacity due to rising energy consumption and/or demand peaks due to high temperatures.	!	▶▶▶	●
10. TRANSPORT	KR10.1	Risk of damage to and reduced operability of port infrastructure due to extreme events.	!!	▶▶	●
	KR10.2	Risk of damage to road network infrastructure due to extreme events.	!!	▶▶▶	●
	KR10.3	Risk of road traffic being affected by extreme events.	!	▶▶▶	●
	KR10.4	Risk of rail service disruption due to extreme events.	!	▶▶▶	●
11. INDUSTRY AND SERVICES	KR11.1	Risk of damage to industrial and service infrastructures due to extreme events.	!!	▶▶	●
	KR11.2	Risk of reduction and/or interruption of industrial processes operability and services due to reduced water supply.	!!	▶▶▶	●
	KR11.3	Risk of reduction and/or interruption of industrial processes operability and services due to extreme temperatures.	!!	▶▶▶	●
	KR11.4	Risk of reduced raw materials availability and increase in prices, when raw materials depend on climatic conditions.	!!	▶▶▶	★

Key risks			Urgency	Monitoring needs	Management needs
12. TOURISM	KR12.1	Risk of reduced visitor numbers or average length of stay due to comfort thresholds being exceeded.	!	▶▶	●
	KR12.2	Risk of reduced tourism demand due to the proliferation of mosquito-borne infectious diseases.	!!	▶▶▶	●
	KR12.3	Risk of reduced tourist appeal due to the disappearance or degradation of natural tourism resources caused by climate impacts.	!!	▶▶	★
13. FINANCIAL	KR13.1	Risk of asset-price correction due to climate change impacts.	!!	▶▶▶	★
	KR13.2	Risk of reduced financial activity due to lower investment and savings in areas highly disrupted by climate change impacts.	!!	▶▶▶	★
	KR13.3	Risk of loan defaults due to reduced agricultural productivity and other water-dependent productive sectors because of drought and aridity.	!	▶▶▶	●
	KR13.4	Risk of increased insurance compensations for insured losses in the agricultural sector resulting from droughts, hailstorms, frosts, floods, extreme heat and pests favoured by climate change.	!!	▶▶	★
14. PEACE, SECURITY AND SOCIAL COHESION	KR14.1	Risk of destruction or degradation of livelihoods and means of subsistence due to climate change impacts.	!!!	▶▶	★
	KR14.2	Risk to security due to severe interruptions in the supply of water, energy or food, or to damage to critical infrastructure resulting from climate change.	!!!	▶▶	★
	KR14.3	Risk of international crises and conflicts due to severe climate change impacts on natural resources and competition for those resources.	!!	▶▶▶	★


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