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CrossEU

D4.2 – Effectiveness of the existing mitigation and adaptation policies

(Version 2)

WP4 - Task 4.1

December 2025

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Executive Summary

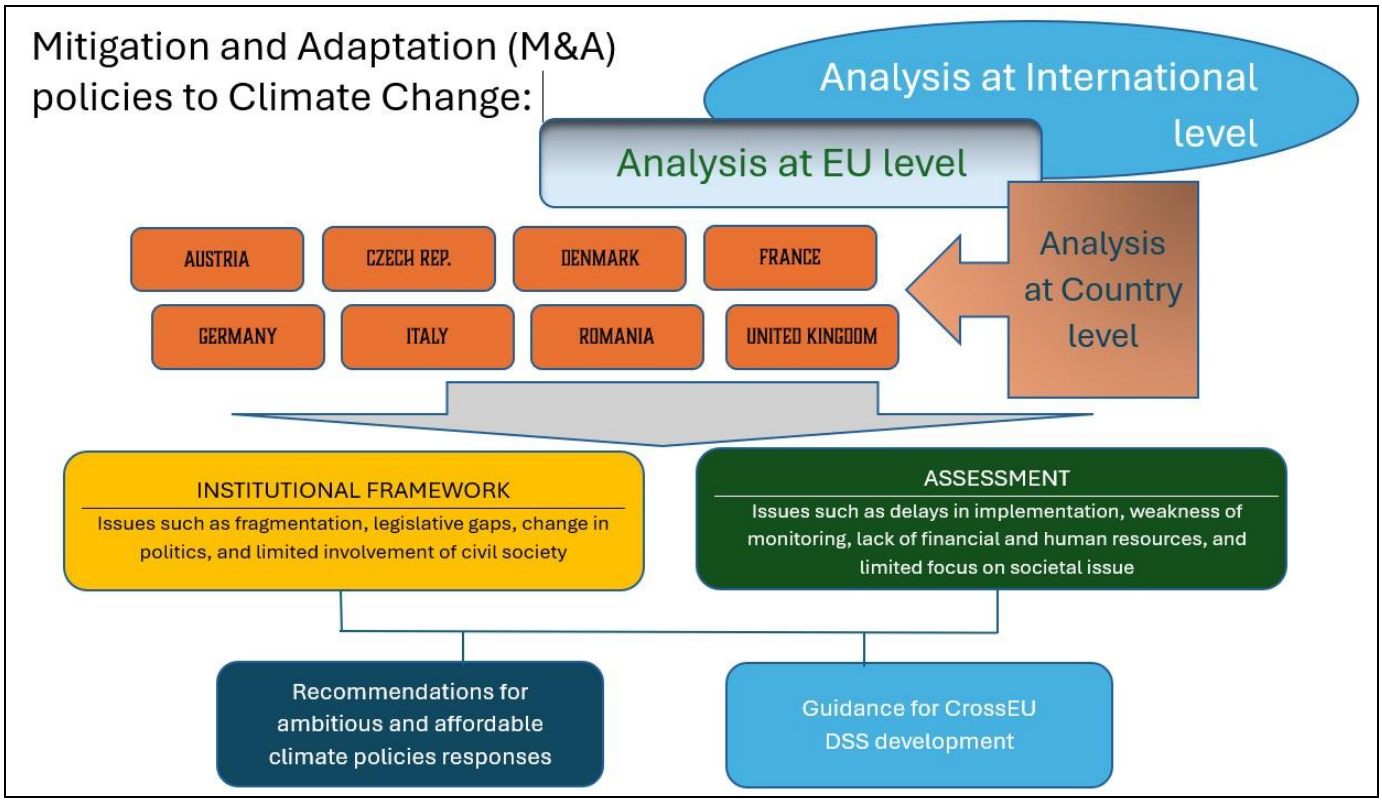
The "D4.2 – Effectiveness of the existing mitigation and adaptation policies (Version 2)" is submitted in the framework of WP4 and is the final output of Task 4.1 (T4.1) "Analysing mitigation and adaptation measures in relevant EU and national policies". It includes the final results of the work carried out in this task and has been preceded by a previous deliverable containing the preliminary results of this task and submitted in March 2025.

T4.1 entailed a systematic and as far as possible, comprehensive analysis of the policy and institutional framework and instruments related to Mitigation and Adaptation (M&A) to Climate Change at EU and national levels (considering also the international level, as a reference framework). The analysis focused on the stated goals, timeframes, cross-sectoral and scale interlinkages, and synergies and contradictions between sectoral driven policies.

Based on available policy documents at different levels, complemented with 42 interviews with relevant key-informants at the EU and the national level, an analysis and assessment of these policies has been undertaken.

D42 includes a comparison of climate policies and measures at EU level and in the countries considered. Due to the heterogeneity of the ways in which the various policies and measures are addressed in different national contexts (despite several similarities in content), the comparison will mostly be qualitative. The focus is first on the main pillars of the two broad domains of climate change policies (mitigation and adaptation) in the eight countries and at the EU level. The relevant sectors are considered through a general description of the related goals, actions and measures, with particular attention paid to the overlap, trade-offs and conflicts between mitigation and adaptation policies. Subsequently, the institutional framework in which climate (M&A) policies are implemented is analysed, highlighting issues such as fragmentation and a lack of coordination among stakeholders, limited but useful involvement of civil society, the presence of 'dominant' actors, and legislative gaps, among others. Finally, the implementation status of climate policies is assessed, as well as the monitoring and evaluation schemes, the weight of further barriers (beyond institutional ones), such as a lack of financial and human resources, regional disparities and a lack of data, and the limited focus on related societal issues.

The conclusions include a list of themes that emerged from our findings. These themes are relevant for both defining new policies and identifying the focus of further research. The conclusions also include some recommendations for the final task of WP4 (T4.5). This task is aimed at developing ambitious and effective climate policy responses. Finally, D42 informs the development of the CROSSEU Decision Support System (WP3) with concrete suggestions relating to its co-creation with stakeholders, as well as providing links to specific plans, adopted laws and further useful documents, classified by country or EU level and sector.



Keywords

Mitigation; Adaptation; Governance framework; Policy assessment; Climate policies; Climate change; Decision Support System; Barriers

Abbreviations and acronyms

Acronym	Description
AAP	Adaptation Action Plan
AOPK	Nature Conservation and Landscape Protection of Czechia
AST	Adaptation Support Tool
BEK 2030	Berlin Energy and Climate Protection Program 2030
BMK	Austrian Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology
CAM	Minimum Environmental Criteria (Italy)
CBD	Conference on Biological Diversity
CC	Climate Change
CCA	Climate Change Adaptation
CCA	Climate Change Act (UK)
CCC	Citizen's Convention for Climate (France)
CCC	Committee on Climate Change (UK)
CCHs	Climate Change Hotspots
CCP	Climate Change policy (UK)
CCRA	UK Climate Change Risk Assessment
CCS	Carbon Capture and Storage
CENIA	Czech Environmental Information Agency
CHMI	Czech Hydrometeorological Institute
CITE	Interministerial Committee for Ecological Transition (Italy)
COAU	Unified Air Operations Centre (Italy)
CoP	Conference of Parties
CoR	European Committee of the Regions
CPP	Climate Protection Policy (the Czech Republic)
CRA	Climate Risk Assessment
CROSSEU	Cross-sectoral Framework for Socio-Economic Resilience to Climate Change and Extreme Events in Europe
CSOs	Civil Society Organisations
CZECHGLOBE	Global Change Research Institute (Czechia)
C40	Covenant of Mayors
DAS	Germany's strategic approach to adapting to climate change
DEFRA	Department for Environment and Rural Affairs (UK)
DESNZ	Department for Energy Security and Net Zero (UK)
DG	Directorate General
DKK	Danish crowns
DRR	Disaster Risk Reduction
DRS	Deposit Return System
DSD	Department for Sustainable Development (Romania)
DSS	Decision Support System
EC	European Commission
ECB	European Central Bank
ECMWF	European Centre for Medium-Range Weather Forecasts
EEA	European Environment Agency
EED	Energy Efficiency Directive
EESC	European Economic and Social Committee

Acronym	Description
EFA	Environmental Fund Administration (Romania)
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIOPA	European Insurance and Occupational Pensions Authority
EGD	European Green Deal
EMODnet	European Marine Observation and Data Network
ENI	Ente Nazionale Idrocarburi (Italy) / National Hydrocarbons Agency
EPG	Energy Policy Group
ESA	European Space Agency
ESF+	European Social Fund Plus
ESG	Environmental, Social, and Governance
ETS	Emissions Trading Scheme
EU	European Union
EU ETS	European Union Emissions Trading System
EVs	electric vehicles
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GHG	Greenhouse Gas
GSG	General Secretariat of the Government (Romania)
G3W	Global Greenhouse Gas Watch
HCC	Haut Conseil pour le Climat (France) / High Council for Climate
ICCC	Interministerial Committee on Climate Change (Romania)
ICT	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
IKI	International Climate Initiative
IMAA	Interministerial Working Group on Adaptation to Climate Change (Germany)
INTRA	Directorate General for International Partnership
IPCC	Intergovernmental Panel on Climate Change
ISPRA	Higher Institute for Environmental Protection and Research (Italy)
ISTAT	National Statistical Institute (Italy)
ITU	International Telecommunications Union
KAnG	Climate Adaptation Law (Germany)
KLAR!	Climate Change Adaptation Model Regions (Austria)
KMGBF	Kunming-Montreal Global Biodiversity Framework
KWAN	Network of Innovative Climate Change Adaptation for Practitioners at Regional Level (Austria)
LANUV	State Agency for Nature, Environment and Consumer Protection (Germany)
LDCs	Least Developed Countries
LDN	Land Degradation Neutrality
LTS	Long-Term Strategy
LULUCF	Land use, land-use change, and forestry
M&A	Mitigation & Adaptation
MASE	Ministry of the Environment and Energy Security (Italy)
MEF	Ministry of Economy and Finance (Italy)

Acronym	Description
MEWF	Ministry of Environment, Waters, and Forests (Romania)
MPO	Ministry of Industry and Trade (Czechia)
MZP	Ministry of the Environment (Czechia)
NAEK	National report on The Energy and Climate Plan (Austria)
NAPs	National Adaptation Plans
NAS	National Adaptation Strategy
NASA	National Aeronautics and Space Administration (United States)
NBSAP	National Biodiversity Strategies and Action Plan
NbS	Nature-based Solution
NDCs	Nationally Determined Contributions
NECPs	National Energy and Climate Plans
NEP	National Energy Policy
NICCAP	Northern Ireland Climate Change Adaptation Programme
NKU	Supreme Audit Office (Czechia)
NGOs	Non-Governmental Organizations
NLTS	Italian Long-Term Strategy
NRRP	National Recovery and Resilience Plan (Romania)
NRW	North Rhine-Westphalia
NSACC	National Climate Change Adaptation Strategy 2030, with a perspective towards 2050 (Romania)
NSSD	National Strategy for Sustainable Development (Romania)
NUTS	Nomenclature of Territorial Units for Statistics
NZEB	Nearly Zero-Energy Building
OECD	Organisation for Economic Co-operation and Development
ONERC	National Observatory on the Effects of Climate Change (France)
OPE	Operational Programme Environment (Czechia)
PCAET	Territorial Climate-Air-Energy Plans (France)
PNACC	National Climate Change Adaptation Plans (France, Italy)
PNCIA	National Air Pollution Control Program (Italy)
PNIEC	National Integrated Energy and Climate Plan (France, Italy)
PNRR	National Recovery and Resilience Plan (Italy)
PPE	Multiannual Energy Program (France)
PTE	Ecological Transition Plan (Italy)
RED	Renewable Energy Directive
R&I	Research and Innovation
RJTP	Regional Just Transition Plan
RNE	German Council for Sustainable Development
RO-ADAPT	National Adaptation Platform (Romania)
SAF	Sustainable Aviation Fuel Bill (UK)
SDGs	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SEP 2030	State Environmental Policy (Czechia)
SFZP	State Environmental Fund (Czechia)
SIDS	Small Island Developing States
SMEs	Small and Medium Enterprises
SNAC	National Strategy for Adaptation to Climate Change (Italy)
SNBC	National Low-Carbon Strategy (France)

Acronym	Description
SNEC	National Strategy for Circular Economy (Romania)
STL	Storylines
SDGs	Sustainable Development goals
SRCAE	Regional Climate-Air-Energy Schemes (France)
TEC	total energy consumption
TFCRFD	Task Force on Climate-Related Financial Disclosures
UFZ	Leipzig Environmental Research Centre
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCCD	United Nations Convention to Combat Desertification
UNCOP	United Nations Conference of Parties
UNDDR	United Nations Office for Disaster Risk Reduction
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services
VNRs	Voluntary National Reviews
WFP	World Food Program
WMO	World Meteorological Organisation
WP	Work Package
WWF	Worldwide Fund for Nature

PART One – Introduction

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1. INSTITUTIONAL FRAMEWORK

The objective of the CROSSEU project is to equip stakeholders with the necessary tools and insights to assess risks arising from climate hazards and make well-informed decisions in order to adapt to those risks and reduce their impacts on different socio-economic sectors. Deliverable D1.1 related to the CROSSEU methodology developed the requirements and expertise from multiple sectors converging to present the socio-economic risks of climate change, giving an overview of the co-design and development process as illustrated in Figure 1.

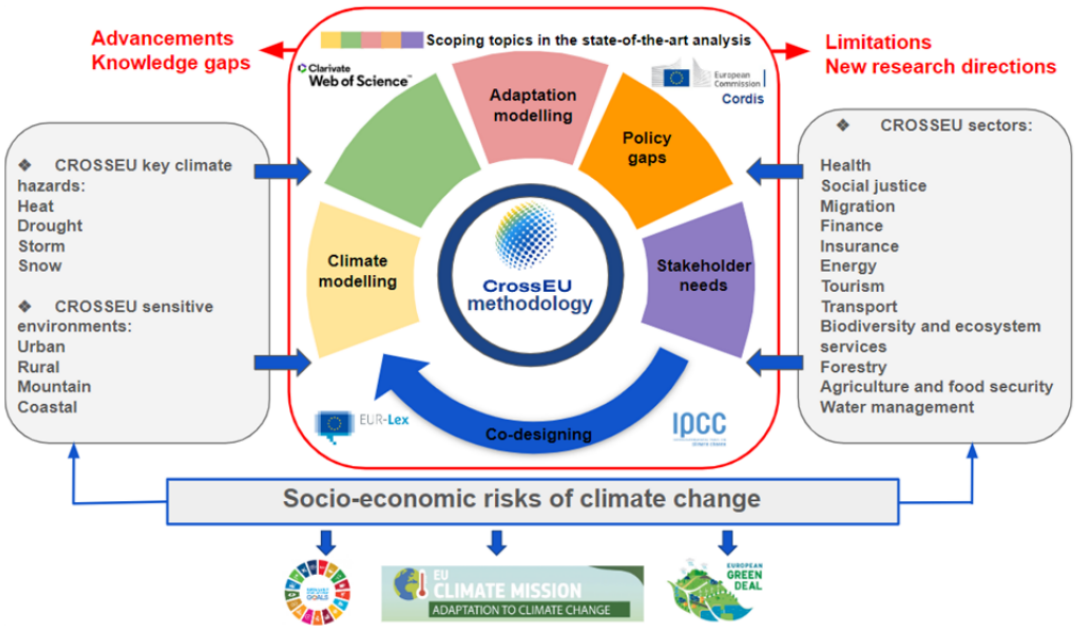

Figure 1 – Scoping analysis for the co-design and development of the CROSSEU methodology

Within CROSSEU, researchers need to collaborate and share data, knowledge and expertise. In this framework, Work Package 4 (WP4) is intended to facilitate climate policy responses, including M&A, and to enhance the integration of CC risks in decision-making and investments both in public and private sectors. WP4 includes five tasks aimed, respectively, at:

(i) Conducting a systematic and comprehensive analysis of the mitigation and adaptation measures in EU and national policy framework (T4.1)
(ii) Analysing climate change impacts and sectoral policy responses relevant for the STLs and CCHs addressed in regional and local in-depth case studies (T4.2)
(iii) Analysing social aspects and consequences of M&A measures in relevant EU, national and sectoral policies (T4.3)
(iv) Analysing climate change related economic and finance policies to mitigate the analysed risk storylines (T4.4), and

(v) Deriving knowledge-based recommendations for ambitious climate policy response in support of M&A (T4.5).

The present Deliverable (D4.2) is the final one of T4.1 "Analysing mitigation and adaptation measures in relevant EU and national policies". It includes the final results of the work carried out in this task and has been preceded by a previous deliverable containing the preliminary results of this task and submitted in March 2025.

T4.1 entailed a systematic and as far as possible, comprehensive analysis of the policy and institutional framework and instruments related to Mitigation and Adaptation (M&A) to Climate Change at EU and national levels (considering also the international level, as a reference framework). The analysis focused on the stated goals, timeframes, cross-sectoral and scale interlinkages, and synergies and contradictions between sectoral driven policies.

Based on available policy documents at different levels, complemented with 42 interviews with relevant key-informants at the EU and the national level, an assessment of the effectiveness of these policies has been undertaken, focusing on two aspects: first, how operational they are (e.g., bottlenecks and barriers in decision, implementation and monitoring process); and second, what results they achieved, considering their role for climate change adaptation, environmental conservation, circular economy and sustainability; and having also in mind actual and possible trade-offs between sustainable development, mitigation and adaptation.

A comparison between the climate policies/measures at the EU level and in the different considered countries is included in this deliverable. Due to the heterogeneity of the ways in which the various policies/measures are addressed in the various national contexts (beyond several similarities in content), the comparison carried out will be mostly qualitative, except for an attempt to compare, in quantitative terms, the various Mitigation and Adaptation policies/measures according to the 12 sectors considered in CROSSEU (see figure 1), namely: Health, Social justice, Migration, Finance, Insurance, Energy, Tourism, Transport, Biodiversity and ecosystem services, Forestry, Agriculture and food security, and Water management.

Comparisons made it possible to:

- Formulate specific observations (commonalities, specific problems, etc.)
- Define some open issues related to diverse national experiences so as to define the questions for the interviews that will be carried out later.

D4.2 isa basis for the co-production of actionable knowledge for policy options. It informs the Decision Support System (DSS) development in WP3 and the policy recommendations in T4.5, fed by the further analysis implemented in T4.2, T4.3, and T4.4 (see, more specifically, the final chapter of this deliverable).

This deliverable is organized as follows. After this brief Institutional framework, the methodological path followed in the production of the results of this task is described (how the work has been carried out, with a specific focus on the sources used – type of documents reviewed and the documentation search procedures; type and distribution of the key informants interviewed).

This introduction is followed by a comparative analysis of all the information collected through the documentary research and the interviews with relevant key-informants at the EU and the national level, which represent the "core" of this document and include a presentation of the ongoing climate policies (mitigation, adaptation and trade-offs/overlaps/conflicts among them); a critical overview of the institutional frameworks highlighting the various governance issues; an overview on the implementation status of policies and related monitoring and assessment tools; an analysis of the main relevant barriers (and drivers) towards the implementation; and finally a specific focus on the societal issues related to the implementation and effects of the climate policies.

Then the final part of this deliverable includes two synthetic paragraphs:

- The research findings addressed to the scientific community
- The recommendations for the concluding phase of CROSSSEU, informing mainly T4.5 (knowledge-based recommendations for ambitious climate policy response in support of M&A) and WP3 (design and test of the DSS).

This deliverable is complemented by 12 Appendixes:

- 3 framework appendixes on the contents-thematic framework, the theoretical framework, and the international framework of the climate policies
- 9 specific appendixes on climate policies and related institutional frameworks at the EU level and in each one of the eight countries taken into account (Austria, The Czech Republic, Denmark, France, Germany, Italy, Romania, and the UK).

The contributions provided by the national CROSSEU partners engaged in the implementation of this task (BOKU, CZU, DTU, LGI, K&I, and MeteoRo[1]), were focused on:

- The strategies of M&A being carried out in the case study areas (having also in mind overlapping, trade-offs, contradictions, etc.)
- The related governance framework (in each of the considered countries, and also at the EU and international levels)
- The main dynamic aspects of these strategies (their evolution, the implementation period, the monitoring systems adopted, etc.)

[1] BOKU – Universitaet fuer Bodenkultur Wien; CZU – Česká zemědělská univerzita v Praze; DTU – Danmarks Tekniske Universitet; LGI – LGI Sustainable Innovation; K&I – Conoscenza e Innovazione; MeteoRo – Administrația Națională de Meteorologie R.A.

- Assessment of the effectiveness of the strategies (e.g., the expected results, the main obstacles met)
- Other aspects that each partner considers important (e.g., main actors involved beyond those included in the governance framework, possible implementation conflicts, open issues, perspectives).

Each partner developed the above-mentioned issues in their country. Moreover, BOKU took, beyond Austria, also the responsibility of Germany; and K&I, beyond Italy, also the responsibility of the United Kingdom and, at an upper level, looked at the EU policies. Finally, these issues were investigated at a global (international) level by our international partner, WMO.

All URLs in the text, as hyperlinks or in footnotes, were accessed on 30 November 2025.

2. METHODOLOGICAL PATH

Task 4.1 implementation entailed the following two big steps.

(i) A first step devoted to a preliminary study functional to the design of the thematic, theoretical and methodological framework of the Task; and, mainly, to a broad documentary research on climate policies and related governance frameworks in the concerned European countries (Austria, The Czech Republic, Denmark, France, Germany, Italy, Romania, and the UK) as well as at the EU and international levels. This first step included also a comparative analysis among countries and levels of the climate policies, as they were mainly understood "on the book". Results of this first stem were included in D4.1 delivered early March 2025.

(ii) A second step devoted to the update of the above mentioned documentary research (which became very necessary given that in several of the countries considered and at the European level, political-governmental changes occurred in 2024 or early 2025 which had effects on climate policies materialized in 2025); and mainly on the assessment of the climate policies and the related governance frameworks focusing on the reality of facts and events, which are sometimes quite distant from what was expected/established in the documents; this is mainly thanks to interviews with key informants. This second step ended with an overall and comparative analysis included in this D4.2 delivered early January 2026, including at its end, as already stated, insights for the co-production of actionable knowledge for policy options, informing the Decision Support System (DSS) development in WP3 and the policy recommendations in T4.5.

As already stated, two sources of information have been used: documentary sources and key-informants (through expert interviews)

Documentary sources were mainly primary sources, such as texts of laws, decrees, regulations and institutional and legal provisions, adopted plans, official reports and similar; and also secondary sources, i.e., surveys, analyses and studies (including assessment studies) carried out by both policy actors and researchers on the various policies/measurements and institutional/ governance frameworks. Many documentary sources are available to anyone on the Internet (open sources); some others have been made available by their authors (people or entities). The analysed documents reported national policies and – when relevant – also regional policies (in cases of strongly regionalized or federal countries). Documents have been chosen based on the relevance and the high authoritativeness of the consulted sources. The documents were those concerning the main actors of the national M&A policies; they were looked for through a snowball approach. The documents have been analysed trying to stress what emerged through the above-mentioned framework concepts. The results were presented (in each one of the 9 specific appendixes) through:

- A general description of M&A policies
- Descriptions following a uniform template making it easier to compare different countries' findings
- A comparison for giving an idea of the differences and critical areas
- Single out the issues to be further deepened.

42 key informants were also interviewed:

- 5 at the European level (officials of the European Commission, European Environment Agency, European investment Bank, European Central Bank)
- 37 at the National level (3 in Austria, 8 in The Czech Republic, 4 in Denmark, 4 in France, 4 in Germany, 4 in Italy, 5 in Romania, 5 in the UK), mainly governmental (or regional authorities) officials involved in climate policies, and also official of national main NGOs/environmental movements).

Key-informants were identified in each country (or at the European level) by the CROSSEU partner responsible of Task 4.1 in the corresponding territorial area, according to the following criteria:

- The interviewees should mainly be managers or representatives of the main bodies mentioned in each of the "governance frameworks" presented for each of the 8 countries (or at the EU level). Therefore, they will mostly be managers/representatives of public bodies.
- However, at least one interview should be done with a representative of one of the main non-governmental bodies involved in the environmental field.
- In each country, interviewees should be in principle from 3 to 5 (however, at the end of the day, we got more in the Czech Republic).

The interviews conducted were open, semi-structure and qualitative, considering the great diversity among the key informants interviewed and the type of knowledge they possess. The various interviews, however, were

all conducted using a common guide for interviews, including the following contents.

- Biographic data.
- Current status of advancement of the implementation of M&A policies/measures, with also a specific focus on the possible difficulties, delays, conflicts, etc.
- Possible missing policy areas.
- The governance of the implementation of M&A measures, including how implementation dynamics work (e.g., how results are monitored and assessed, the difficulties encountered in steering action, and the identification of best practices and reasons for success).
- The ways in which different actors cooperate in the context of multilevel governance (i.e., cooperation among the various levels of government), as well as how non-public actors intervene and cooperate, including specific problems (e.g., lack of cooperation due to bad regulation, political cleavages) and relevant best practices.
- Substantive issues connected to the governance of M&A policies, concerning the interlinkages and balances between Mitigation, Adaptation, and Sustainability, including cases of conflicting policy objectives and solutions identified to harmonise these policies.
- The capacity of M&A policies to establish a new regime of climate change-related risks [2].
- The extent to which climate-change policies are introducing the diffuse changes needed to effectively mitigate and adapt to the impacts of climate change (e.g., changes in firms' routines, more responsible consumer behaviour).
- The extent to which the social impacts of climate change and related policies are effectively addressed, including the adequacy of current measures.

The interviews were conducted in the national language of the interviewee or (sometimes at the European level) in English.

The analysis implemented in the eight considered countries, as well as at the European and global levels, were updated with new information wherever new developments occurred between the time of deliverance of D4.1 and October 2025.

[2] The concept of Risk Regime concerns the societal approach to managing climate risks. A functioning regime is a set of practices, institutions, expectations, societal values, and actors permanently focused on dealing with certain types of risk – in this case, those related to climate change.

PART Two – Comparative analysis of Climate policies in Europe

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As mentioned in the introduction, this deliverable's core is a cross-comparative analysis of mitigation and adaptation policies in Austria, the Czech Republic, Denmark, France, Germany, Italy, Romania and the United Kingdom at the European level. Details of these policies can be found in Annexes B1 to B9. Annex B1 refers to the EU level, while Annexes B2 to B9 contain specific texts for each of the aforementioned eight countries.

1. General overview on Mitigation and adaptation policies (M&A)

A general overview of what is being done to mitigate and adapt to climate change is summarised in the table below where the 12 CROSSEU sectors (see figure 1 in the introduction) are "crossed" with the 8 European countries considered in this Report (+EU). Our aim is to try to visualize if and where each of the 12 socio-economic CROSSEU sectors is taken into account by the present climate (M&A) policies in each country, as it results from the documentary analysis.

Table 1 – CROSSEU sectors in the eight countries considered (+EU)

	EU	AT	CZ	DK	FR	DE	IT	RO	UK
Health	x	x	x		x	x	x	x	x
Social justice	x	x	x	x	x	x	x	x	x
Migration									x
Finance	x	x	x	x	x	x			x
Insurance	x			x	x		x	x	
Energy	x	x	x	x	x	x	x	x	x
Tourism	x	x	x		x	x	x	x	
Transport	x	x	x	x	x	x	x	x	x
Biodiversity and ecosystem services	x	x	x	x	x	x	x	x	x
Forestry	x	x	x	x	x	x	x	x	x
Agriculture and food security	x	x	x	x	x	x	x	x	x
Water management	x	x	x	x	x	x	x	x	x

As might be expected, most of the 12 sectors are targeted by the climate policies of both the EU and the eight countries surveyed. These are, notably:

- Health

- Energy
- Transport
- Biodiversity and ecosystem services
- Forestry
- Agriculture and food security
- Water management.

The finance sector could be added to this list, as it is only not mentioned in two countries' (Italy and Romania) documents.

Tourism, then, is taken as a focus of climate policies everywhere, except for Denmark and the UK, both countries where tourism has a certain importance and is prone to natural hazards (e.g., heat waves in the UK urban areas and coastal floods in Denmark).

A more in-depth discussion seems necessary in this regard, and the same applies to the subject of insurances (explicitly mentioned just in Denmark, France, Italy and Romania, as well as at the EU level). The direct impact in the form of acute natural hazards is the destruction in value of the physical assets of a population due to extreme weather events and the insured losses from extreme weather events that have increased by as much as 250% in the last 30 years.

Despite this increased responsiveness, most insurance sector segments remain vulnerable to climate change, including property and casualty, life, surety, accident and health, hospital and medical, and agents. This vulnerability is compounded since the historical distributions of climate risk exposure under which insurance contracts were defined are markedly different from the prevailing profile for these risks. This creates the tension between the affordability of insurance for the consumers and the solvency of the insurers. Innovation in insurance products is likely to be central to insurers' ability to ease this tension. There is, therefore, still a situation of profound indeterminacy and it may therefore not be surprising that climate public policies in some countries have not yet focused on this issue.

Finally, it seems quite unequivocal that the focus on disadvantaged people (or those at risk of becoming disadvantaged in connection with certain climate policies) is still rather limited. The connections between climate change and migration seem to be of concern only in the UK. This may not be the case, but attention remains restricted, even if local migration due to climate risks can impact the economy (e.g., house prices and citizens' willingness to pay for solutions) and the society (e.g., social cohesion issues).

Broadening the field, the more general theme of 'social justice' in relation to climate change appears to be a strong concern at the EU level but has so far encountered limited consideration in the countries surveyed (even though it is still mentioned, but by few sources).

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2. COMPARATIVE ANALYSIS OF MITIGATION POLICIES

Going now more in depth, we can look at the main pillars of Mitigation policies in the eight countries. There is a certain convergence on what Mitigation policies consist of in practice, which includes promoting:

- Development of renewable energy
- Energy efficiency in various sectors, mainly industry and buildings
- Decarbonisation of transport, mainly through Electric Vehicles (EV), recharging infrastructure, walking and cycling, enhancing public transport
- Reduction of emissions from agriculture, for example through carbon farming practices and the practice of forestry
- Emission trading systems (ETS) and carbon pricing are not exactly activities aimed at reducing emissions but mostly at creating incentives for reductions. Such practices are widespread in the considered countries, also because ETS is an official European policy.

These five types of activities (among which there are, obviously, interdependencies and overlaps; for example, the decarbonisation of transport is also based on the development of renewable energy) are the backbone of what is generally meant for mitigation policies. Indeed, in most of the countries we considered there are provisions for them.

Other types of activities are also considered part of mitigation policies, even if they are not so directly connected with emissions reduction, or if they are connected to mitigation objectives according to different approaches. It is the case of:

- Forestry, which is sometimes distinguished from agricultural policies; forestry, anyhow, sometimes is considered part of more general policies concerning land use
- Policies on water resources are sometimes mentioned as part of mitigation policies (but, in general, are more the object of adaptation policies)
- Green financing. This is a very general label that includes various types of activities, potentially also activities connected to carbon pricing. In general, the idea is to promote the use of private capital to favour private investments in decarbonization technologies and initiatives
- Waste management and circular economy initiatives. Not in all countries this kind of initiative is mentioned in relation to climate policies, and in any case, they do not seem to form the backbone of mitigation (probably because their effects are delayed in time and not easily predictable)
- Research and Innovation (R&I). R&I are always mentioned as part of mitigation policies (and adaptation as well, see below). R&I are “transversal” and impact other activities (typically, energy efficiency in industry, or the promotion of renewable energy)

- Public engagement and information. Initiatives aimed at informing the public and stakeholders in general about the objective of mitigating climate change.

Some countries include the international dimension of mitigation policies openly (e.g., the UK and France), while others consider it as the context in which policies are implemented, also for abiding with international treaties and regulations (typically, European regulations).

Below are some comments on how these various types of mitigation activities are being promoted in the eight countries considered.

2.1. Renewable energy

The first set of mitigation policies is related to the adoption of renewable energy.

In Italy the introduction of renewable sources, up to 72% is expected, and the complete phase-out of coal (renewables mean solar, wind, biogas, and in the framework hydrogen, bioenergy and synthetic fuels are included) is foreseen. It is also stressed that the generation of energy from renewables can happen from distributed sources. Recently in Italy, there has also been a reopening of debates about the reintroduction of nuclear energy, but nothing concrete has happened so far.

Similar approaches are being followed in other countries. Firstly, in Romania, where the objective is to increase the share of renewable energy to achieve a minimum of 38.3% of gross final energy consumption while, in general, arriving at a diminution of 85% of GHG emissions. Coal should be phased out by 2032.

Czechia is also committed to increase the share of renewables to 23%, 26%, and 41% of the Typical Energy Consumption by 2030, 2040, and 2050, respectively. Key initiatives include solar and wind energy development and biomass utilization. Renewables are thought also as diffuse tools for mitigation, i.e., meant to be practiced by a large number of actors (as in the case of house-heating or new farmers' practices). Difficulties are being met in increasing the share of renewables in the transport sector, and the preference is for biofuel as a renewable source of energy. The issue of promoting renewables was first launched in the National Renewable Energy Action Plan of 2010 and in the various versions of the National Energy and Climate Plan (NECP).

In Germany too, the aim is to support the development and increase of the share of renewable sources, also by promoting research in this sector. It is to stress that all landers have their own programmes and objectives, and this makes clear the institutional complexity of this policy, especially for a big country, where the regional dimension is key. Another factor of complexity, mostly technical in nature, is the issue of the integration of renewable sources in the distribution grid. The trend towards renewable energy, has slowed down slightly in 2024 and Germany is currently

investing again into coal, albeit if, conversely, the current government has an internal aspiration to achieve the phase-out from coal by 2030 (presently still in 2038).

Austria has ambitious objectives since electricity should be 100% renewable by 2030. The country will rely on hydroelectric power, wind, solar, and biomass energy to replace fossil fuels. Up to now, there have been some positive results, especially concerning electricity generation, with a substantial reliance on hydropower and growing investments in wind and solar energy. Problems are being met in other sectors, for example in transport.

In Denmark the objectives are increasing the share of renewable energy in gross final energy consumption and phasing out coal-fired power plants by 2030. Among the tools to deploy this strategy, there are feed-in tariffs and auctions. Monitoring with indicators is foreseen. Results achieved up to now are important, for example, the country's leadership in wind energy production, which doubled between 2011 and 2023. Results are being obtained also for building heating. Renewables deployment is a policy led by a specialized agency (Danish Energy Agency). Interestingly, workers in the fossil fuel sector are being re-skilled and retrained to be employed in the wind offshore industry.

Also in France, decarbonisation and diversification of the energy mix, notably by developing renewable energy and phasing out coal for electricity and heat production, are foreseen. The use of nuclear energy in France remains very important.

For the UK's policies, renewable energy is crucial, and new policies are expected to foster investments in this area, including for infrastructure. Sectors focused by the former government were offshore wind by 2030, with more onshore, and solar. It was requested by the independent committee (Climate Change Committee/CCC) a deployment at scale of new renewable electricity generation, with appropriate energy storage and decarbonised back-up solutions, subject to ensuring security of supply. The trend towards increasing the use of renewable energy has significantly intensified under the current government.

Overall, some observations can be made. The policies being carried out by the eight countries are not, at least in general, that different. Phase out from coal and making use of renewable sources is a common feature (including some possible delays, also in relation to the Ukraine crisis). There are differences concerning the pace, the strategy, and sometimes the ambition (see Denmark aiming at maintaining a leadership role or the UK aiming at "Making Britain a Clean Energy Superpower"). Sometimes research is stressed as a facilitating tool. In some cases, what emerges is the complexity of the implementation, which implies the involvement of National Agencies, and/or the cooperation of various government levels (e.g., regional government in Germany). In general, promoting renewable energy sources implies a huge innovation process, which is not just – and

even primarily – economic but also social, if not cultural. The issue is that of passing from a source of energy (fossil) to diverse sources, more dispersed and whose availability and usability change depending on the location (hydropower, for example, is practical in mountainous territories). This is going to change massively how crucial activities – producing energy – are done. Unlike oil or gas, which can be transported through pipelines, transport is not an option when it comes to renewable energy. The types of infrastructure need to change accordingly. Furthermore, the fact that a progressive limitation of old energy sources (and emissions) is being practiced, implies that promoting renewables means that the idea of abundance in energy sources should be abandoned.

2.2. Energy efficiency

As a matter of fact, what is at stake is how the overall energy sector works and, in this framework, the issue is being dealt with also under the lens of the promotion of energy efficiency. In general, it is to stress that energy efficiency is inherently cross-sectoral[3] and concerns various aspects of social and economic life. A crucial aspect of energy efficiency is energy saving (particularly carbon energy). How the latter is achieved depends on the approach adopted. While the promotion of renewables has to do with the production of energy, energy efficiency has to do with energy use, given the objective of reducing emissions.

In France, for example, one of the pillars of energy efficiency is the management of energy demand. In Romania, there are ambitious objectives in terms of reduction of primary energy consumption by 25% and gross final energy consumption by 29% compared to 2022. The sectors mostly entailed by the policies of Energy efficiency are industry, building and transport. In Denmark, through diverse actions concerning building codes, appliance standards, and industrial energy efficiency programs, there was a significant decoupling of economic growth from energy consumption. The life cycle approach to building industry was promoted. Industry has contributed significantly to reduction of emissions. A similar approach is also implemented in Germany where measures to improve energy efficiency were taken concerning buildings, industry, and transportation.

Efficiency strategies imply the implementation of "diffused" actions, e.g., for improving buildings' energy efficiency. This is evident in Austria, for instance, where policies such as the Austrian Climate and Energy Strategy and the Renewable Energy Expansion Act encourage energy-efficient construction, the use of renewable energy for heating and cooling purposes, and the retrofitting of existing buildings to reduce emissions. However, despite the active involvement of the relevant authorities in

[3] A specific CROSSEU case-study (CS7) is devoted to this issue.

these measures, challenges remain in scaling up green building practices, particularly with regard to affordability and regulatory barriers.

The building sector is crucial for mitigation in many countries: in Germany measures to improve energy efficiency were taken concerning buildings, which include stringent building codes and a national carbon pricing system for sectors not covered by the EU ETS. The same applies in Italy, where policies entail building standards and regulations (that include increased resistance to high winds, flooding, and therefore something relevant to adaptation). In France too, energy efficiency is particularly focused on buildings. In Romania emissions from the buildings and waste sectors rose by 9% and there is a general difficulty in fully complying with the requirements of the EU Energy Efficiency Directive. In Czechia, programmes are aimed at diminishing local pollution caused by boilers, thus impacting the residential sector. Relevant results have been achieved also using incentives for the replacement of old equipment, as well as legal and regulatory measures like bans on polluting devices. In Denmark too, energy efficiency is pursued through regulations and incentives such as building codes and appliance standards aimed at promoting energy conservation and reducing energy consumption. It should be noted that the forms of energy efficiency could be very complex, such as district heating which serves 64% of Danish households.

The issue of Energy efficiency is particularly relevant in the so-called 'hard-to-abate' sectors (steel, glass, ceramics, cement, chemistry) and active actions are being undertaken. In Italy, the guiding principle is 'energy efficiency first', which finds in efficiency the first lever to be used to obtain economic and environmental benefits in terms of reducing emissions. Energy efficiency is considered crucial in a "high energy intensity" country like Czechia, which has large energy-intensive industry sectors. Industries were allowed tax incentives and grants to favour the adoption of more efficient machinery and processes via subsidy programmes. In this way, the industry is having good results in terms of decreasing emissions. Romania registered a decrease in emissions from the industrial sector. In Germany, energy efficiency in industry implies support for industrial energy-saving technologies. Lenders may offer incentives and support for businesses to adopt more sustainable practices, such as energy efficiency improvements, waste reduction, and the use of renewable energy. Austria is supporting the development and implementation of energy-efficient technologies in industry. This is achieved through financial incentives. In various industrialized areas, there have been many advancements in industrial technology transformation. In the UK the objective is to decarbonise industry whilst simultaneously transforming it by attracting inward investment through support to the industry to switch to cleaner fuels, improve resource and energy efficiency through dedicated funds, the use of UK ETS and fair carbon pricing. Table 2 below synthesises, at the national level, the main focus, the key sectors targeted, and the main policy instruments.

Table 2 – Synthesis of the main focus, key sectors, and policy instruments on energy efficiency at the national level

Country	Main focus	Key sectors targeted	Main policy instruments
Austria	Energy-efficient construction and retrofitting	Buildings, industry	Incentives, climate and energy strategies
Czechia	Efficiency in energy-intensive economy	Industry, buildings	Subsidies, equipment replacement, regulatory bans
Denmark	Decoupling growth from energy consumption	Buildings, industry	Building codes, appliance standards, industrial programmes
France	Demand-side management and energy saving	Buildings, transport, industry	Standards, building renovation policies
Germany	Systematic efficiency improvements	Buildings, industry, transport	Standards, carbon pricing, support schemes
Italy	"Energy efficiency first" principle	Buildings, industry	Building standards, incentives, regulations
Romania	Reduction of energy consumption	Buildings, industry, transport	Targets, regulatory measures, EU directives
UK	Industrial dicarbon. through efficiency	Buildings, industry	Funds, carbon pricing, support for fuel switching

2.3. Decarbonisation of transport

Another relevant sector of mitigation policies is transport, and all the countries considered intervene in it. Italy's policy includes promoting EVs, zero-emission ships and planes, trains also for freight, cycling with dedicated lanes, recharging structures for electricity and hydrogen, and electrification of ports.

In Romania, the strategy focuses on strengthening rail transport and increasing electric vehicles. Efforts are underway but authoritative observers say that they should be intensified.

In Czechia, there is a plan for promoting electric vehicles, through recharging points and a new law that establishes new standards and regulations for vehicles. Urban policies are promoting public transportation and other measures to favour cycling and walking.

Germany promotes the use of electric vehicles through subsidies, tax incentives, and the development of charging infrastructure. Additionally, there are efforts to enhance public transportation and encourage cycling

and walking. Germany has introduced a national carbon pricing system for sectors not covered by the EU ETS, which includes transport. This system sets a price on carbon to incentivize emission reductions. Regional governments promote sustainable transportation options such as public transit, cycling, and walking. This can involve investments in public transport infrastructure, the development of bike lanes, and initiatives to reduce car dependency. Local governments implement these activities in practice.

Various levels of government are involved in Austria's transport policies, which foresee the adoption of EVs and the related charging infrastructure, the expansion of public transport, and the promotion of sustainable mobility practices to offer low-emission alternatives to private car use.

The Danish transport plan aims to reduce national emissions from road transport, shipping, and aviation. This objective will be achieved through a combination of electrification, biofuels, and other innovative measures, promoting cleaner and more sustainable modes of transportation, which implies setting targets for electric vehicle adoption, promoting public transportation, and improving fuel efficiency standards. Infrastructures are relevant also for the promotion of cycling. EVs are promoted via incentives.

In the UK the objectives of transport policies are similar to those of other countries: accelerating decarbonisation of transport sector, transforming cities and towns with greener, faster, and more efficient transport; promoting Zero-emission vehicles, including by giving a clear signal to investors; increasing the share of journeys taken by public transport, cycling and walking, electrifying more railway. Decarbonisation will also involve the maritime sector. The tools for doing this are funding of various forms of support and grants for EVs and for recharge infrastructures, promoting the updating of public transport.

The pillars of France's strategy are the Improvement of the energy performance of vehicles (light and heavy), the decarbonization of energy consumption for vehicles, and adapting infrastructure. A distinctive aspect of the French plan is the Management of demand for transportation through teleworking, carpooling, local supply chains, and vehicle usage optimization, encouragement of modal shifts toward lower-emission passenger and freight transport (public transit, rail), and support for active modes (cycling, walking).

What is crucial to consider is that the impacts of these policies – maybe because they are diffuse and involve a plethora of individual actors- are below the expectations and needs. In Romania emissions in the transport sector have risen by 50% since 2005, now accounting for 17% of the country's total emissions. Czechia is not reaching the targets, and an extra effort is being promoted. In Germany, the transport sector is considered one in which the challenges are the hardest, and in Austria too there are problems since the high emissions in the transport sector have undermined the overall effort to diminish GHG emissions. In France,

transport policies have not been as successful as hoped. One exception seems to be Denmark, which had significant progress in sustainable transport with the increase in the use of public transport, cycling, and electric vehicles.

Table 3 below synthesises, at the national level, the main focus and the measures and tools.

Table 3 – Synthesis of the main focus and key measures on the decarbonisation of transport at the national level

Country	Main focus	Key measure & tools
Austria	Sustainable mobility alternatives	EV adoption and charging infrastructure; expansion of public transport; sustainable mobility practices to reduce private car use; multi-level governance involvement.
Czechia	Urban mobility and EV regulation	Promotion of EVs through charging points; new law setting standards and regulations for vehicles; public transport, cycling and walking in urban policies.
Denmark	Comprehensive low-carbon transport	Electrification, biofuels and innovation; EV incentives; targets for EV adoption; public transport and cycling infrastructure; fuel efficiency standards; road, shipping and aviation included.
France	Supply- and demand-side transition	Energy performance of light and heavy vehicles; decarbonisation of vehicle energy use; infrastructure adaptation; teleworking, carpooling; modal shift to public transit and rail; support for cycling and walking.
Germany	Systemic transition of transport	EV subsidies and tax incentives; charging infrastructure; public transport, cycling and walking; national carbon pricing for transport; regional and local implementation.
Italy	Modal shift and electrification	Promotion of EVs; zero-emission ships and planes; electrification of ports; rail (including freight); cycling with dedicated lanes; electricity and hydrogen charging infras.
Romania	Rail transport and EV uptake	Strengthening rail transport; increasing electric vehicles; implementation underway but requiring intensification.
UK	Accelerated transport decarbonisation	Zero-emission vehicles; funding and grants for EVs and charging infras.; public transport upgrades; cycling and walking; railway electrification; maritime decarbonisation.

As we will highlight below, the transport sector is also a cause for concern in terms of adaptation because it can be severely affected by flooding, avalanches, landslides and other natural hazards, which can have a knock-on effect throughout the economy and society. The policies implemented in all the countries considered in this regard are often more reactive than preventive.

2.4. Reduction of emissions from agriculture

Agriculture is one of the sectors that contribute to the overall GHG emission level. It is crucial for climate change policies also because mitigation policies in this sector overlap with those of adaptation (and the correct coordination between them is necessary). In Austria and Denmark there is a special focus on the need to increase the use of renewable energy in agriculture. In Italy, Romania, Czechia, Austria, Denmark and France it is recognized that the emissions produced by agricultural activities have to decrease. The tools mentioned in the documents consulted are various. For example, those from Italy, Denmark, and Austria mention regenerative agriculture, carbon-based agriculture, and improved livestock practices, including through the use of the ETS. Furthermore, the promotion of carbon farming is a wider European policy. The results reported are mixed: in Romania diminution of emissions are registered, but in Czechia the results were not so big.

2.5. Emission trading systems (ETS)

Almost all of the countries considered participate in the European Emission Trading Scheme. The ETS is a financial tool that funds innovations that reduce emissions. Relevant results seem to have been reached in Czechia: while GHG emissions from facilities covered by EU ETS decreased by 33.7% in the period 2005–2020, emissions outside EU-ETS (i.e., especially waste management, agriculture, transport, and households) decreased only by 8.4% in the same period. Based on this, the International Energy Agency's (IEA) Energy Policy Review (2021) recommended "introduce a carbon tax in sectors not covered by the EU ETS to stimulate further low-carbon investment and reduce fossil fuel consumption in Czechia. However, right now (2025), the Czech government wants to step out of ETS II.

In Germany, as mentioned above, a national carbon pricing system has been introduced for sectors not covered by the EU ETS, such as transportation and heating. The UK also considers this approach to be promising and has set up a UK-based ETS.

Mitigation is not limited to these core sectors but also to others: forestry, water management, green financing, waste management, research and innovation, and information to stakeholders. How countries implement policies concerning them varies significantly.

2.6. Forestry

Forestry is very often considered as an autonomous aspect of mitigation policies, as forest carbon sinks could be used to offset emissions and, therefore, could contribute to the desired emissions targets. This is reported in Romania, Czechia, Austria, Germany, France, and Italy. There is a significant overlap with adaptation, as it is mentioned by the Italian

authorities (forestry is not only a way to sequester carbon but also a nature-based approach to control flooding, contrast urban heat waves, etc.). In Denmark and the UK, the role of forestry for adaptation is more emphasized.

2.7. Water resources management

In general, water management is considered part of the adaptation policies, and this emerges clearly from the countries' chapters. The exception is Italy where it is mentioned, in the consulted documents, that a more rational water management can help in reducing emissions by decreasing water use (because of less energy needed for water treatment and transport).

2.8. Green Financing

One of the problems of the mitigation policies is connected to funding the planned activities. As mentioned above, ETS is one of the approaches being practiced. In general, the issue is the mobilization of the needed funds and, in this framework, the involvement of the private sector and engagement in investing in economic activities in line with the objectives of mitigating climate change. In the various countries considered here there are diverse approaches. The box below summarises the main measures collected in the documentation.

Table 4 – Main green financing measures adopted at the national level

Country	Key Measures and Tools
Austria	Funding from ETS, national funds, and EU climate programs; financing projects on mitigation and adaptation focusing on innovation, renewables, and sustainable infrastructure; engagement with private sector via incentives, subsidies, and public–private partnerships; mix of public and private investment including EU programs.
Czechia	ETS experience; funding mainly expected from EU sources; national agency manages administration of relevant EU funds.
Denmark	Combination of public funding, private investment, and innovative financing mechanisms; diversified approach to ensure financial sustainability and leverage public/private resources and expertise.
France	Funding remains a persistent challenge; policies supported through European funds, including the Just Transition Fund.
Germany	Public funds crucial; government provides financial support (e.g., to coal regions) to aid transition toward sustainable economic activities.
Romania	Specific funding facilities for mitigation and adaptation; EU funds and public investments essential; private sector financing critical but difficult due to weak enabling environment.
UK	Promotion of private investment to finance the transition; consumers and economic actors central, with goal of reducing energy bills and incentivising green choices.

2.9. Waste management and circular economy initiatives

Waste is among the causes of GHG emissions and, as part of the circular economy, sometimes enters the domain of mitigation policies. It could be noted that actions for waste management require a diffuse action of different actors (final consumers, firms, local and regional authorities, etc.).

The Italian plan foresees preventing waste and/or promoting its reuse. The concept is the valorisation of waste biomass, urban organic waste, non-food crops, and second-harvest crops to produce energy, bio-products and biofuels, with clear production, environmental, and climate benefits. In the framework of the PNRR projects have been launched on “Green Islands” and “Green Communities”.

In Romania, waste management is considered crucial also because emissions from this sector grew (together with emissions from buildings while diminished emissions from industry and agriculture). Progress in sectors such as packaging, waste, textiles, or construction is rather unsatisfactory. In Czechia, the management of waste is particularly relevant for urban climate transition policies. In Denmark circular economy initiatives are promoted to reduce waste, increase resource efficiency, and minimize the environmental impact of production and consumption patterns. This aligns with both adaptation and mitigation by reducing resource consumption and minimizing the environmental impact of production and consumption patterns. Waste management is a way to reduce newly generated energy. In France the valorisation of biomass to reduce the consumption of carbon implies the use of waste.

In the UK, Natural Resources, Waste & Fluorinate-Gases is one of the policy sectors of mitigation. Actions include funding net zero related research and development across Natural Resources, Waste & F-gases, to inform development pathways. Public funds to improve food waste collection for all households are also foreseen. It is interesting what happens at the regional level: in Wales progress has been seen in the waste sector since recycling rates remain higher than in the rest of the UK, but improvements have stalled in recent years.

2.10. Research and innovation

Research is considered one of the tools of mitigation policies in most of the countries considered. In Romania funds of the Environmental Fund Administration (EFA) are allocated explicitly for research but a recent evaluation stated that there is a lack of concrete measures to support research and innovation in renewable energy technology and adaptation to climate change.

The German government supports research and innovation in climate-friendly technologies and practices, fostering development in areas such as renewable energy, energy storage and sustainable agriculture. Examples of such initiatives include the Energy Research Programme and

the National Hydrogen Strategy. Some lenders invest in the research and development of climate-friendly technologies and practices, often in collaboration with local universities and research institutions. Notably, the German government also funds research programmes and partnerships with research institutions and the private sector. Cooperation between diverse actors in research, in the spirit of the so-called Quadruple helix approach, is practiced also in other countries.

In Austria, the government works closely with researchers, businesses, local authorities, and civil society organizations to ensure that climate action is informed by the latest data and that policies are inclusive and widely supported.

In Denmark, research on environmental issues and climate change is promoted to develop and implement climate solutions by fostering collaboration between research institutions, businesses, and government agencies.

This cooperative approach is interesting since it could help addressing the problem of implementing diffuse innovation by involving the potential users as early as possible in technology development.

2.11. Public engagement and information

In general, public awareness and engagement are considered crucial, and all of the analysed countries recognise the importance of implementing them, at least in principle. However, inconsistencies sometimes highlight the complexity of the issue. In Romania, for instance, recent studies have identified public awareness and engagement deficits as a barrier to M&A. Nevertheless, a good percentage of Romanian people say that they are concerned with environmental issues. In Czechia it is reported that many residents, regional and local policy and decision makers, city planners, as well as local stakeholders are unaware of the specific climate risks facing their communities (especially for what concerns adaptation). Nevertheless, it seems that even if low, awareness is raised.

More interventions are needed in Czechia, as it happens in other countries. In Germany, regional governments often run public awareness campaigns and educational programs to inform citizens about climate change and encourage sustainable behaviours.

In Austria, public engagement and awareness campaigns also play a vital role in fostering climate responsibility at the community level. To raise awareness of the consequences of climate change among stakeholders at regional level, regular dialogue events have been held since 2013 to transfer knowledge and highlight a wide range of options for action in cooperation between the BMK, the Climate and Energy Fund, the federal states and the Federal Environment Agency.

There are differences in approach. Some countries consider it important to promote general awareness of mitigation and climate change issues. In

other cases, it is emphasised that public awareness and engagement are necessary for demand management. Denmark's approach falls into the latter category, as the country's plan emphasises that public awareness and education can indirectly influence consumption patterns and lifestyle choices. By informing and engaging citizens about climate change, more sustainable consumption habits and reduction of overall demand for energy and resources can be encouraged. In this framework, NGOs and environmental organizations have a pivotal role for raising awareness, advocating for ambitious climate policies, and holding the government and businesses accountable for their climate commitments. Communities, in their turn, can play a role in promoting sustainable practices, supporting local initiatives, and creating a culture of climate awareness.

In France, as mentioned above, 'demand management' is considered an important aspect of mitigation policies, as are training, awareness-raising and involving citizens in the transition towards a low-carbon culture. However, it should be noted that the participation encouraged following the Gilets Jaunes crisis did not lead to significant consideration of citizens' hints. This suggests that dialogue is a politically challenging endeavour, hence the potentially positive role of NGOs and citizen organisations in facilitating dialogue.

3. COMPARATIVE ANALYSIS ON ADAPTATION POLICIES

Adaptation policies are more diverse in the various countries) and, in general, seem to have a wider scope than Mitigation policies. This should come as no surprise, given that the problems connected to mitigation should be addressed with reference to the global sphere, while the problems of adaptation are much more specific to each specific local context.

An interesting example is the list of sectors that were included in the French five-year adaptation plan of 2011-2015 (see Annex B5 – the list was later adapted according to the needs that emerged from implementation). To introduce this issue effectively, it is helpful to present it here, as it illustrates the wide range of diverse sectors that can be included in adaptation policies (see Table 2).

There are some overlaps among climate policies between mitigation and adaptation (we will examine this question in detail in the next paragraphs). This concerns, in different ways, all the entries highlighted in yellow or in blue in the table.

Table 5 – List of climate change policy sectors

1.	Health
2.	Biodiversity
3.	Natural hazards
4.	Fisheries and aquaculture
5.	Tourism
6.	Coastal zones
7.	Mountain regions
8.	Water resources
9.	Agriculture
10.	Forests
11.	Energy and industry
12.	Infrastructure and transport systems
13.	Urban planning and the built environment
14.	Financing and insurance
15.	Cross-cutting actions
16.	Information
17.	Education and training
18.	Research
19.	Governance

We compare countries' policies in relation to the white entries as well as urban planning and infrastructure. We include the latter two from the yellow entries, because adaptation policies in these segments differ quite a bit from the mitigation ones.

Ultimately, we will look at:

- Natural hazards
- Infrastructures and urban planning
- Biodiversity, nature-based solutions, fisheries and aquaculture
- Health
- Coastal zones
- Mountain regions
- Tourism.

Among the set of activities under these entries, there are overlaps: for instance, the natural hazards' management is also of interest in coastal zones and mountain zones.

3.1. Natural hazards' management

In general, climate change brings about risks that often produce disasters connected with natural hazards. Adaptation, therefore, means also dealing with the prevention and/or mitigation of the effects of such disasters.

The current approaches are diverse in the various countries considered here. The contexts are different as are the major natural hazards.

Sometimes, forms of coordination are foreseen with already existing civil protection mechanisms. Notwithstanding this, emphasis is put in the various countries on the novel situation being brought about by climate change. In Czechia, funds have been allocated at the national level for supporting and developing early warning systems for emergency events but, in Romania, the National Disaster Risk Reduction Strategy is not included in the climate change adaptation policies. In Denmark, disaster risk management is recognized as one of the sectors of adaptation policy, and it is interlinked with others. In Italy disasters' risk management is crucial, but it is much more considered reactively in relation to occurred disasters and much less for preventing the effects of natural hazards (indeed, in Italy, we spend too little on prevention and then end up spending a lot on repairs; the ratio varies from 1 in 6 to 1 in 10 and the situation gets worse). Similar situations occur in many other European countries.

Climate change implies disasters that cannot be considered rare events but a new normality. In some countries, for example, in Germany or the UK, disaster risk management is implemented at the local level, where the effects of disastrous events occur and are mainly felt. In Czechia, responsibility for management of risks and disasters connected to climate change is considered, among others, at the urban level, in the Climate Change Adaptation Strategy of the Capital City of Prague. In Denmark the adaptation plan foresees initiatives, such as a pilot project for a comprehensive storm surge protection plan for Copenhagen and surrounding municipalities (already underway), or for addressing high groundwater levels in urban areas. Cross-sectoral collaboration and knowledge sharing is also being promoted on this matter. Beyond the immediate relief, in general, interventions are being implemented aimed at avoiding disasters, such as the construction of new infrastructures. The table below provides a national-level overview of the key measures and tools.

Table 6 – Key measures for natural hazard management adopted at the national level

Country	Key Measures and Tools
Czechia	National funding for early warning systems for emergency events; risk and disaster management addressed also at urban level.
Denmark	Disaster risk management recognized as a sector of adaptation policy; pilot projects for storm surge protection; initiatives addressing high groundwater levels; cross-sectoral collaboration and knowledge sharing.
Germany	Disaster risk management implemented mainly at local level, close to affected areas.
Italy	Disaster risk management mainly reactive; reliance on civil protection mechanisms; low investment in prevention compared to post-disaster repairs.

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Country	Key Measures and Tools
Romania	National Disaster Risk Reduction Strategy exists but is not integrated into climate change adaptation policies.
UK	Disaster risk management and civil protection mechanisms at local level.

3.2. Infrastructures and urban planning

Infrastructures are a crucial aspect of the adaptation strategies considered. In some cases – as in Italy, for example – they are mostly connected to water management and the change in hydrological systems brought about by climate change. The focus is on maintaining the functionality of critical infrastructures at risk, including energy transmission networks (e.g., in the Czechia Annex (B3), also concerning the integration of imported energy sources) and communication networks (as in the UK case, where infrastructures should also be resilient to the so-called "cascading risks"). Adaptation of infrastructures – as reported in the Czechian case – has not to do only with the physical renewal of existing infrastructures but also with the optimization of activities that are served by those infrastructures: for example, the use of water in manufacturing.

A further aspect concerns regulations that should be in line with the new technical standards that may be required by updated infrastructures. This is stressed, particularly in Czechia with a reference to the blue-green infrastructures. This aspect is also relevant to address the negative perception of adaptation measures by various stakeholders, including investors. This type of regulatory change has also been the object of adaptation initiatives in France, where the focus was – among other things – on updating infrastructure standards to address climate risks (e.g., transport and construction sectors). In the UK there is specific attention to changing standards for promoting infrastructure resilience as part of the expected change in the overall system for the provision of infrastructures.

In general, changing infrastructures to promote adaptation has large impacts on territories and society. Renewed infrastructures must withstand the changing climate, mainly (but not exclusively) by upgrading flood protection systems, improving water management, and making buildings more resilient to heat waves. This very wide scope of infrastructural policies for adaptation is clear in Austria, which is upgrading its flood protection systems, and this implies the construction of new dams, retention basins, and flood barriers, as well as restoring natural floodplains to mitigate the risk of flooding. This is happening both in rural and urban areas (in different ways). In Denmark, beyond infrastructures serving energy and communication systems, cycling infrastructures are also explicitly mentioned in the consulted documents. In this framework, the overall urban design is going to be impacted.

Infrastructure updates involve, in general, a wide array of actors, particularly local and regional authorities. The involvement of the private

sector is relevant too, as it is stressed in the cases of France, Czechia, and the UK. Basic information on the key measures adopted at the national level is provided below (Table 7).

Table 7 – Key infrastructure and urban planning measures adopted at the national level

Country	Key Measures and Tools
Austria	Reforestation; wetland protection; adaptation of farming practices; drought-resistant crops; soil management techniques; support to climate-resilient land use.
Czechia	Limiting landscape fragmentation; protection of ecosystems and watercourses; use of nature-based solutions at urban level
Denmark	Biodiversity as a guiding principle; integration of nature-based solutions in adaptation and mitigation policies.
France	Ecosystem preservation and restoration; implementation of "no-regret measures" to avoid irreversible damage (including to marine species).
Italy	Biodiversity as a guiding principle for adaptation and mitigation; use of nature-based solutions; preservation of fisheries and aquaculture.
Romania	Biodiversity as a principle of action; promotion of nature-based solutions.
UK	Peat restoration; woodland creation and management; Nature Recovery Projects across terrestrial, freshwater, coastal and marine habitats.

3.3. Biodiversity, nature-based solutions, fisheries and aquaculture

Biodiversity is an important aspect of the adaptation policies in all eight countries. It can be seen as a "hybrid" issue because it serves both as a guiding principle that shapes actions across different areas of adaptation policy and as a subject of specific initiatives and activities. In Italy and Denmark, this is explicitly a guiding principle for both adaptation and mitigation that, for example, leads to considering nature-based solutions in policy implementation. This approach is also shared by Romania and Czechia.

In general, biodiversity means paying attention to preserving native species and ecosystems that can better withstand climate impacts when intervening to promote adaptation. The idea is to make the ecosystems continue providing their services when promoting climate change mitigation and adaptation and leveraging nature-based solutions to enhance resilience. In this framework, attention must be paid to how to restore biodiversity and/or how to preserve it when doing other interventions.

In the Italian documents that have been consulted, explicit reference is made in this regard to actions such as preserving various forms of fisheries and aquaculture; In France, adaptation effort means also implementing the so-called "No-regret measures" to avoid permanent damages such as the destruction of certain marine species. In Austria, adaptation implies

reforesting areas and protecting wetlands, adapting farming practices to changing weather patterns. It involves promoting drought-resistant crops, improving soil management techniques, and providing farmers with climate data and guidance on sustainable practices). Peat restoration and woodland creation and management are among the actions considered in the UK. In this country, more in general, the Natural environment is one of the sectors of activity of the most recent (the third) National Adaptation Plan, which foresees Nature Recovery Projects focused on terrestrial, freshwater, coastal, and marine habitats and species, forests and peatlands, agriculture, and soils.

Biodiversity is also important if considered as a principle of action. As such, it potentially has a strong impact on other adaptation (and mitigation) activities. In the case of France, it means, in very general terms, the objective of preserving and restoring ecosystems to address climate hazards (it is one of the suggestions received from a review and adopted in the current plan of action for adaptation). In Czechia, respecting biodiversity means limiting landscape interventions that fragment ecosystems (defending biodiversity includes also watercourses). In the city of Prague, the strategy focuses on reducing the negative impacts of climate change by using nature-based solutions to preserve water, soil, and biological components of the landscape. In Italy, Romania, and Denmark it means that nature-based solutions have to be searched for.

In general, promoting biodiversity in adaptation (but the same could be said for mitigation), has the following implications.

Firstly, it implies long-term planning (on the same scale as for infrastructures or even longer, as in the case of peatland restoration). Secondly, it requires the interaction of policymakers with those who take care of landscapes.

Thirdly, and more generally, it implies multi-actors' cooperation (in agriculture, infrastructure building, forestry, fisheries, land management, e.g., in wetlands, and urban planning) which, in turn, requires sharing visions concerning biodiversity and how to defend and promote it. Fourthly, as suggested in the UK, there is a need for dedicated funding for adaptation that allows for the consideration of biodiversity objectives

Last but not least, it should be highlighted that there may also be conflicts between individual (sets of) policies, such as between nature/biodiversity and any infrastructure intensive interests (or even beyond, e.g., with agriculture and forestry). For example, in Denmark, a fluvial flood protection scheme was actively declined in one municipality because the plan failed to clearly explain how it considered the effects on a protected frog. It requires a lot of effort to reconcile nature/biodiversity with other interests.

3.4. Health

Health is a recognised factor in climate adaptation, particularly with regard to mitigating the effects of hazards such as heat. Including it in this category of policies reflects the wide scope of climate change's impact on our societies and the comprehensiveness required of policies to effectively address this challenge. Adaptation involves dealing not only with the direct environmental, infrastructural and economic consequences of global warming, but also with its social and human impacts, paying particular attention to disadvantaged groups whose health conditions are most affected by the effects of climate change.

Therefore, the issues to be dealt with are inherently social and not merely technical. This is clearly evident in some countries where inequality issues emerge in relation to the promotion of public health. The way in which the problem is approached in various countries inevitably depends on the characteristics of their respective national healthcare systems and reflects the principles and structures on which they are based. Interestingly, Scotland's adaptation plan is based on the principles of 'just transition' and focuses on supporting the most vulnerable people and communities and building resilient, healthy and equitable places. The table 8 below summarises the main measures collected in the documentation.

Table 8 – Main health-related measures adopted at the national level

Country	Key Measures and Tools
Austria	Focus on strengthening the healthcare system's capacity to deal with heat-related health risks, such as heatstroke and vector-borne diseases; improving early warning systems; developing heat action plans; ensuring that vulnerable groups, such as the elderly, have access to necessary support.
Czechia	Emphasis on preventing infectious and non-infectious diseases; ensuring adequate healthcare infrastructure; informing the public about risks and preventive measures.
Denmark	Public health is one of the sectors of the national Adaptation Plan.
France	Various forms of coordination with other adaptation policies; focus on the reduction of health risks and the adaptation of living conditions to increasing temperatures.
Germany	Public health is one of the sectors of the national Adaptation Plan.
Italy	Protection of health is one of the criteria for defining and evaluating adaptation strategies.
Romania	Public health is one of the sectors of the national Adaptation Plan.
UK (Scotland)	In the UK, attention is paid to alerting health care systems so that lives can be protected. Scotland's adaptation plan, based on the principles of *"Just transition"*, focuses on supporting people and communities most vulnerable to climate impacts and on building resilient, healthy, and equitable places.

3.5. Coastal zones

Some of the countries considered (among those having coasts) pay special attention to the preservation of the coasts. In France, coasts have been an object of interest for many years. In Italy, they are an area of particular concern especially for preserving biodiversity and promoting ecosystem restoration. Mapping and monitoring of marine and coastal systems and their restoration are being implemented. In Denmark Coast protection is a traditional sector of public action. The adaptation plan includes state assistance to municipalities for coastal protection also through pilot projects focused on storm surge protection and sand nourishment. The complexity of the issue is acknowledged too, and cross-sectoral collaboration, knowledge sharing, and the improvement of the framework for municipal coastal projects are promoted. In the UK investments in coastal erosion schemes have also been promoted.

3.6. Mountain regions

Mountain regions received a special mention in the case of Germany (for the southern "Länder's") and, particularly, in Austria, where in mountainous provinces such as Tyrol and Vorarlberg, the adaptation policies emphasize the protection of landscapes from the impacts of landslides, avalanches, and glacial retreat due to rising temperatures. These regions have invested in infrastructure improvements such as stabilizing slopes, enhancing early warning systems, and restoring natural barriers. To a lesser extent, this also occurs in Italy, with particular regard to the Alpine regions (based on our documentary sources).

3.7. Tourism

Tourism is an economic sector particularly impacted by climate change. The focus does not seem to be so much on how to preserve the tourism sector at risk from climate change, but rather on ensuring that the promotion of tourism does not hinder adaptation efforts. On this basis, there are some differences between countries. In Italy, sustainable tourism is seen as a tool to preserve the sea and coasts. In Czechia, the need is connected to educate all participants in the tourism sector on the issues of climate, and each stakeholder is encouraged to consider the consequences of their actions. In Germany, the creation of a sustainable and climate-friendly tourism industry is an objective of adaptation policies in Southern länders. Austria has focused on leveraging its alpine geography to promote eco-tourism as a sustainable economic model. In France, the need is stressed to support the transition of various sectors, including tourism, to more resilient models. In Romania, tourism is one of the sectors of the Climate Change Adaptation Strategy for 2030.

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3.8. Adaptation and change of risk regimes

Adaptation involves dealing with the 'forces of nature' (related to natural hazards) in a different way to how we have done in the past. In almost all cases, policies involve mapping new or intensified risks (the mapping-based mechanism is clearly presented for the UK case) and defining consequent actions. Hazards and vulnerabilities are increased by climate change due to GHG emissions and have to be met by appropriate measures. Examples include rising sea levels and the consequent damage to coasts, as well as floods, droughts and wildfires. These issues are evident in many countries: coastal defence is a key concern in Denmark, France and Italy, while flood defence is a widespread issue in all countries considered. Climate change requires a new approach to managing such 'forces of nature', which has a profound impact on modern societies (e.g., how we use the sea or the mountains, how we use precipitation for our human activities such as agriculture or electricity generation; see Latour "We have never been modern"[4]). This change of risk regime is a significant challenge. Activities intended to adapt to climate change can alter landscapes. Examples include peatland restoration (e.g., in the UK), flood control (e.g., in Italy), restoration of natural floodplains (e.g., in Germany and Austria) and the construction of retention basins or dams (e.g., in Austria).

Adaptation actions are significantly based on intervention in infrastructures.

This is evident if control of floods and sea levels are concerned but emerges in general. Agriculture, for example, is a crucial sector of Adaptation actions and the management of risks requires a renewal of infrastructures for the management of water scarcity. Water scarcity, of course, concerns also other uses beyond agriculture, including the construction of new water reservoirs (see The Czech Republic). Infrastructure renewal is implied also in relation to Adaptation action concerning the building stock, roads, and public transport. The same can be said for urban adaptation initiatives (see Denmark). In the UK and Denmark, the protection of other civil infrastructures is mentioned, such as those concerning telecommunication or distribution of electricity. The centrality of infrastructure implies the complexity of this type of investment: not only do they normally imply long-term programming, but they also require special intervention and responsibility of public actors and specific rules they must follow to operate (concerning the release of funds, the management of contracts, the ownership of infrastructure works, etc.).

One consequence of this important 'infrastructural' aspect (though not exclusively) is that adaptation policies tend to be long-term, both due to objective reasons (some works required for adaptation take a long time to carry out) and bureaucratic issues in decision-making processes (see below, Section 6), as well as other reasons or delays in finding the necessary funding. This is despite them being aimed at achieving concrete results in

[4] Latour, Bruno (1993). *We have never been modern*. Harvard University Press. p. iv.

terms of immediate or short-term risk reduction (while mitigation measures unfortunately only generate effects in the longer term). The time needed to decide on, design and implement many activities labelled as 'adaptation' could exceed the three to five years normally defined as a long period. This does not apply to all types of adaptation activities, but it should be recognised as a typical consideration. 'Softer' initiatives, such as those concerning regulations and education, also normally require several years to produce the expected effects

4. STRUCTURAL AND NON-STRUCTURAL MEASURES

The blue entries in the table above are defined (in the source document i.e., PNACC1 France) as 'soft aspects' or 'non-structural' climate change policies, while the yellow entries represent 'harder aspects' or 'structural' policies, which are mostly dedicated to infrastructural interventions or their preparation. Structural measures generally involve physical constructions designed to reduce or avoid the potential impact of hazards, or the application of engineering techniques or technology to make structures or systems more resistant to and resilient in the face of hazards. Examples of common structural measures for disaster risk reduction include dams, flood levies, ocean wave barriers, earthquake-resistant construction, and evacuation shelters.

Going beyond the prevention of possible impacts of hazards, structural measures involve the construction of artificial structures that, through a combination of science, technology and a bit of brute force, prevent, for instance, a river from flooding but also the construction of wind turbines as part of the transition towards renewable energy. However, structural measures are not always an adequate and sufficient response, as they cannot completely eliminate the risk or assure the transition. Moreover, such measures can involve huge financial investments and lead to various social and environmental impacts.

Soft, or non-structural, measures are those not involving physical construction that use knowledge, information, or agreement to reduce disaster risks and impacts. Common non-structural measures include building codes, land-use planning laws and their enforcement, research and assessment, information resources, public awareness programmes, training, and education.

We define them "soft" since they do not consist of actions aimed at intervening physically to mitigate or adapt to climate change (we consider soft and non-structural actions as synonymous, see above), but to set the conditions for correct and smooth implementation of such interventions. In all the countries, these aspects have become relevant aspects of climate policies.

Even if we have highlighted the differences in approaches to M&A, it is notable that soft aspects are foreseen everywhere, even if they are defined and managed differently. They are justified by the huge complexity of the effort that is being made to address the climate change challenges. Such complexity (it could be even better to say "social complexity") seems to be acknowledged in the different countries considered. Relevant sources of such complexity are:

- Climate change and its impact on society is an unfolding process, the knowledge of which is partially uncertain and always in the making
- Diversity and number of actors, each having specific points of view, interests, capabilities, and power
- Climate change is a process systemically impacting society; it can be tackled only if approached holistically and considering the interactions between different phenomena and trends
- Climate change affects various technological paradigms on which our modern world is shaped (e.g., the use of energy and natural resources retro-act on the environment). The regime (see Section 3.8) through which the (social, economic and environmental) risks have been traditionally handled is not working anymore and new regimes should be established
- Climate change produces an overall transition to a new regime (see Section 3.8). A transition can be imagined as the result of a trend this case how the environment is being changed by current uses) and the policies to handle this trend. How policies address the development of the trend is a matter of research and, possibly, successive adjustments.

A comparison between the different countries makes it possible to highlight some criticalities of M&A policies that can be better understood, at least prima facie, by considering these sources of complexity (see below section 6). Most of these criticalities are social in nature or are generated by social interaction implied by their implementation.

5. Overlaps, trade-off and conflicts among Mitigation and Adaptation policies

5.1. Resource availability and priority hierarchy

Before we delve into the content of the policies, we must consider the issue of resource use, in terms of both finances and human resources. Since the resources allocated to climate policies are limited, it's clear that the more they are used for one side of the issue, the fewer resources will be available for the other.

Key informants interviewed in Austria, Denmark, France, Germany, Romania and the UK highlighted this issue. It is also associated with a

priority hierarchy among climate policies, with mitigation being prioritised over adaptation.

"Tensions between mitigation, adaptation, and broader sustainability goals, mostly arising from: resource constraints; sectoral fragmentation; competing political priorities" (France).

"Tension arises in the allocation of financial and human resources. Mitigation measures, such as transitioning to renewable energy or retrofitting buildings for energy efficiency, often require significant upfront investments, which can limit the resources available for adaptation projects, such as flood defences or early warning systems. The latter will always be prioritized. This trade-off is particularly pronounced in regions that are already experiencing the impacts of climate change, where the urgency of such adaptation measures (also to save lives), will compete with the long-term benefits of mitigation" (Austria).

"The German government wants to reach climate neutrality by 2045, but these mitigation measures, such as transitioning to renewable energy or implementing carbon pricing mechanisms, often require substantial investments, which can limit the resources available for adaptation projects" (Germany).

"The energy sector dominates climate policy implementation, with major gaps in other key sectors. Mitigation policies have dominated the climate agenda due to European decarbonisation targets and access to dedicated funding. In contrast, adaptation has remained relatively marginal, often treated as an annexe to environmental or agricultural policies, lacking consistent financing and clear objectives for local implementation" (Romania).

"Politically, the long-term goal of adaptation constantly shifts due to dependence on global mitigation, making it hard to commit public funds for centuries to come" (Denmark).

5.2. Overlaps, convergence and conflicts

The most important point is that there are overlaps, trade-offs and conflicts between climate mitigation (reducing emissions) and adaptation (adjusting to the effects of climate change) policies because they can have synergistic or competing effects. This requires careful, integrated planning to maximise benefits and minimise negative consequences. Synergies occur when a policy, such as sustainable land use, supports both mitigation (e.g., increased carbon sequestration) and adaptation (e.g., reduced flood risk). Conversely, conflicts can arise when an action that benefits one goal harms the other. For example, a policy that increases greenhouse gas (GHG) emissions to address an immediate adaptation need, such as cooling indoor spaces in summer, will consequently result in trade-offs, as there will be a need to compromise between achieving one goal at the expense of another. A dual focus on mitigation and adaptation can highlight the

synergies that can be achieved when policies are designed with both objectives in mind. A varied typology of phenomena, in this regard, has been recorded in the various countries considered in this study.

Firstly, it should be noted that the European Climate Law, published in the Official Journal on 9 July 2021 and coming into force on 29 July 2021, focuses primarily on mitigation and only minimally on adaptation. Indeed, EU-level adaptation policies are much less developed. This is partly because issues related to mitigation tend to be global, whereas adaptation actions are specific to each local context. Nevertheless, work is underway at the EU level to prepare an adaptation plan, which is expected to be ready for implementation by mid-2026.

In Austria, the interplay between mitigation and adaptation measures reveals areas of overlap and inherent 'trade-offs', reflecting the complexity of addressing climate change comprehensively. The country's commitment to achieving climate neutrality by 2040 and its efforts to adapt to the growing impact of climate change are closely linked, as many measures serve dual purposes, while others require careful balancing to avoid conflicts. In agriculture, for example, reducing emissions by changing land use or livestock management can conflict with the need to adapt to changing climatic conditions, such as increased droughts or heavy rainfall. Farmers may need to adopt practices that prioritise water retention and soil health to adapt to these changes, but this would be very expensive and there is currently no funding available. Nevertheless, Austria's reliance on hydropower necessitates careful water resource management to ensure stable energy production during periods of drought or flooding. Moreover, urban planning regulations in cities such as Vienna, Graz and Innsbruck continuously promote green infrastructure policies, such as green roofs and urban forests, to alleviate heatwaves, manage stormwater and decrease gas emissions.

The historical buildings, monuments and cultural landscapes of Austria are also vulnerable to the impacts of climate change, such as flooding, heat waves and extreme weather events. Austria's adaptation strategy officially recognises the need to protect cultural heritage from these risks, and measures such as flood protection for historic sites and climate-resilient restoration techniques are being implemented. However, mitigation is not applied in this respect. Although preserving historic buildings often involves energy-intensive restoration processes, there is a growing interest in retrofitting these structures with energy-efficient technologies, such as improved insulation and renewable energy systems, in order to align with mitigation goals. This dual approach of preserving cultural heritage while reducing its carbon footprint should be coordinated, but it faces the greatest technical and regulatory challenges. In particular, it is difficult to balance modern energy standards with the preservation of historical authenticity.

In Germany, the Climate Change Act and the German Strategy for Adaptation to Climate Change (DAS) integrate both mitigation and

adaptation considerations into its policy frameworks, and should also contribute to emissions reduction, but sectoral coordination is difficult in practice, the expert says, although it is written in the documents.

In Italy, specific attention is paid to the balance between Mitigation and Adaptation. The following table shows a series of examples of measures to be applied, as stated in National Strategy for Adaptation to Climate Change (SNAC) proposed and adopted in 2015 (SNAC is supposed to be reviewed every five years to take into account the results of the monitoring activities and to achieve the overall objective of resilience).

Table 9 – Balance between mitigation and adaptation measures in the Italian SNAC

ENERGY	
Mitigation	Adaptation
Reduce emissions by expanding the use of renewable energy	Reduce vulnerability to widespread grid outages by favouring distributed generation from multiple renewable sources (solar, wind, biogas, etc.)
Reduce emissions by improving the efficiency of energy and water distribution systems	Reducing the risk of grid overload and failure due to decreased demand
GREEN' BUILDING	
Mitigation	Adaptation
Reducing emissions by reducing energy consumption through greater efficiency	Lower energy use will create less demand on the grid during extreme events such as heat waves, reducing the risk of blackouts
Adopt or encourage 'green' building standards for commercial, residential, retrofit (modernisation) and municipal projects	Building regulations could include increased resistance to high winds, flooding, etc.
FOOD PRODUCTION AND CONSUMPTION	
Mitigation	Adaptation
Reduce emissions by favouring local food production through the encouragement of short supply chains and/or farmer's markets, urban gardens etc. in order to reduce the number of kilometres needed to transport food	Reducing dependence on a centralised food system in which commodity production is concentrated in a few locations that may be vulnerable to climatic disruptions, such as damage
FORESTRY AND NATURAL SPACES	
Mitigation	Adaptation
Increasing carbon sequestration from forests by promoting the development of forests (including urban forestry) and natural spaces	Reducing vulnerability to flooding by promoting functional watersheds, including 'healthy' forests and natural spaces
	Increasing the habitat available to species at risk from climate stress by protecting natural spaces
	Counteracting urban heat island impacts by planting trees to provide shade and cooling
WATER RESOURCES	
Mitigation	Adaptation
Reducing emissions by decreasing water use (less energy needed for water treatment and transport)	Conserving water so that it is available during droughts

In Romania, climate policy development is insufficiently integrated to address co-benefits and trade-offs, and ensure the harmonisation of adaptation, mitigation, and sustainability actions. Mitigation measures are implemented relatively effectively due to quantifiable indicators, reporting obligations, and potential legal consequences for non-compliance (including infringement procedures). In contrast, adaptation strategies are weakly operationalised, limited mostly to emergency management and flood interventions. There is a large gap between identified needs, allocated resources, and real actions. Romania is far from effectively implementing the National Climate Change Adaptation Strategy or integrating adaptation into sectoral strategies.

In the UK, the departments responsible for mitigation and adaptation policies are aware of the difficulties in this regard. They recognise that there are slightly conflicting objectives and that this is not just a challenge for the UK. They are therefore working to highlight the co-benefits of taking measures to mitigate and adapt in tandem. For example, improving heating systems that are also reversible can produce advantages in urban areas experiencing heatwaves. Another example is retrofitting a home with insulation and flood defence or flood resilience measures (simple things that you could add to the home to make it a little more resilient to flooding in future).

In Denmark, it has been noted that the level of coordination between climate adaptation and mitigation is unclear among professionals. While there are often “imagined synergies”, these are not always realised in practice. Nevertheless, specific attention is paid to considering the interconnectedness of M&A, as well as to maintaining coherence between the two. This is relevant not just to policy design, but also to implementation and monitoring. The issue particularly affects the research sector in terms of devising and updating appropriate monitoring tools.

6. GOVERNANCE SYSTEMS

6.1. Diffuse character of M&A policies

M&A policies have a multidimensional character: they both do not only have an economic or technical character, but they also involve various sectors, diverse actors, etc. Apart from the different levels of multidimensionality of the two strands of policies (mitigation and adaptation), it can be stressed that they imply both very centralised actions (e.g., adoption of new technologies in large production plants) and “diffused” actions whose main result is the behavioural change of a large number of actors whose decisions are decentralized (e.g., families that change some consumption routines). The point is that some of these policies must achieve diffused results to be effective. A very relevant

phenomenon, which occurred in many countries among those considered here, is that while good results are being achieved in the promotion of diversified sources of energy production, more diffuse sectors lag, as in the case of construction or the diffusion of electric vehicles. This occurred, for example, in Romania and the Czech Republic or in France, where the Carbon Budgets were not complied with in some years because of the transport and construction sectors. In the Czech Republic, some successes were achieved for ETS diffusion but not in other sectors. This observation has important consequences.

One of the challenges of climate M&A policies is ensuring that the actions undertaken "penetrate" all societal and economic sectors. The necessary changes must be diffused and implemented as quickly as possible. This is more difficult when decision-making processes are diffuse, as with consumption, transportation or circularity practices. It is important to recognise that the 'diffused decision process' necessary for promoting both mitigation and adaptation should not be viewed simply as the sum of individual choices. Rather, it is primarily the result of broader social interactions.

This is a general stance that should be considered when considering the possible difficulties being faced in promoting effective M&A policies. Of course, the nature of these "broader social interactions" changes according to the sectors being considered. For example, the circular economy involves many actors, many of whom are individuals or small organizations, such as common citizens, families, and SMEs. The common challenge is changing diffused routines but, it goes without saying that the routines to be changed are different (for example, consumption habits are very different from the production practices of small businesses). Consequently, the tools to be used change according to the sectors, for example, for communicating or producing effective incentives for producers (not just small entrepreneurs but also farmers). Different are also the "actors of the context" (e.g., producers associations), the context where interventions are needed (e.g., urban vs rural), relevant laws and regulations, etc. For sure, M&A activities must be managed in a tailored way and a one-size-fits-all approach cannot work.

The problem is that all these huge sets of activities must be implemented soon, and policymakers must engage in substantial and innovative actions on top of their existing responsibilities. This general issue helps to explain why certain sectors produce more results in terms of contributing to mitigation and adaptation. Among the factors that explain such different "elasticity" in results are the plethora of certain sectors (i.e., the abundance of diverse actors), their widespread integration within the social fabric, and consequently, their different levels of "social complexity" compared to others.

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6.2. Multilevel governance and coordination

One relevant issue that emerges in many countries is that M&A policies require sophisticated multilevel governance approaches. This is due to their complex nature. Two different aspects of multilevel governance are worth being stressed here: the need for coordination between the various actors being involved in M&A and the support that has to be given to local governments (i.e., mainly municipalities) to implement these policies.

The first issue that emerges in many countries as important is the coordination among different ministries and administrative actors overseeing one or more aspects of M&A policies. This aspect could seem trivial, something that could be taken for granted – but it is important since there is significant work to do to distribute funds, and control the implementation of the activities, through monitoring, etc. Additionally, many aspects of M&A policies should be based on European regulations, and compliance with them should be carefully assessed. Moreover, each ministry and local administration has its specific mandate to follow that is, at least in part, independent from M&A policies; therefore, coordination is necessary.

This coordination clashes with the widespread tendency towards fragmentation in several countries. This tendency is reported in many countries.

- France: governance fragmentation complicates coordination between regions, departments, inter-communalities and municipalities; and an absence of hierarchical authority between the State and local authorities is noted.
- Austria and Germany: in relation to their federal system a dualism “cooperation vs. conflicts of roles” between the 16 Länder/Germany or 9 provinces/Austria and the central state is reported (for example, while the federal government sets overarching climate targets and policies, the states have significant autonomy in implementing these measures. This can result in both innovation and fragmentation, as the federalist system creates obstacles to coherent policies, and the states can obstruct or delay key federal climate initiatives).
- Czech Republic: poor coordination between ministries, regional authorities, and municipalities, as well as between public/stakeholders and local governments, often leads to inefficiencies and inconsistencies in adaptation efforts.
- Denmark: the municipalities are responsible for climate adaptation, while the state sets the framework and offers support. Implementation occurs locally. Indeed, practical climate adaptation is complicated by financial fragmentation, fragmentation of responsibility, the politicisation of risk (especially in flood risk management) and conflicting policy goals. Ultimately, responsibilities are not specific, so each actor is likely to wait for others to take action, which inhibits proactive behaviour.

- Italy: many actors have partially overlapped responsibilities – e.g., Looking specifically at reactive measures for adaptation, there are overlaps between regions and the state in terms of water management and wildfire control. The Department of Civil Protection plays a central role in risk management and in addressing the impacts of climate change, but regions, local authorities, ministries, public agencies and river basin authorities are also heavily involved.
- Romania: deficit of vertical coordination between central and local levels; limited institutional cooperation and horizontal coordination; responsibilities fragmented between government, municipalities, private operators and intercommunity associations, leading to weak coordination; and many institutions operate independently and without a coherent harmonisation of priorities.
- UK: although local authorities ultimately deliver the action, there are other levels to be considered, such as the devolved administrations in Scotland, Wales and Northern Ireland, and the central government, where each department has system ownership. There is a difficult interplay between the local and central levels.

The above also leads to a 'passing of the buck' regarding problems in countries such as Austria, Germany, Italy and Romania. Due to insufficient human resources, some responsibilities (e.g., environmental impact assessment in Italy) are devolved to regions or local authorities, where there are often even fewer competent people. Even if the problem no longer exists at the central level, it essentially remains and has even worsened.

Moreover, a main problem reported in many countries is that the matter is divided across many different departments and often depends on the actions and motivation of individuals in these departments (or equivalents). Where there are particularly motivated and competent individuals, they often find a way to overcome most of the problems, even though informal procedures. In many other cases, however, situations of stalemate and inertia prevail.

Still, it has been highlighted that relevant legislative frameworks exist in countries such as France, Italy and Romania, but these are not being applied effectively. This leads to significant difficulties in achieving effective institutional coordination. There are also accounting issues that cause difficulties. In Romania, for instance, there is a lack of cross-ministerial accountability.

Finally, the involvement of a plurality of actors can generate conflicts. For instance, in Italy the Environmental Impact Assessment of infrastructures inherent to energy transition (e.g., photovoltaic systems, wind turbines) is under the responsibility of the Ministry of the Environment and Energy Sustainability, but also of the Ministry of Cultural Heritage (limited to landscape issues). The approaches adopted are often conflicting. The Presidency of the Council of Ministers is supposed to resolve controversial issues, but this is almost an additional complication (because a third party

comes into play). Disputes should be resolved based on the principle of prevailing interest, but it is very difficult to effectively apply this criterion (the Ministry of Cultural Heritage tends not to understand that the energy/climate transition is essential even at the cost of damaging the landscape). Similar situations were recorded in the Czech Republic (e.g., extremely lengthy approval processes due to lengthy negotiations with relevant state authorities due to cultural heritage protection, agricultural land preservation, road safety).

Opinions differ at the European Union level. Overlaps among EU actors on climate policies are not considered a risk, but rather an opportunity, demonstrating an increase in the integration of climate issues. Furthermore, this creates synergies due to the principle of collegiality, at least within the European Commission. However, according to others, conflicts in policymaking among EU actors (or within the EC, e.g., between the CLIMA and Agriculture Directorates) are not only a risk, but a real problem. These conflicts should be overcome through agreed policies that strike the right balance, but there are many limitations in this regard. Nevertheless, it has been reported that the situation has improved in recent years, although risks remain[5].

The coordination of M&A policies is often assigned to specific administrative bodies, as is the case in almost all instances. In general, these administrative bodies are responsible for the practical guidance of policy-related activities, which are overseen by the government, who also supervise the activities carried out by other administrative branches, typically ministries. Various forms of supervision are put in place. These have not necessarily been as effective as expected, but strong efforts are being made to improve them, as shown in the previous example. In Romania, existing cooperation mechanisms such as the Interministerial Committee for Climate Change and the Department for Climate Change are neither sufficiently active nor transparent, largely due to a lack of political will. Furthermore, coordination is limited due to the irregular participation of decision-makers, the absence of a clear coordination mandate and the lack of established reporting and evaluation procedures.

The Italian source highlights three specific coordination problems.

- There is insufficient coordination among the public bodies having responsibilities in the implementation of climate policies and the

[5] In this regard, it is worth remembering that the situation within the European Commission has changed profoundly over the last 25/30 years. At the beginning of the millennium, there was a profound divergence of views, philosophy, and agenda between DG Industry, which was primarily concerned with growth and competitiveness, viewing environmental issues almost with distaste; and DG Environment, which was concerned almost exclusively with the latter; with other DGs such as DG R&I, DG Energy, or Move occupying intermediate positions. Today, the situation is drastically different, with DG Growth (formerly Industry) seeing environmental sustainability as one of the pillars of growth; and DG Climate (formerly Environment), which is concerned with environmental sustainability that is compatible with economic growth. Therefore, the agendas (and objectives) are now almost perfectly aligned. This has also facilitated intense staff circulation within the EU, including the EIB.

Ministry of Economy and Finance, which makes financial resources available. This severely weakens the governance system.

- The main body responsible for coordination, the Ministry of the Environment and Energy Security, was established to better connect energy policies to environmental sustainability; however, it could conversely reduce its attention towards the latter.
- There are also many other coordination bodies, each responsible for a specific domain (e.g., the National Observatory for Climate Change Adaptation, ISPRA/Higher Institute for Environmental Protection and Research, and the COAU/Unified Air Operations Centre, which coordinates air operations in the fight against forest fires).

Looking at other countries, a lack of adequate financial instruments has been highlighted in France and Romania. Moreover, this situation makes a long-term political commitment towards a comprehensive long-term climate-risk regime impossible, bearing in mind that, if effects are to be produced as soon as possible, the timeframe for implementing policies and measures and realising results is often long. This creates a problem of maintaining consistency in the implementation of actions, as well as consensus and coordination among the various actors over time. The time dimension should be controlled, at least in part, through tools such as monitoring, dynamic policy planning, and multi-year budgeting procedures (so that operational objectives can be reframed based on results and new data). However, this is often not the case, precisely due to the aforementioned lack of adequate financial instruments.

Thanks to the cooperation between the administrations and the consultative body, the Climate Change Committee (CCC), an advanced approach to coordination and supervision has been developed in the UK. The CCC carries out analysis of risks and emissions. It provides policy authorities with guidance on the actions and objectives to be pursued. Recently, the CCC defined 14 systems on which adaptation should be based. DEFRA, the department responsible for adaptation, is now pushing for the specific responsibility for each of these systems to be diffused throughout the government departments. Each department will have ownership of a system. The objective is also to make other departments aware of the risks in the adaptation domain. Currently, work is underway to understand the potential impact of heat on wealth and transportation. Moreover, work has recently been done on the so-called Green Book: every new government investment proposal must undergo climate risk analysis, and the person or department proposing it must consider the cost of climate resilience and the extent to which the intervention needs to be climate resilient, as well as the cost implications, and incorporate this into the investment case.

The Department for Environment, Food and Rural Affairs (DEFRA) has a special power, namely the Adaptation Reporting Power, which enables it to request reports from various government and regulated bodies (e.g., water supply companies) on the risks they pose to adaptation and their

plans to address the issue. This enables DEFRA to influence key decision-makers, encourage them to consider adaptation and recognise their responsibility. Recently, they piloted reports from local authorities.

This power applies to England and reserved functions, i.e., functions under the responsibility of the central government. The issue is complex because the power does not apply to devolved matters (i.e., matters under the responsibility of the Scottish, Welsh and Northern Ireland governments), and the reporting power is applied differently in the various devolved administrations. There has been discussion in Parliament about new provisions regarding strategic authority over these issues, but no definitive decision has yet been taken.

Understanding better the risks in each domain is crucial also for understanding better the fiscal challenge, that is: "how do we pay for the levels of resilience that we might want". Are there innovative funding models? In this framework, there are a lot of actors who should come together to deliver the interventions that might be required.

A similar arrangement is practiced in France, where a High Council for Climate (HCC) has been established. HCC is independent and is charged with evaluating national climate policies on an annual basis and providing recommendations for adjusting the strategies based on the results obtained.

Governance arrangements are often very complex since they must include regional administrations, as in the case of federal states such as Germany, strongly regionalised states such as Italy, and plurinational states such as the UK. In general, the source of this complexity, beyond the nature of the policies themselves, is that central administrations adopt regional/ decentralised plans concerning M&A policies. This could, of course, imply negotiations to ensure that regional solutions are consistent with national objectives.

The challenge of multilevel governance does not come only from the regionalisation of many European member states' administrations, but it is intrinsic to the very nature of M&A policies: they have to affect local areas with new ways of producing and using energy and adapting the territory to a changing climate through different behaviours of citizens and businesses and renewed infrastructures. All this is made possible if actions at the local level are effective and this requires a strong intervention of local authorities (and not just regional authorities).

There can be a noticeable disconnect between institutional decision-making and the realities on the ground, resulting in some misalignment between national strategies and territorial needs. For example, France's target of protecting 30% of land by 2030 is challenging due to the limited availability of land. Furthermore, except in coastal areas or regions experiencing visible climate impacts, most French territories do not consider adaptation to be an urgent priority, which explains the limited demand for support in this area.

Another issue raised in many of the national reports is how to provide adequate support to local governments. This could include providing adequate funding for local initiatives, as well as training, skills, and expertise to implement innovative activities at a local level. In France, for example, a specific office has been established to support local authorities. In Denmark, an initiative has been launched to help all the country's municipalities define and implement action plans aligned with the Paris Agreement. This initiative is called DK2020 and includes activities to foster cooperation between municipalities and the national government and regions, as well as capacity building for municipalities. In France, the importance of these issues emerged from an evaluation of experience with climate change mitigation and adaptation (M&A) policies. Suggestions included improving coordination between different levels of government and supporting local governments. Among the issues that emerged in other countries was also the lack of funds for local authorities.

6.3. Relations between the European Union and Countries

A specific feature of multilevel governance relates to the connection of both European and national/country levels in climate policies. Most climate policies and measures in the European countries considered in this deliverable (except for the UK, of course) consist of the national adoption of European Union regulations, standards, objectives and other more or less prescriptive guidelines. Failure to adopt, partial adoption or delayed adoption may also result in sanctions in certain cases.

In this respect, without any claim to exhaustiveness, the sources consulted reveal several circumstances that highlight (sometimes) a nature of the connection perhaps more straightforward in its form than in its essence

In Italy, governmental actors having responsibilities in climate policies tend to focus only on what is 'mandatory' under European legislation. This tendency is reported as a limitation as it occurs at a time when many national climate policies are considered less concrete, with the new European Commission. Previously, the European Union was considered much more a driving force thanks to the EGD. Furthermore, although European resources (such as the PNRR and NextGenerationEU) are crucial, integrated management between DRR and climate funding is not yet fully consolidated, which risks the duplication or dispersion of efforts. Interviewees also believe that future prospects largely depend on the actions of the European Union.

The Austrian government complies with EU climate directives and targets, which often drive domestic policy changes. For instance, the EU's 'Fit for 55' package and the European Green Deal have prompted Austria to reinforce its carbon pricing system and speed up the deployment of renewable energy. However, it should be noted that Austria still needs to submit a detailed progress report on its adaptation strategies to the EU Commission in 2026 (NECP as well). This process could take a considerable amount of

time. Furthermore, Austria will have to report on the recent adoption of formal guidelines to ensure that public and private investments align with the EU Taxonomy, thereby promoting climate-friendly economic activities.

In Romania, alignment with the EU framework is considered mandatory. Reporting to the EU relies on ad hoc contributions from ministries, which affects the coherence and comparability of data. However, many climate policies remain largely theoretical and lack the operational depth required to generate socio-economic transformation. Consequently, this alignment is more formal than substantial. We can observe asymmetric progress, with mitigation advancing through EU-driven mechanisms while adaptation remains underdeveloped. Of the existing policy frameworks, the National Plan for Recovery and Resilience (NPRR) is the most dynamic, and its implementation is closely monitored by the European Commission due to funding conditionalities.

In Denmark, for areas pointed out by the EU Flood Directive, there are specific national legislation as well as procedures for local management (e.g., local authorities are obliged to involve non- public actors).

6.4. Collaboration between stakeholders, particularly with citizens and civil society

As previously mentioned, many different actors are involved in implementing climate policies, which leads to the fragmentation and coordination issues that have just been discussed. This includes citizens and civil society.

Austria has a tradition of social partnership (Sozialpartnerschaft), which should involve close collaboration between government, business associations, labour unions, and civil society organizations. This approach is also applied in the formulation of climate policies, where stakeholders are often consulted through advisory councils, working groups, and public consultations with little advocacy for environmental matters. The fear for labour market and job endangerment is often prioritized as well as the demands by industry. In theory, this inclusive approach helps to build consensus and legitimacy, it can also slow down decision-making, as competing interests must be reconciled. Nonetheless, public acceptance remains sometimes a critical factor: e.g., the recent policies like carbon pricing and renewable energy expansion face resistance in some communities, necessitating stronger public engagement efforts

Similarly, in Germany a wide range of actors is engaged in bodies like for instance, the German Council for Sustainable Development (RNE) and the Climate Action Alliance (Allianz für Klimaschutz), which provide platforms for dialogue and input and are very important for interaction with relevant stakeholders on the issue. Moreover, the German Adaptation Strategy (DAS) involves various stakeholders, including federal states, municipalities, associations, scientists, and citizens, through the “dialogue

for climate adaptation" (Dialog KlimaAnpassung). The public, along with associations and other stakeholders, is involved in setting measurable goals, selecting indicators, and choosing measures. This inclusive approach should ensure that diverse perspectives and ideas are integrated into the strategy, enhancing its comprehensiveness and acceptance.

Likewise, in Denmark, citizens and communities (and further stakeholders) are deeply engaged and municipalities play a crucial role. These actors must be properly listened to and their advice considered. However, this interaction does not always work optimally. Moreover, sometimes private foundations or associations step in and support individual projects or development work across a number of municipalities (e.g., for the area of Copenhagen, there is an ongoing collaboration in adaptation policies between the national government, municipalities and large infrastructure organisations, such as Metro, Airport, Harbour etc. to find the right level of protection and determine how to split the costs).

In Romania, the involvement of non-public actors in climate governance is improving but remains mostly consultative, with reduced integration into decision-making processes. There is still no national climate partnership platform bringing together public administration, academia, NGOs, and the private sector in a coordinated policy co-creation process. Non-public actors, such as the NGO WWF Romania, participate in numerous monitoring committees as observers, without any decision-making role. Their involvement in public consultation processes is often hindered by the short duration of consultations or by the lack of adequate accessibility. Moreover, current legislation on public participation and decision-making transparency is often applied only formally, reducing the effectiveness of consultations (Romania).

In France the situation appears varied and differentiated. In biodiversity-progressive regions such as Drôme, local communities are increasingly engaged, while NGOs face difficulties entering carbon and biodiversity compensation markets due to measurement and verification challenges and high transaction costs. However, they contribute to the National Biodiversity Commission and various working groups with the Ministry for Ecological Transition. Moreover, debates over the expansion of wind energy have highlighted tensions between environmental groups advocating for rapid deployment and local communities concerned about landscape impacts with industry advocates still building them, but not for communal benefits but rather for their own profits.

Similarly, in Italy, there are areas characterised by strong community and citizen participation, often in conjunction with municipalities playing a significant role. The proliferation of energy communities in recent years is one example of this, but there are also many other local groups that play a significant role in their own areas. Generally speaking, the environmental movement is often involved in local government climate policies. Sometimes it spurs them on, but not always. It should also be noted that

few national movements actually exist on the ground today, while many other groups only have a core at the central level.

Finally, in the UK, the "environment" of climate policies appears litigious (e.g., some civil society organizations made a claim to justice court, that DEFRA won on adaptation measures; anyhow, there were other controversies, and in 2022the claims on mitigation policies were acknowledged by the High Court, leading to their reformulation). Dialogue between actors is, anyhow, recognized as important and the Government established Net Zero Council, "a partnership between government, business and civil society, providing strategic leadership to support delivery of the government's Clean Energy Superpower Mission".

6.5. Dominant economic actors

The governance of environmental policies can be more or less strongly influenced by the existence of some dominant economic actors (e.g., lobbies like aluminium, concrete and steel are very strong industries).

In Romania, the decision-making process appears (according to the interviewed key-informants) concentrated in narrow political circles, with little transparency or inclusiveness.

In Austria, it has been reported that "the influence of organized interest groups and neo-corporatist social partnerships can encourage inactivity (also called 'lethargy'), and this hinders ambitious climate action. Economic interests (e.g., industry power) prevail, and climate protection can go at the latest rank (economic impacts and competitiveness often ranked much higher than all emission reduction measures)".

In Italy, one of the most important players in climate policy is ENI (Ente Nazionale Idrocarburi), which seeks to subordinate all energy policy (including the development of renewables) to "its" energy policy, where hydrocarbons have a very significant weight.

6.6. Political actors

Governance systems, beyond the presence of dominant economic actors, are also affected by the divisions between political parties.

In the present German Government, for instance, two ministries oversee climate-related affairs, and both play key roles in areas like environmental protection and adaptation. While the former is currently led by the Christian Democratic Union/Christian Social Union (CDU/CSU) alliance, the latter, which is more focused on environmental policy, has been attributed to the SPD. This may reflect a division between economic and energy policies, which include climate policies on the one hand, and issues related to the environment and nature conservation on the other. All this makes inter-ministerial coordination on climate policies more difficult.

In Romania, frequent government changes and political divisions hinder the effective implementation of climate policies and further cross-sectoral coordination. Key informants nearly unanimously highlighted the fragility of climate policy across electoral cycles, describing climate topics as increasingly politicised and vulnerable to reversals, which undermines long-term planning. According to the key informants interviewed, this is further compounded by a lack of political will, which affects not only Romania, but also other countries such as Italy and France.

Conversely, in the UK, the transition from the climate policies of the former government to the present happened with some continuity. The Climate Change Policy framework was based, so far, on a bipartisan consensus. The difference with the preceding Government's approach lies in the idea of the implementation of a mission through active intervention vs the use and/or production of the right incentives and limitations (via taxes and some regulations) that are supposed to promote the transition (with a high relevance of the social dimension of climate policies – see Section 9). Nevertheless, this consensus is at risk since the Tories declared that, if would they win the next elections, they would repeal the Climate Change act of 2008. There are no actual risks at the moment, but if politicians tend towards populism, things could change.

The transition from the former government's climate policies to those of the current government also happened gradually in Italy. However, a significant slowdown occurred due to changes in management at the Ministry of the Environment and Energy Sustainability. Several senior executives changed, as tends to happen with a change in government majority. These changes occurred slowly, taking more than two and a half years to complete after the change of government, causing some activities to almost grind to a halt. Nevertheless, most of the technical and scientific staff have remained the same and are able to guarantee good operational capacity.

6.7. Scientific research

Science enters the policymaking concerning climate change thoroughly. One example is monitoring (see Section 7 below), which plays a crucial role in climate policies' fine-tuning. The choice of indicators, the collection of data, and their interpretation depend heavily on the contribution of scientists (from a diverse array of disciplines, by the way). In Italy, an Observatory has been established, in the UK a scientific committee is called to provide advice including on monitoring, and the same happens in France where the Haut Conseil pour le Climat (HCC), an independent committee, carries out policy evaluation.

More in general, climate-related policies are more and more connected to research and innovation. Such a connection is not new, but what has changed is the role that research is playing nowadays. In a certain sense, policy priorities are not dictated primarily by political choices anymore, as

was usual before the climate change emergency, but they are – if not dictated – at least highlighted by scientists. The novelty, therefore, is not so much the existence of a strong relationship between the research sector and Academia on the one hand, and politics and policymaking on the other. Rather, what is new is that research has taken a leading role in this kind of policy. In some cases, this novelty has been institutionalized. An important example of this is the role that a technical advisory body plays as in climate policy in the UK (Climate Change Committee)[6] and France (High Council for Climate).

However, the integration of science into the policymaking process remains limited and requires more institutional support (e.g., in Italy or Romania). Scientific studies (which do exist) that could support evidence-based policymaking are not always consistently integrated into policy design.

Another issue is the lack of accurate data and integrated public platforms that would enable cross-sectoral analysis and evidence-based decision-making.

Moreover, trust in the scientific community cannot be taken for granted and supported by the public.". The low socialization of science – which emerged, for example, during the COVID pandemic – is something that undermines science also in its specific role as an important pillar of climate change policies. The problem is not so much the grip negationism has – somehow unexpectedly – on the public, as the consequences it has on policies: they have to be deployed in the long run, act upon phenomena whose consequences are heavy but the causes are almost invisible, at least initially (the increase of temperature changes the climate but can be felt by humans only when it is too late to intervene or to avoid hard consequences). Policy arenas nowadays are affected by the so-called "short-termism" and polarization whereas the need is to implement policies that require a long-lasting consensus among policymakers, citizens, and stakeholders. In this framework, scarce trust in science and a wrong connection between science and policymaking is a problem – of a social nature – that must be tackled appropriately.

6.8. Multidisciplinarity

Reading the Annexes to this deliverable, it appears that M&A policies, in general, require the cooperation of many diverse disciplines. Actors called to action are those concerned with the economy or with energy provision;

[6] Recently in the UK a further relevant development occurred, and the "Climate Adaptation Research and Innovation Framework" was released by DEFRA. It "outlines the research and innovation (R&I) needed to support adaptation plans across UK governments and sectors. [It was] produced under the guidance of the government's Climate Adaptation Research and Innovation Board, [which] identifies the main climate adaptation research and innovation challenges that can help us address climate risks and opportunities identified in the third UK Climate Change Risk Assessment (CCRA3). The framework supports an evidence-based programme of public sector research and innovation and provides information for businesses and academics working on climate adaptation-related research.

in the management of the territory, urban management and planning, coastal management; in disaster prevention and management (e.g., as explicitly mentioned in Germany and in Romania); in the management of cultural heritage (e.g., in France); and healthcare; and in many other fields: agriculture, biodiversity, circular economy, etc. This means that the entire set of policy tools must be updated, including the professional approaches.

It also emerges that all the policies imply communication activities. While this is a very general (and not questioned) tenet of many policies, it implies a wide array of subordinated activities. Communicating with small communities – or relatively small – of sector players (e.g., electricity producers) or professionals is very different from communicating with larger audiences or with dispersed actors in the so-called "marginal regions". The skills and capacities required are different and must be coordinated with those of the existing policymakers.

The diversity of the actors involved is also relevant because of their professional and cultural backgrounds. Climate policies often involve actors that are not accustomed to working on climate-related issues. This is true, for example, of the health sector, tourism and cultural heritage. For example, in some cities, the management of cultural heritage can prevent the planting of new trees (at the direct request of the superintendencies of fine arts and historical and architectural heritage).

6.9. Legislative and regulatory issues

Last but not least, governance systems in relation to climate policies are deeply informed by legislative and regulatory issues. Some examples follow.

- Many strategies and plans are not legally binding (e.g., the adaptation strategy in Austria or climate adaptation planning at the level of Danish municipalities).
- Laws can expire without being renewed (e.g., Austria lacks an updated climate law since the previous one expired in 2020, and the current National Energy and Climate Plan indicates that the country is likely to miss its 2030 climate targets without further efforts).
- Strategies and measures can be neither legislatively nor substantively reflected in the legal framework (e.g., in the Czech Republic, blue-green infrastructure is not legally defined in the "Building Act" (283/2021).
- Over-regulation leaves less room for genuine voluntary initiatives. Many stakeholders focus on complying with, or even exploiting and circumventing, the rules rather than going beyond them. Furthermore, the same set of regulations is applied in different ways depending on local capacities and political orientations, creating a highly variable environment for private actors. This heterogeneity complicates the implementation of a coherent climate strategy at the project level, for example in France, Italy and Romania, where

legislative and bureaucratic obstacles, including overlapping institutional mandates and unclear responsibilities, hinder the implementation of green and adaptation infrastructure.

- The most ecological option is sometimes the most difficult to implement under current rules. For instance, albeit from it is preferable to prioritise rehabilitation of existing buildings rather than new construction, both from a climate and a heritage perspective, in France regulatory compliance is often more complex for rehabilitation projects, whereas new construction more easily aligns with standards.
- There are many situations (e.g., in Italy or Romania) where legislation changes very often in an attempt to adapt (often unsuccessfully) to changes in reality (e.g., to try to adapt scarce resources to growing needs).
- There are situations (e.g., the implementation of EIA in Italy) where litigation is very high, as it is always possible to appeal (with considerable burdens).

7. Implementation status

It is neither expected nor possible, within the framework of CROSSEU Task 4.1, to outline the state of implementation of climate policies at the European and country levels. From the standpoint of climate policy assessment, we will nevertheless attempt to highlight in this section some issues related to the effectiveness of their implementation.

First, the limited evidence available to us seems to highlight some delays compared to expectations and plans.

At the European level, looking at the general trends, considering the scenarios prepared 10 or 15 years ago, significant delays in at least three areas have been noticed.

- Electrification – By today, over 30% of everything should have been electrified, whereas we are only at 22%/23%. The current plateau suggests a stagnation and there is still little use of renewables and nuclear power.
- Carbon Capture and Storage – The EU's current operational carbon capture and storage (CCS) rate is low, at approximately 2.7 million tonnes (Mt) of CO_2 per annum as of early 2024, across five operational projects in Europe, while the EU has an ambitious target to scale up this capacity to at least 50 Mt CO_2 per year by 2030, and around 450 Mt CO_2 per year by 2050.
- Hydrogen – many billions have been spent in research on hydrogen (however, a single total cumulative figure is not publicly available) but the concrete and operational results are few.

According to some interviewees, this is partly due to the fact that there is a gap between a vision at the European level and what is happening locally.

At the European level strategies and laws as well as an immense quantity and quality of research and innovation findings support mitigation and adaptation. On the ground, the investments to implement what is needed are largely missing. This indicates that the discrepancy between what is required and what has been achieved is significant, despite the substantial impact of climate change, as assessed and documented by research, and acknowledged by the European Commission.

Many concrete examples of delays have been highlighted in various European countries in the frame of the implementation of this Task (see Annexes B1-B9 to this deliverable for more details and references). Some examples are listed below.

- There are delays in phasing out fossil fuels. For instance, Germany has temporarily extended the use of coal and natural gas to ensure energy supply. This country has a committed phase-out of coal power by 2038, but it is currently investing again into coal. Policy dynamics such as the war in Ukraine have led to these energy shortcomings and the changes in the governments' decisions.
- For the same reason, phase-out has been delayed in Denmark too, but it is achieved presently.
- Romania is negotiating with the European Commission to delay the shutdown of coal plants (consisting of approximately 2.6 GW) since replacement projects are lagging.
- In Germany, delays or weakening of some policies (e.g., building regulations or transport emissions) risk impeding faster reductions. Research groups such as Climate Action Tracker project that Germany's 2030 emission levels may exceed the target by approximately 85 million tonnes of CO2-equivalent.
- In France, recent evaluations, particularly by the High Council for Climate (Haut Conseil pour le Climat, HCC), continue to highlight significant delays in key sectors such as transportation and buildings. Local actions, critical to achieving national objectives, face challenges due to insufficient coordination and funding.
- Moreover, the limited implementation of the Citizen's Climate Convention (Convention Citoyenne pour le Climat, CCC) proposals – only 10% having been adopted without modification – continues to fuel public scepticism about the political commitment to climate ambition.
- Less than 50% of "Plan Climat Air Energie Territorial" (PCAET) actions are implemented (France Pays de la Loire, Bretagne).
- The Multiannual Energy Programme in France (PPE; Key energy planning tool aligned with the National Low-Carbon Strategy/SNBC) is presently delayed due to political instability.
- In Italy, environmental impact assessments for energy infrastructure projects, especially those involving wind and photovoltaic power, are almost never completed within the 130 days established by law. Deadlines are often longer, and delays are mounting. This fact is

reported as a vicious cycle, and the situation is deteriorating daily. Many projects remain stalled for extended periods. In fact, many have never even begun. Currently, over 1,000 projects are behind schedule

- Although the Czech Ministry of Environment's Evaluation Report of the Climate Protection Policy (CPP) considered the implementation of CPP as successful with 73% of measures being "fulfilled" and 22% being "partly fulfilled," an independent report by a consortium of Czech NGOs (Centrum pro dopravu a energetiku and Klimatická koalice), concluded that only 13% of EU's financial resources were used on measures with "clear climate benefits" between 2014–2020 (compared to an EU's target set to 20%). Moreover, "the current trajectory of emission reduction is insufficient to meet the indicative reduction target of 80% by 2050 compared to 1990 levels".
- In Romania, there are delays and inconsistencies regarding recycling and landfill closure obligations, and so Romania is subject to infringement proceedings. Of the 68 non-compliant landfills, only 20 have been permanently closed. Progress in the building sector has been slower. More significant delays are related to energy-intensive industrial sectors, which have only made limited progress by implementing isolated energy efficiency measures, rather than undertaking the deep structural transformation required to align with a clear pathway towards climate neutrality. While the energy sector is advancing steadily along its decarbonisation trajectory, heavy industry remains insufficiently transformed and represents a key challenge for achieving Romania's long-term mitigation goals. Nevertheless, globally, greenhouse gas (GHG) emissions have continued to fall in recent years, largely due to the EU carbon pricing mechanism, the expansion of renewable energy capacity, and the planned phase-out of coal-fired power plants (Energy Policy Group, 2022).
- Still, the degree to which the outcomes of Romania's National Climate Change Strategy 2016–2020 were achieved was found to be unsatisfactory across all key sectors. Only around 16 out of 147 measures could be reported as having been completed. Some measures were partially implemented, while certain objectives were partially met through actions outside the original plan that were not specified. The analysis also highlighted the absence of clear monitoring mechanisms and updated data necessary to evaluate the effectiveness of the actions.

However, delays cannot be generalised. Denmark's commitment to a structured, legally binding climate strategy, for example, has yielded significant results. In 2025, the Danish Council on Climate Change concluded that the government had demonstrated that the country was on track to achieve its national target of reducing greenhouse gas emissions by 70% by 2030. This success story is seen as crucial not just because of the emissions cut (which is a small fraction of the world's total), but also because it confirms the country's ability to act as a frontrunner and 'green superpower'.

Furthermore, Denmark has already made significant progress in reducing emissions (it had achieved a 39% reduction in greenhouse gas emissions by 2020 compared to 1990 levels, demonstrating substantial progress towards the 2030 target of a 70% reduction) and in increasing the use of renewable energy (Denmark is a global leader in renewable energy, particularly wind power, and in 2020, 47% of its electricity consumption came from wind energy, the highest share in the world). The country has also made significant strides in improving energy efficiency across various sectors, as well as promoting sustainable transport options such as public transport, cycling and electric vehicles. However, a major point of debate concerns the country's consumption-based emissions (climate footprint), which have not declined at the same rate as territorial (production-based) emissions due to the outsourcing of production.

Implementation delays are associated with issues related to the monitoring and assessment of measures and policies. In this regard, we refer to the relevant paragraphs in Annexes B1 to B9 of this deliverable. Below, we mention three insights which seem to characterise two opposite situations (tending to be positive – 1 and 3; and tending to be negative – 2).

1) The German Adaptation Strategy (DAS) is designed as a living document; it should be capable of adapting to new information and changing circumstances. It includes a robust monitoring and reporting mechanism. A monitoring report is created at least every four years to inform the public about the observed effects of climate change and the progress in achieving the goals. If goals are not met, measures will be adjusted accordingly. The monitoring will provide the scientific basis for evaluating progress and updating the strategy. The strategy includes an evaluation process to analyse the effectiveness of the DAS and its implementation. This external evaluation occurs every four years, providing critical feedback to refine and improve the strategy. Broadly, the effectiveness of CC policies in the German Länder is enhanced by a framework of collaboration, continuous development, and rigorous monitoring and evaluation, ensuring that both federal and state-level strategies are aligned in addressing the impacts of climate change.
2) In Romania, monitoring and evaluation systems are ineffective at assessing the real impact of adaptation and mitigation plans (other than the National Recovery and Resilience Plan (NPRR)), which largely remain on paper, with no clear, transparent or systematic monitoring of their implementation. Furthermore, Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs), which are legally mandatory, are usually carried out only after the relevant strategies or plans have been finalised, preventing any meaningful revisions or improvements. For example, there is a lack of clear monitoring mechanisms and updated data is missing to evaluate the effectiveness of the actions of the National Climate Change Strategy 2016–2020. To evaluate the implementation of the SDGs at a national level, the Department for Sustainable Development, in collaboration with the National Institute of Statistics, has developed a set of 98

national indicators to monitor progress towards the SDGs. This framework should enable systematic tracking and reporting on the implementation of sustainable development policies. In practice, however, monitoring of M&E measures is fragmented across institutions and performance indicators are not integrated into a unified system. Finally, monitoring and evaluation mechanisms remain largely formal or absent in local authorities. Conversely, Romania has participated in Voluntary National Reviews (VNRs) in 2018 and 2023, presenting its progress and challenges.

3) As for what concerns adaptation in the UK, the approach to monitoring extends beyond risk assessment and planning to include a stronger focus on delivery and implementation of adaptation actions. It also implies "a theory of change for how to achieve those outcomes through the policy levers available to the Government" (see Annex B9 on UK). The monitoring framework in the UK focuses on thirteen critical thematic areas or sectors of the adaptation challenge. These thirteen thematic areas[7] cover the range of relevant identified risks from CCRA3 (the ultimate Climate Change Risk assessment carried out by the CCC). These thematic areas for adaptation action have been already taken as a reference point for various adaptation programmes both at the UK and Nations' levels.

8. Barriers and drivers

The implementation status of climate policies (and, consequently, their effectiveness and impact) is greatly affected by all the governance issues described in Section 6. Many other barriers hinder this process. In this section, we will attempt to describe these barriers based on our documentary research and interviews with key informants.

[7] 1. Nature: Terrestrial (including on farmland), freshwater and marine habitats; 2. Working lands and seas: Agriculture, forestry and fisheries; 3. Food security: Domestic and imported food supply chains, as well as vulnerability of society to climate-related food disruption; 4. Water supply: Public water system which supplies households and businesses; 5. Energy: Key energy systems, the electricity system (transmission, distribution, and generation), gas networks and novel sources of energy supply (such as hydrogen) as they develop; 6. Telecoms & ICT: Communications and ICT infrastructure, including data centres, networks and other critical national infrastructure; 7. Transport: Road networks (both the national strategic road network and local roads), railways, ports and airports; 8. Towns and cities: The built environment at a settlement scale, covering flooding, coastal erosion and overheating risks; 9. Buildings: Individual buildings and their occupants, covering overheating and flooding; 10. Health: Public health, including mortality and morbidity, as well climate-sensitive vector-borne diseases and health care delivery; 11. Community preparedness and response: Preparedness of communities for climate impacts, including the ability to protect cultural heritage, and their ability to effectively respond when climate and weather-related disruptions occur; 12. Business: Businesses and their function as a commercial entity, including risks to supply chains (both domestic and international), sites and assets, access to capital and productivity impacts; 13. Finance: Financial system, so that systemic risks from climate change are minimised and it can effectively support the economy in investing in necessary adaptation actions.

8.1. Plans, strategies and funds

The first emerging problem is the lack of financial resources allocated for the implementation of actions to achieve the objectives set out in the plans and strategies.

In Italy, for example, the plans (PNACC, PNIEC, PTE, etc.) contain excellent principles and set acceptable and satisfactory objectives, but they are rather 'empty' in practice because they do not involve significant financial allocations in the short term (e.g., only €20 million for the 2026–2028 period for adaptation in the MEF's Structural Financial Plan). Support for expanding the use of renewable energy is also minimal. A similar situation is being reported in France and Romania. Furthermore, the planned public funding cycles of three to four years are incompatible with the 20-year needs of biodiversity restoration and insufficient long-term financial mechanisms.

Secondly, the tools and measures envisaged in the Plans are not sufficiently integrated. This is particularly evident in Italy, France and Romania. For example, in Romania, the lack of integrated planning is said to generate imbalances and conflicts between sectoral policies and climate strategies.

Thirdly, there is sometimes an absence of measures that would be considered essential for achieving greater consistency in climate policies. For example, the Integrated National Energy and Climate Plan in Romania fails to address adaptation policies across all relevant dimensions of the Energy Union. A comprehensive analysis of climate vulnerabilities and associated risks that could impact the achievement of national objectives, targets and contributions is lacking. Furthermore, it does not adequately outline policies and measures within the individual dimensions of the Energy Union. The connection between adaptation policies and specific Energy Union objectives and policies, including the support they should provide, is neither specified nor quantified. Additionally, plans to reduce gas consumption and improve energy storage are underdeveloped.

One consequence of this partial uncertainty (regarding the actions to be implemented and the financial resources actually allocated) is a lack of well-designed grant programmes, which can lead to a low level of motivation among potential investors from the private sector (e.g., local businesses, land and building owners) to implement effective measures, as has been noted in the Czech Republic, for example. This is exacerbated by (i) the extremely lengthy approval process for granted projects, which is also due to disputes, administrative errors and lengthy negotiations with the relevant state authorities (due to cultural heritage protection, agricultural land preservation and road safety, as previously mentioned), and (ii) the significant administrative burden associated with the granted projects.

8.2. Small actors' weakness

Further problems in this regard stem from the weakness of the 'small players', who make up the majority of municipalities, businesses (most of which are SMEs or micro-enterprises) and civil society organisations. We have already discussed the latter extensively in Section 6. Some recorded examples are highlighted below.

- In France, costs are the primary barrier, particularly from the perspective of a small company. Implementing ecological and high-performance solutions systematically increases investment costs, while market conditions do not always allow these costs to be fully passed on to sale prices or rents. Small structures often lack the time and resources to follow in depth all regulatory and strategic developments. This creates an information and capacity gap at the very moment when regulations are becoming more complex and demanding
- In smaller municipalities in France, elected officials are often overwhelmed by the complexity of norms and regulations, and lack staff and expertise. Moreover, they often encounter difficulties with innovation due to a lack of capacity (e.g., expertise gaps) and investment
- In Romania, local authorities have limited resources and expertise, displaying minimal capacity and initiative. For example, they frequently lack the capacity to manage integrated waste systems, and infrastructure for separate collection, sorting and recycling is still lacking in many regions
- In the Czech Republic, particularly in small municipalities, the implementation of projects is significantly hindered by a lack of specialised staff and limited financial resources. These factors together obstruct the adoption and implementation of measures to address climate change. Nevertheless, municipalities (in collaboration with NGOs) often compensate for weaknesses at the national level
- In Italy, smaller regions and municipalities often find it difficult to turn national guidelines into practical actions due to a lack of resources, expertise, and planning tools.

Nonetheless, local authorities in Italy play a positive role in implementing climate change adaptation and mitigation policies. Concrete activities are being undertaken, such as installing photovoltaic systems on the roofs of many schools in Rome, promoting renewable energy in other ways, resurfacing roads to make them more heat-absorbent, launching information initiatives and establishing networks of climate shelters (cooling centres for those who cannot afford air conditioning at home, particularly the elderly, which also serve as social gathering places). However, many local authorities are weakened by reduced resources. Many other local authorities do nothing or almost nothing.

Still in Italy, it seems that the lack of organisational capacity also affects relevant government structures, and even more so regional ones. The same can be said for Romania, where government structures are often described as bureaucratic, inefficient, poorly digitalised, weak and hindered by a culture of avoiding responsibility and a lack of expertise in leadership positions.

8.3. Regional disparities

Moving on to another topic, we must mention the question of the disparity that sometimes occurs between the territories of the same country. Three examples.

1. There is uneven progress across the German federal states, with some states, such as Baden-Württemberg and North Rhine-Westphalia, taking a proactive approach to climate action, while others lag behind (interviewed key-informants suggested that some more binding mechanisms should be installed, in order to ensure that all states contribute equitably to national climate goals).
2. In Austria, some states, such as Styria and Upper Austria, as well as Vienna, have been proactive in promoting renewable energy and energy efficiency (at least in promotion), while others have faced delays due to local opposition or resource constraints.
3. In Italy too, there are significant disparities in technical and financial capacities across territories.

8.4. Cross-border collaboration

Cross-border collaboration is another concern. Two examples.

1. Due to its geographic location, Austria relies heavily on cross-border collaboration on issues such as water management and energy infrastructure.
2. At a lower level, Denmark's lack of defined cross-municipal cooperation in legislation creates hurdles to the implementation of complex, shared coastal and water management schemes. This fragmented responsibility can encourage actors to wait for others to take responsibility, which can inhibit the implementation of crucial 'soft measures' and sometimes create problems, for example when municipalities decide on different ways to finance a common coastal protection scheme.

8.5. Public awareness and exchange with the public

A major concern is related to public awareness and exchange with the public. In almost all the countries considered, attention is paid to informing the public, promoting awareness of climate-related risks and policies, and

therefore engagement (see Section 4, the so-called "soft aspects" of M&A policies).

In general, many sources acknowledge that climate change is impacting our individual and social lives, but it cannot be taken for granted that citizens and stakeholders agree and, even more, that they agree with the policies to be implemented on the subject. Based on this, in all the countries, consulted sources foresee that civil society and further stakeholders are given special attention in the communication concerning M&A policies. The emphasis, of course, changes. In the French case, a specific role is given to dialogue with citizens (even if the problem was that after a wide citizens' consultation, just 10% of the proposals were adopted in the final plans); in other cases, mention is made of campaigns aimed at informing citizens (see Germany and Wales).

In Scotland, the concept of Public Engagement is mentioned, therefore not just the provision of information to citizens but also their active involvement. As a matter of fact, the recent Scottish plan for Adaptation was completed after an open consultation.

It should be noted that, as the French case shows, engaging citizens and stakeholders is not easy. It is important to clarify the extent to which actors in civil society have a say in the content and implementation of policies. There is a risk of adopting a paternalistic stance by trying to instruct external actors on what is good or bad for addressing the climate crisis. This could lead to people understanding the problem of the social impacts of M&A policies in terms of being properly informed only, implicitly assuming that the negative impacts of such policies cannot be mitigated. This could lead to a lack of trust in the policy process, as seems to be the case in France, or to insufficient consensus, which is generally recognised as a problem.

When considering the role of the public, it is important to note that climate change policies are an area of public life in which conflicts arise. Beyond the aforementioned case of the French Gilet Jaunes movement, for instance, some UK civil society organisations mobilised the judiciary to rule that government actions were not in line with UK climate change legislation. Following the court's ruling, the UK government took action to comply with the court's decisions. In other words, considering the social aspects of M&A policies also involves managing social dialogue with various stakeholders and taking emerging conflicting positions and interests into account. Notably, populism against climate policies is increasing, as evidenced by the rise of populist narratives, not only in France and the UK, but also in other countries such as Italy and Romania.

According to some interviewees, perhaps more serious than populism is the growing indifference that manifests itself in behaviours such as wanting much bigger cars and believing that there must not be bigger electric cars. These behaviours are not in line with the desired pro-environmental ones.

Public understanding and support for climate change related measures and policies remain generally low in Czechia, which lowers the demand for adaptation measures at the local level as well as prioritization of climate-related topics at the national level. Many residents, regional and local policy and decision makers, city planners, as well as local stakeholders are neither aware of the specific climate risks facing their communities, such as increased flooding, prolonged droughts, and heat waves, nor of effective technological measures to mitigate these impacts. Bridging this gap requires targeted education and outreach campaigns to raise awareness of climate change impacts as well as examples of good practice.

In Romania, awareness and understanding of climate action remain limited among both citizens and decision-makers. As a result, climate change is usually perceived as an abstract or technical issue, despite its tangible local consequences.

In the UK, the Department for Environment, Food and Rural Affairs (DEFRA) promoted a 'Public Dialogue' on climate change adaptation in England. Initially, participants had little awareness of climate change adaptation, although they agreed that England's weather had changed significantly during their lifetimes. Once the concept of adaptation was better understood, there was strong support for urgent action, as England was perceived to be unprepared for a changing climate. Participants felt that the government should have taken action sooner, and that the time to act is now. This message remained consistent throughout the dialogue.

In Denmark, there is some evidence that citizens are changing their behaviour. For example, homeowners are becoming more aware of flood risks and considering these issues when buying property. Until recently, there has been a lack of public and political acceptance. Severe incidents related to recent flooding have led to a much higher level of acceptance, but many citizens still expect society to solve local problems, which is often not possible.

Therefore, the problem for policymakers is not only overcoming the denialist tendencies of certain sectors of public opinion through public understanding initiatives, but also dealing with emerging public opinion on specific aspects of M&A policies. This is particularly important given the ever-changing context: public opinion changes for many reasons, including the implementation of policies themselves.

8.6. Lack of data

Further concerns are lack of data, and, above all, issues in the transmission of data among relevant climate policies involved actors, are.

According to a key informant from the European Environment Agency, there is a lack of connection within and between meteorological institutes in some European countries. Many other key informants have reported difficulties accessing useful damage data belonging to insurance

companies due to GDPR regulations. This data is essential for calculating the socio-economic value of projects and helps justify the cost of protection schemes. Furthermore, there is often a lack of social data relating to climate change and the effects of climate policies (e.g., data differentiated by social group; maps showing the intersection of physical and socio-economic factors; detailed wealth distribution data for designing a just transition policy). In this regard, there are significant differences in data accessibility among EU member states.

According to many key informants, there are still problems with access to and dissemination of major information on climate risks, vulnerability and costs.

8.7. Macro-economic barriers

Last but not least, some macro-economic barriers are mentioned from the European Banks' (EIB, ECB) key-informants.

Firstly, the mistakes of Europe in the past are creating difficulties for its future. Higher energy prices may make it harder for Europe to fully adopt the new technologies that will drive future productivity. Access to cheap, plentiful energy will be crucial if Europe is to make the most of artificial intelligence.

Moreover, the missing link here is capital markets. Debt and equity financing currently rank lowest among the funding sources that firms expect to use for green investment. Deepening and integrating EU capital markets is critical to support the large-scale investments we need. Collectively, Europe has the resources to succeed. What it now needs are deeper capital markets and steadfast policies to turn its green ambitions into reality

Finally, although mortgage lending is a sizable share of most European banks' business, it is not always fully incorporated into their climate and nature-related (C&N) risk management frameworks. This means that some banks consider only transition risks in their collateral valuation, while neglecting physical risks. And even when banks do account for both physical and transition risks, or have established key risk indicators, they do not consistently link them to concrete follow-up actions in their risk management (ECB key-informant).

9. Focus on Societal issues related to climate policies

In general, all climate change policies have important societal implications and, implementing them implies managing social aspects through dedicated actions. This point is relevant for two main aspects.

- For mitigation policies, as some among them can exclude/penalise disadvantaged groups (e.g., car-free mobility measures, such as fuel taxes, regulatory restrictions to encourage modal shift, restrictions on the use of vehicles in certain urban areas, enforcement of zero- or very low-emission vehicle standards, etc., can have a devastating impact on the poorest people and those living in peripheral areas, especially in cities where public transport services do not function very well).
- For adaptation policies, as adapting to climate change requires re-framing how traditional human activities are carried out (e.g., climate-related catastrophic events are affected by the change in frequency and scope, and emergency situations that are becoming "the new normality" change how populations and professionals are engaged and called to intervene in, collect and use resources).

The social dimension also emerges when considering the pervasiveness of climate policies targeting citizens. These policies now affect not only public entities and industry, but also citizens' cars and homes (e.g., energy performance of buildings). Citizens must spend considerable sums to upgrade their homes and switch to electric cars. Those in the most disadvantaged circumstances especially have difficulty adapting and therefore tend to resist. However, this opposition is not only linked to a lack of money, but also to cultural and behavioural factors. Not only do they not buy electric cars; they are also unwilling to engage in low-cost activities such as bike-sharing and do not use public transport, preferring to drive old petrol-powered cars. It seems that pro-environmental behaviours with no or very low economic costs are adopted much more readily by people in higher economic strata.

The issue of social justice when pursuing climate change M&A objectives is important and is mentioned in most Appendixes. For example, it was mentioned in Denmark's 2020 climate neutrality law, which requires the consideration of the social and economic implications of climate policies. In France, the issue was considered in the most recent climate mitigation policies and became a point for reflection following the so-called 'Gilets Jaunes' crisis, during which protests (and even riots) took place across the country against the carbon law that imposed taxes on the consumption of carbon fuel. The issue has also been raised in Romania and Germany, where possible social inequalities caused by climate change policies are among the damages indicated. In the case of the Czech Republic, reference is made to the relevant EU programme and policy provisions (e.g., the Just Transition Fund). Italian policies also highlight the risk of social damage caused by both climate change and the actions undertaken to address it, including the risk of 'energy poverty'.

However, we could say, in general, that a specific approach to how to handle the social dimension of transition and M&A policies does not emerge clearly.

- In France, justice and equity considerations are not sufficiently integrated. This results in unequal territorial protection and socio-

economic vulnerabilities, as well as inconsistent alignment between economic, social and ecological policies.

- In Romania, the social dimension of climate change is formally acknowledged in climate policies that reference social equity, a just transition or the protection of vulnerable groups. However, these commitments remain largely declarative. The social dimension is insufficiently addressed, with no coherent policies in place to alleviate the social impacts of climate risks or support vulnerable communities. For example, the National Social Climate Plan, which was intended to leverage the Social Climate Fund to support vulnerable communities, has been initiated; however, its development has stagnated and remains opaque. Social considerations are not embedded in national climate strategies, which risks exacerbating inequalities and limiting the long-term effectiveness of the transition. Current policies lack dedicated support mechanisms, such as social assistance programmes or investments in community-level protective infrastructure.
- In Austria, the social dimension of the transition is addressed by outlining actions to consider vulnerable groups. However, the attention dedicated to the social aspects of mitigation and adaptation often seems too vague.
- In Denmark, specifically with regard to flood protection, interviewees noted that many different values are at play. People's houses are flooded, and there are discussions about whether society should protect everyone against everything. This raises questions about whether we should retreat from some areas and whether we can accept flooding in certain areas sometimes. There are many different opinions. There is also debate over whether flood protection should be prioritised over environmental protection.
- In the UK, the social dimension of climate change policies is now being considered by the new government through the objective of lowering bills and producing short-term benefits. To speed up the achievement of these goals, actions are being taken to ensure that supply chains can meet the growing demand for decarbonised energy. This also involves developing a workforce capable of working in a new energy supply environment. The previous government's approach was to allow the benefits to be transmitted through the functioning of the market and, if necessary, to provide protection for the most vulnerable people. The current focus is on achieving tangible results that impact citizens' daily lives, whereas previously, the emphasis was on funding the costs of the investments needed for this transition. The idea was that the cost of transition disruption should not be borne solely by consumers.
- In Italy, concrete measures have been taken regarding the 'just transition', providing support for workers who lose their jobs due to the closure or downsizing of fossil fuel-based industrial activities. Some attention is also paid to the social dimension of energy policies,

for example through the promotion of energy and social communities. However, a comprehensive approach to the issue seems to be lacking.

The relatively low focus on the social impacts of climate policies does not mean that possible social problems are not a practical concern for policymakers.

Hopefully, such approaches will consist of clearer definitions of action principles and priorities, and the identification of specific sets of tools (e.g., for tax policies) and actions aimed at promoting social justice in the management of climate change. Moreover, we should consider that these problems are relatively highlighted only recently and new approaches are still being developed. Interestingly, it is worth noting that in France, where the social dimension of transition first emerged as a political issue, there are funds for researching the social implications of climate change.

In the European Union institutions (e.g., the Social Climate Fund and the Just Transition Fund), looking at social justice in connection to the implementation of climate policies is a must. The European Investment Bank considers that the most crucial aspect of the climate strategy is that no one can be left behind. However, paying attention to these issues could result in a slowdown. This risk is particularly significant in the current context, given the growing importance of competitiveness, which could take precedence over social benefits.

Moreover, a few interviewees also highlighted that, while social justice and just transitions are noble intentions, they are very difficult to implement due to the limited expertise in this area at both the EU and national levels. Furthermore, the term 'just transition' is not considered as entirely clear: different people have different ideas about who should pay and who should be supported in this process. There is a need to look beyond principles and examine what is happening at the local level.

PART Three – Conclusions

1. RESEARCH FINDINGS

Based on the comparison between national experiences in the implementation of M&A policies presented in the preceding chapter, it is possible to list some research findings. They represent a list of themes that emerged as relevant both for defining new policies and for defining the object of further research. They could be of interest to the members of the scientific community, who are carrying out policy research and for policy makers as well. Particularly, these findings can be grouped into six thematic areas that could be of help in framing such further research efforts.

1. All the countries are confronted with a huge innovation process that has social, cultural and economic characteristics.

- M&A policies represent an attempt to promote a change in the current paradigm of how the relationship between humankind and natural environment is managed. Adaptation, in particular, is aimed at a risk regime change. The entire social and economic system is therefore involved in M&A, which cannot be considered in any way as "sectoral policies". The changes implied by M&A policies concern a wide array of diverse social actors, which makes these policies highly complex. Protecting society from climate change risks through M&A and by supporting resilience also implies a vast social and economic innovation effort.
- The huge innovation needed to mitigate and adapt to climate change could create bottlenecks in the supply chain, especially in terms of skills and overall capacity (including advising the adopter of new technologies, such as heat pumps – See Annex B9).

2. The societal innovation process needed to react to climate change has a long-term horizon.

- Climate policies imply a change in people's routines. Change must be diffused, and this requires both operational and cognitive/cultural changes. This is relevant for both Mitigation and Adaptation. The management of the complex time dimension is to be included among the cultural aspects of climate policies. In order to maintain the effort over time, Climate policies (many of which will only yield tangible changes in the medium to long term) should bring about results that are felt also in the short run, so as to promote consensus among the various stakeholders and citizens and help align their points of view with climate policy objectives. The "urgency" dimension of M&A policies should be considered as relevant.
- The alignment of orientation among stakeholders has also an operational effect. For example, adaptation is oftentimes

underfunded. The problem is also that commitment to funding should be maintained in time, also for a long-time span.

3. Cultural issues, that is, how people see Climate Change policies, the meaning they attach to them, are crucial. This is particularly evident in the case of adaptation policies.

- For climate policies, especially for adaptation, preparedness is fundamental. It constitutes a multifaceted process that necessitates awareness among diverse stakeholders of the need to intervene to address the risks caused by climate change and the formulation of assumptions regarding potential adverse events projected far into the future. Assumptions should also concern the distribution of responsibilities among involved actors in the process.
- Adaptation policies and Climate policies in general, do – due to their systemic characteristics – not only consist of Infrastructural interventions, new rules, and funds, but also of non-physical activities aimed at setting the conditions for making the physical interventions smooth and effective. These activities concern many actors, their operations, and interactions (building and use of new skills and capabilities, production of relevant knowledge, new rules definition and implementation and so on).
- It is worth stressing that the conflicts connected to Climate policies are not just of an operational nature (i.e., because of the costs they bring about to certain groups) but also cognitive and cultural. It is the case of the opposition to the new use of land implied by M&A, or the defence of the landscape. The opposition Nature vs Climate is a matter of "vision" of the problem and of its future developments.
- Cognitive and cultural issues are crucial: people don't like to be told how to behave in certain situations and change routines, for example, concerning dietary habits, the type of car to use, how to farmland. Part of the Climate policy should be devoted to awareness raising and the management of these cognitive aspects. Such aspects are also crucial because parts of M&A policies imply a change in the demand by the users (families, farmers, etc.).
- Mitigation and Adaptation are two prongs of Climate Change policies, but they are often very different. Such differences increase the likelihood that they are understood by relevant stakeholders as independent policies, if not competing ones (as long as the same funds are concerned).

4. Multilevel governance is a crucial aspect of the difficult implementation of M&A policies. Diverse government and governance actors are involved at different levels (International, national, regional, local).

- Multilevel governance also implies regulatory complexity.

- In Europe, multilevel governance of M&A policies implies the EU, particularly through the implementation of EU regulations. The problem is that in various cases, compliance with these regulations doesn't occur smoothly and cannot be taken for granted.
- Possible conflicts between M&A policies' objectives and actions should be tackled through specific strategies and interpretations involving actors and decision makers at the local level (because each country/region has its own characteristics, risks and opportunities).
- M&A policies imply both very centralised actions (e.g., adoption of new technologies in large production plants) and "diffused" actions whose main result is the behavioural change of a large number of actors whose decisions are decentralized (e.g., families that change some consumption routines). The most diffused actions (e.g., electrification of heating systems) should be implemented at lower levels.
- Involvement of civil society stakeholders often is not effective and presents various problems (delays, scarce results, lack of clarity of the effective roles to be played by various actors, etc.). For example, strong actors (e.g., highly polluting industries) have more impact than smaller ones (e.g., small municipalities, SMEs), even if more numerous.
- Governance systems are not necessarily consistent, and conflicting prerogatives and functions do exist between different levels. This situation can be intentionally used by specific actors of the governance process to hamper the implementation of M&A policies.
- There are delays in implementing M&A policies. Delays are not generalized. Good results of M&A policies also exist. Monitoring is key to promoting implementation. The right choice of indicators is crucial for monitoring and requires the involvement of the scientific community.

5. The complexity of M&A policies raises the question of the coordination of their components.

- Coordination has to do with not just the components of these policies (Mitigation and Adaptation) but also between other policy dimensions:
  - levels of governance (national, international, regional, local) (see above)
  - stakeholders' involvement (certain stakeholders are easier to single out and involve in policy definition than others; see above)
  - diverse intervention methods may be required (in some instances, influencing the behaviour of specific actors, whereas in others, achieving widespread changes in production or consumption routines is necessary).
  - use of diverse sets of knowledge (effective intervention in climate issues requires the integration of knowledge from a range of disciplinary backgrounds)

  - specific skills and capabilities for policies' implementation are needed; the availability of enough people (and firms) with the desired competencies cannot be taken for granted
  - adequacy of funds. M&A policies often imply a wide distribution of responsibilities that is not consistent with the assigned funds, which oftentimes are scarce.
  - territorial scope and border collaboration is needed in many M&A programmes in which several implementation activities should be undertaken to achieve the same result, as in the case of flood protection. M&A policies not just impact several actors but also various regions and/or municipalities that should coordinate their actions even if they could have diverse political orientation, capabilities, etc.
- The need for effective coordination clashes with some tendencies to fragmentation and shifting responsibilities among actors in the political systems.
- Lack of adequate coordination creates difficulties in properly managing M&A-related conflicts.
- Lack of coordination makes the time management of M&A policies difficult, which has to be rolled out in long time dimension.
- Stakeholders' involvement (e.g., intermediate bodies, multi-level administrators, and politicians) should be aimed at those who can facilitate operations in a concerted way. The tools for doing this are diverse. This is part of the overall coordination problem of M&A policies.

6. The implementation of M&A policies is complex, also because of the uncertainty of the context in which it takes place. Some findings are connected to the issue of the role of scientific research, including measuring (and monitoring which is not just a managerial practice but also entails a scientific understanding of the climate change process).

- There is a new role of scientific research in climate policies. Science not only helps to find solutions (as it has been so far) but is also at the origin of the very identification of the climate change problem. In the UK and France, the relevant scientific communities have a recognized and institutional role in rolling out such policies.
- Mitigation is easier to measure and account for (which concerns mostly the reduction of CO2 emissions) compared to adaptation (which concerns more "avoided loss"). How to deal with this problem is a matter of dialogue among the relevant stakeholders that include the scientific community. Such a dialogue is important since the climate change policies also have a cognitive nature because of the need to agree on a certain vision of the future.
- M&A policies are measured differently. Mitigation indicators are more straightforward and clearer, while Adaptation's ones are more complex. This partly explains some of the difficulties that are being met in implementing Adaptation policies, also because it is more difficult to present the results to obtain, the progress made, and so on.

- The effectiveness of M&A policies is enhanced by dedicated scientific research on various aspects of climate change, which is an unfolding process.

2. RECOMMENDATIONS

In addition to making the specific findings available to the scientific community and to policymakers involved in designing, implementing and monitoring climate policies, T4.1 is required to provide specific guidance on implementing the final task of WP4 (T4.5) and designing and operationalising the CROSSEU decision support system (DSS).

2.1. A few guidance for Task T4.5

Task T4.5, "Knowledge-based endorsement for mitigation and adaptation policy options," should draw on the results of all previous WP4 tasks (not only T4.1) as well as other relevant sources to provide recommendations for ambitious and effective climate policy responses. To this end, specific recommendations can be derived from T4.1 based on the analysis of current climate policies.

In this context, we can make the following suggestions in relation to all the European countries considered (and at the European level).

From planning to Implementation

In order to be effective, any policy – including ambitious ones – must be implemented, or at least initiated. We mention this obvious fact because the comparative analysis has shown that climate policies are often conceived, designed and planned, but never implemented due to a lack of financial resources.

Furthermore, as documented in this deliverable, policies and measures are sometimes blocked by delays and conflicts in the implementation of procedures, such as Environmental Impact Assessment or Social Impact Assessment, which are, of course, entirely justified. They may also encounter other regulatory obstacles. Conflicts may also arise between the actors responsible or involved in some way. They may also encounter any of the other barriers mentioned in the comparative analysis, including the widespread tendency to "pass the buck" for problems among stakeholders involved in policy implementation.

The first set of recommendations for an ambitious and effective climate policy response is to address both:

- the governance framework of the policies, and
- their financial sustainability (e.g., mobilising the necessary funds, considering ETS schemes, involving the private sector and combining public funding, private investment and innovative financing

mechanisms) to ensure that the proposed policy is operationally feasible or, at least, to understand the conditions for its feasibility.

Synergies

Climate policies require greater synergy. The topic has been widely covered in the 'comparative analysis', which paid particular attention to the set of mitigation and adaptation policies. This analysis emphasised that a dual focus on mitigation and adaptation highlights the synergies that can be achieved when policies are designed with both objectives in mind.

While more or less everyone is aware of the trade-offs, conflicts and overlaps between mitigation and adaptation, this deliverable suggests that little is being done to resolve associated problems, such as the coexistence of different institutional actors who design and implement specific policies in different sectors (and, sometimes, on mitigation on one side and adaptation on the other) and often do not talk to or understand each other, or even conflict with each other; the lack of integration among the tools and measures envisaged in the plans; and the conflicts in the use of limited financial resources.

It is therefore necessary to identify (and apply) the conditions that will enable these synergies to be achieved and translated into practice.

Finally, and importantly, we would like to emphasise that ambitious policies need to be implemented in a synergistic way at 'lower levels' in order to overcome possible conflicts between specific sectoral policies and measures (e.g., nature conservation and water management interests). For example, a fluvial flood protection scheme was actively declined in one municipality because the plan failed to clearly explain how it considered the effects on a protected frog. However, it should be noted that nature and biodiversity are sometimes considered together when planning projects, demonstrating potential synergies.

More proactive policies

As highlighted in the "Comparative Analysis", climate policies are too often reactive, prompted by crises rather than being part of long-term preventive strategies. We are referring primarily to crises caused by natural hazards (some of which are more or less related to climate change, such as hurricanes, cyclones, floods, avalanches, landslides and heat waves), but also to social reactions to certain measures that neglect or do not include certain negative social effects (particularly on disadvantaged groups), such as car-free mobility measures.

While these reactive policies are undoubtedly important, focusing solely on them often leads to preventive policies being neglected, even though the effectiveness of the latter can render the former less necessary.

Highlight the "Missed" areas

Some "missed" areas were highlighted during the comparative analysis. Firstly, these are specific issues (e.g., climate policies related to biodiversity protection, cultural heritage, the circular economy or migration) that should be given much more consideration in an ambitious climate policy framework. Furthermore, there are issues that policy actors have not yet figured out how to address properly. Insurers are an important example of this. As the comparative analysis states, insured losses from extreme weather events have increased by as much as 250% in the last 30 years, generating tension between the affordability of insurance for consumers and the solvency of insurers. Innovation in insurance products is likely to be central to insurers' ability to ease this tension. Therefore, there is still a situation of profound indeterminacy. This issue should be addressed much more.

Take into account the societal issues more

There is also a profound sense of uncertainty about how to address the social aspects related to the implementation and effects of climate policies. Here, we are not referring to the involvement of citizens and other stakeholders in the design and implementation of these policies, but rather to the negative unintended effects of some mitigation and adaptation policies on the most vulnerable, and their exclusion from the deployment of these policies (see Section 9 in the 'Comparative Analysis'). Many issues have been raised in this regard, such as the 'just transition', which focuses on supporting the most vulnerable people and communities and building resilient, healthy and equitable places, and the integration of climate resilience into infrastructure planning. Many protagonists of climate policies are more or less perfectly aware of the importance of this issue. Nevertheless, some climate policies have significant limitations at the operational level, often excluding or penalising disadvantaged groups who are likely to resist them.

As the comparative analysis shows, the focus on disadvantaged people (or those at risk of becoming disadvantaged as a result of certain climate policies) is still rather limited. Most measures should be tailored to the specific characteristics of various social groups. In general, there needs to be a stronger connection between climate and social policies.

Research-based

While it is true that much is already known about the measures needed to implement ambitious and effective climate policies, further research is required.

Above all, it is necessary to understand what needs to be (or could be) done to overcome all (or at least some among) the barriers that stand in the way of operationalisation, especially at the societal and governance levels. Since successful solutions in this regard have already been identified and implemented here and there, it also seems necessary to ensure the

effective circulation of information about good practices, obviously taking into account their contextualisation (considering the differences between the various contexts: geographical, economic, social, political, etc.).

Short-term → Long-term

For climate policies to be effective, they must be able to think long-term. As stated in this deliverable, policy areas nowadays are often affected by short-termism and polarisation, whereas policies requiring long-lasting consensus among policymakers, citizens and stakeholders are needed. However, this is not possible (or is it unclear how it could happen) given that political majorities in power can change in European countries (and at EU level), fortunately! Nevertheless, we should hope that most objectives will be widely shared and that changes will take place gradually, as is already happening in some countries.

Multi stakeholder approach should be "real"

There is almost universal agreement on the need for a multi-stakeholder approach to the design and implementation of climate policies. However, for ambitious climate policies to be truly effective, they must 'penetrate' all societal realms, also through broader social interactions where relevant. Therefore, to ensure this effectiveness as far as possible, multiple precautions should be taken into consideration. Some examples are given below.

- Do not disregard or forget relevant actors
  - the "actors of the context", that is, those who are not directly involved, but who may nevertheless be affected or who can give a useful contribution (e.g., insurance companies, relevant private foundations, the judiciary system)
  - the 'weak' actors – sometimes almost invisible – who do not have the strength to make themselves heard and who, therefore, are often ignored (e.g., migrants without residence permits or those who live illegally in an area – possibly prone to flooding).
- Do not forget that each actor has specific points of view, interests, capabilities, and needs, often very differentiated and not always consistent.
- Consider that the involvement of a plurality of actors can generate conflicts that need negotiations.
- However, consider also that it is necessary that conflicts (as sometimes happens when public entities are involved) do not lead to blockages or delays; ultimately, disputes should be settled on the basis of the principle of prevailing interest.

Last but not least, strengthening cooperation among NGOs, public institutions, and private actors should increase funding, expertise, and data availability. This would indeed increase the effectiveness of climate policies.

International dimension

Climate change and climate issues in general sometimes encounter geographical barriers, but completely ignore political boundaries. To be effective, ambitious climate policies should be conceived as transnational, with a specific focus on cross-border areas where relevant. However, since policies will inevitably continue to be predominantly national, they should at least be conceived within a coordination framework (the EU is already playing an important role in this regard, as are UN bodies, as demonstrated in this deliverable).

Table 10 – Key recommendations at glance

From planning to implementation	Climate policies often remain unimplemented due to financial, governance and procedural barriers; their feasibility and funding must be addressed upfront.
Synergies	Identify (and apply) the conditions that will enable possible synergies among policies (including between mitigation and adaptation) to be achieved and translated into practice
More proactive policies	Stronger preventive strategies are needed to reduce future risks and so the need of reactive measures.
Highlight the "missed" areas	Key issues such as biodiversity, cultural heritage, circular economy and insurance remain underdeveloped and require greater policy attention.
Take societal issues more into account	Social impacts of climate policies on vulnerable groups are insufficiently addressed; stronger links between climate and social policies are needed.
Research-based	Additional research and better circulation of good practices are needed to overcome governance and societal barriers to implementation.
Short-term vs. Long-term	Climate policies require more long-term vision and continuity beyond political cycles, supported by broad and stable political consensus.
A "real" multi-stakeholder approach	Stakeholder involvement must be inclusive and effective, addressing conflicts without causing delays and ensuring decisions serve the public interest.
International dimension	Climate policies should be coordinated across borders, with strong EU and international frameworks supporting national action.

2.2. A few guidance related to the CROSSEU DSS

CROSSEU will deliver a common online Decision Support System (DSS) platform. The DSS will allow to select, launch model computations, and display project research outputs in an accessible format, to provide stakeholders with socio-economic indicators and evaluations of the future of Climate Change impacts and enhanced resilience to socio-economic risks across Europe. It is already well underlined that the DSS is (and it is

happening presently) co-produced with stakeholders and it is expected that it will be tested, co-evaluated and refined with stakeholders.

This deliverable can provide three points of guidance in relation to this process, which is already highly complex and well-designed.

I – Adopting the broadest possible conception of the notion of stakeholder, going beyond the 'usual obvious ones' (the scientific community, environmental NGOs/CSOs, businesses, the government, regional and local authorities, etc.), in the same spirit as already pointed in Section 2.1. Of course, we should be realistic. Testing the DSS with 'weak actors', such as elderly people, isolated rural communities and low-income households, is not feasible, nor is involving them in its 'co-evaluation'. However, it may be possible to involve associations that work with these disadvantaged groups and understand their needs and capabilities. Furthermore, some categories of stakeholders could be disregarded despite playing a significant role in climate policies, such as insurance companies, city planners, the media and certain private foundations. Conversely, these categories of actors should be involved.

II – We are aware that the governance system of climate policies is far from ideal, but it is what it is. There are many problems and barriers that we have identified, as well as sometimes controversial power balances. For example, consider the interference of 'dominant economic actors' that we mentioned in the 'comparative analysis'. Furthermore, the governance system varies greatly between and within European countries. What works in one place may seem incongruous elsewhere. The construction of the DSS must therefore take into account this problematic and differentiated governance status. Ideally. The CROSSEU DSS should be 'adaptable' to such situations. However, this is virtually impossible. At least, therefore, the methods of presenting and disseminating the DSS will have to be highly adaptable.

III – As was understood during the implementation of T4.1, climate policies are evolving in terms of both their conception and their implementation. Continuous updates are needed where possible. Therefore, while the DSS can be informed by categories, policy examples and specific information about plans such as the PNACC in Italy or France, adopted laws such as the EU's Climate Law, and further documents such as examples of specific practices, institutional and governance frameworks and overall policy frameworks may become invalid in a relatively short timeframe.

The table below reports the documents (links) numbers used in this deliverable that could inform the DSS. A legend containing all the document names and the corresponding links associated with the numbers is provided after the table.

Table 11 – Document references that could inform the DSS

	EU	AT	CZ	DK	FR	DE	IT	RO	UK
Health	10	14	25,30,31	n.a.	42,45	48,49,51,52	55	62	67,68,69,70,71
Social justice	3,6,13,20	14	27,31	38	44,45	48,49	53,56	62	66,70
Migration	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	72
Finance	8,9,11	15,17	24	34,35	42,43	51	n.a.	n.a.	66,68,70,71
Insurance	8	n.a	n.a.	36	42,43	n.a.	54	62	n.a.
Energy	1,7,9,20	14,16,17,18	24,26,27,28, 30,32,33	34,37	39,40,41,42,4 3,45	50,52	53,54,55,57, 58	59,60,61,62,63	65,66,67,68,71
Tourism	4	14	25,30	n.a.	42,44	52	54	62	n.a.
Transport	2,9,10,20	14	24,30,31,32	34,36	39,40,42,43,45	48,49,50,51,52	54,55.57	60,62,63	66,68,69,70,71
Biodiversity, ecosystem services	5,8,12,20	14,15	21,30	36	39,42,44	48,49,52	55,57	62	66,68,70,71
Forestry	4	14	24,30	36	39,40,42	49,51,52	54,57	62	67,70
Agriculture and food security	9,10	14	24,30	34,35	39,40,42,43,4 4,45	49,51	54,57	60,62	66,67,68,69,70, 71
DRR/DRM	8	14,15,19	22,23,29,30, 32	36	42,43,44	48,49,52	54,55,57	62	67,69,70,71
Circular economy	9,46	n.a.	31,47	34	39	n.a.	55,57,58	64	n.a.
Cultural heritage	n.a.	n.a.	33	n.a.	n.a.	n.a.	54	n.a.	69,70
Water management	8,10	14	21,30	36	42	49,51.52	54.57	62	67,68,70,71

Legend:

1. European Commission, Practical guidance to help EU countries
2. European Commission, Communication to decarbonise corporate fleets
3. European Commission, Social Climate Fund
4. European Council, Council adopts conclusions on the new EU forest strategy for 2030; European Council, Council Conclusions on the New EU Forest Strategy for 2030 – Approval; European Council, Deforestation - Healthy forests are vital for people and the environment; European Council, European Green Deal; European Council, Climate change: what the EU is doing
5. European Commission, Biodiversity strategy for 2030; European Commission, Delivering the European Green Deal
6. European Commission, The Just Transition Mechanism: making sure no one is left behind; European Parliament, Just Transition Fund
7. European Commission, REPowerEU: A plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition
8. European Union, Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions empty
9. European Commission, European Climate Law
10. European Commission, Adaptation to Climate Change: Support at least 150 European regions and communities to become climate resilient by 2030. Implementation Plan; European Commission, EU Mission on Adaptation to Climate Change
11. European Central Bank, Climate change, nature loss and banking supervision
12. European Commission, Nature Restoration Regulation
13. European Union, Regulation (EU) 2021/691 of the European Parliament and of the Council of 28 April 2021 on the European Globalisation Adjustment Fund for Displaced Workers (EGF) and repealing Regulation (EU) No 1309/2013
14. The Austrian Strategy for Adaptation to Climate Change
15. KLAR! Climate Change Adaptation Model Regions for Austria
16. National report on The Energy and Climate Plan
17. Climate Change Regulation 2025 – Austria
18. Austrian Emissions Trading Registry (EN_HOME_Emissionshandelsregister)
19. Natural hazard and climate change check for municipalities (Austria)
20. 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutralityl
21. State Environmental Policy of the Czech Republic 2030 with outlook to 2050
22. Climate change adaptation strategy in the Czech Republic
23. National Climate Change Adaptation Action Plan (The Czech Republic)
24. Climate protection policy of the Czech Republic. Executive summary 2017
25. Updated Strategic Framework Czech Republic 2030 with Outlook to 2050
26. How the state (doesn't) wants to protect the Czech climate: a key "green" document returned to the government, but failed again
27. National Energy and Climate Plan of the Czech Republic, 2019
28. National plan of the Czech Republic in the area of energy and climate
29. Report on the Czech Republic's adaptation to climate change
30. Adaptation Strategy of the Czech Republic
31. Climate Plan of the City of Prague 2030
32. Climate Change Adaptation Strategy of the Capital City of Prague
33. Energy-efficient renovations of architecturally and historically valuable buildings
34. "An ambitious and binding climate law"
35. The Planet and Denmark – the DCCC's 10th Anniversary Publication
36. Climate adaptation in Denmark
37. DK2020
38. Managing a just transition in Denmark
39. National Low Carbon Strategy (France)
40. Vers la 3e Stratégie nationale bas-carbone (SNBC 3)
41. Carbon neutrality, adaptation… France's policy on climate change
42. France's National Adaptation Plan to the Effects of Climate Change 2011-2015
43. Climate action plan of the Ministry of Ecological Transition (France). Summary
44. Mid-term evaluation of the 2nd national climate change adaptation plan – 2018-2021 (France)
45. The proposals of the Citizens' Convention for Climate (France)
46. European Commission, Ecodesign for Sustainable Products Regulation
47. Strategic framework for the circular economy of the Czech Republic 2040
48. Climate Adaptation Law
49. German Strategy for Adaptation to Climate Change
50. The Climate Path Forward Under Germany's New Government

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51. Climate Action Programme 2030 (Germany)
52. Bavarian Climate Protection Program
53. National Integrated Plan for Energy and Climate – PNIEC (Italy)
54. National Plan for Adaptation to Climate Change – PNACC (Italy)
55. National Recovery and Resilience Plan – PNRR (Italy)
56. Social Climate Plan (Italy)
57. Ecological Transition Plan – PTE (Italy)
58. Integrated Plan of Activities and Organisation – PIAO (Italy)
59. Institutional Strategic Plan of the Ministry of Energy 2024 – 2027 (Romania)
60. Integrated National Energy and Climate Change Plan 2021-2030 (Romania)
61. National Energy Strategy 2025-2035 (Romania)
62. National Climate Change Adaptation Strategy 2030 (Romania)
63. National Recovery and Resilience Plan (Romania)
64. Clean Power 2030 Action Plan: A new era of clean electricity (UK)
65. Scotland's Climate Change Plan – 2026-2040 (UK)
66. Third National Adaptation Programme - NAP3 (UK)
67. Progress in adapting to climate change – 2025 (UK)
68. Climate change – Scottish National Adaptation Plan: annual progress report 2024-2025 (UK)
69. Climate Adaptation Strategies for Wales 2024 (UK)
70. Third Northern Ireland Climate Change Adaptation Programme – NICCAP3 (UK)
71. Net Zero Strategy: Build Back Greener (UK)

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ANNEXES

FRAMEWORK ANNEXES

ANNEX A1 – THEORETICAL FRAMEWORK

The explicit objective of the Task 4.1 is "a systematic analysis of the policy and institutional framework, and instruments of Mitigation of climate change and Adaptation to Climate Change at EU and national levels", also considering:

- The actual interlinkages, and synergies and contradictions between policies
- Specific synergies between Mitigation & Adaptation
- Bottlenecks and barriers in the decision, implementation and monitoring process
- The scope of the various policy fields for societal transformation
- The institutional/governance framework.

T4.1 is looking "only" at the current policies and measures, i.e., ongoing policies and measures, the policies and measures that are being implemented or that should be implemented based on the regulations in force; of course, these policies/measures could have started some time ago and could represent the "evolution" of previous instruments. Present regulations together with the involved actors (or actors expected to be involved) with their specific roles/functions in each country (or at the European or at the global levels) constitute the "institutional" or "governance" framework (in the country, Europe or globally). These frameworks too are taken as they are presently (maybe also considering their recent evolution or expected evolutions in the immediate/near future)

The territorial scope of Task 4.1. is represented by the European countries represented in CROSSEU (Austria, The Czech Republic, Denmark, France, Germany, Italy, Romania, UK), as well as, by the EU as a whole. Moreover, relevant international policies (beyond EU – e.g., United Nations level) will be also taken into account (also thanks to the WMO – the United Nation Agency on Meteorology – participation in CROSSEU).

Some concepts are used repeatedly throughout the task. We define these concepts here below.

'Policy' refers to a set of actions (as well as non-actions) taken by public and private actors that are in some way related to a collective problem[8]. Inequality can be taken as a critical lens through which to examine any social and economic policy, because policies are applied to and have effects on different groups of people that are, or can be, very different precisely because of the inequalities we have just discussed. This, of course, also applies to climate change policies, if only because climate change poses a greater threat to exposed and vulnerable countries, communities and social groups.

Climate policies can be divided into mitigation and adaptation policies (with some overlap), as shown in Figure 1.

[8] Capano, G. (1992). Bruno Dente (a cura di), Le politiche pubbliche in Italia, Bologna, il Mulino, 1990, pp. 397, L. 32.000. Italian Political Science Review/Rivista Italiana di Scienza Politica, 22(1), 161-164.

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As already mentioned in the "thematic framework" (Annex A1 above), adaptation policies or measures are those that aim to help people and communities adapt to climate change by adjusting their daily lives to rising temperatures and their associated consequences. These consequences are, on one hand, slow processes (but very significant even in the short and medium term) such as melting ice, increasing sea and air temperatures, rising sea levels, major droughts, and, on the other hand, catastrophic and often sudden and extreme events such as hurricanes, floods, avalanches, landslides, heat waves. These events have occurred many times in the past, but with climate change they seem to be occurring with much greater frequency.

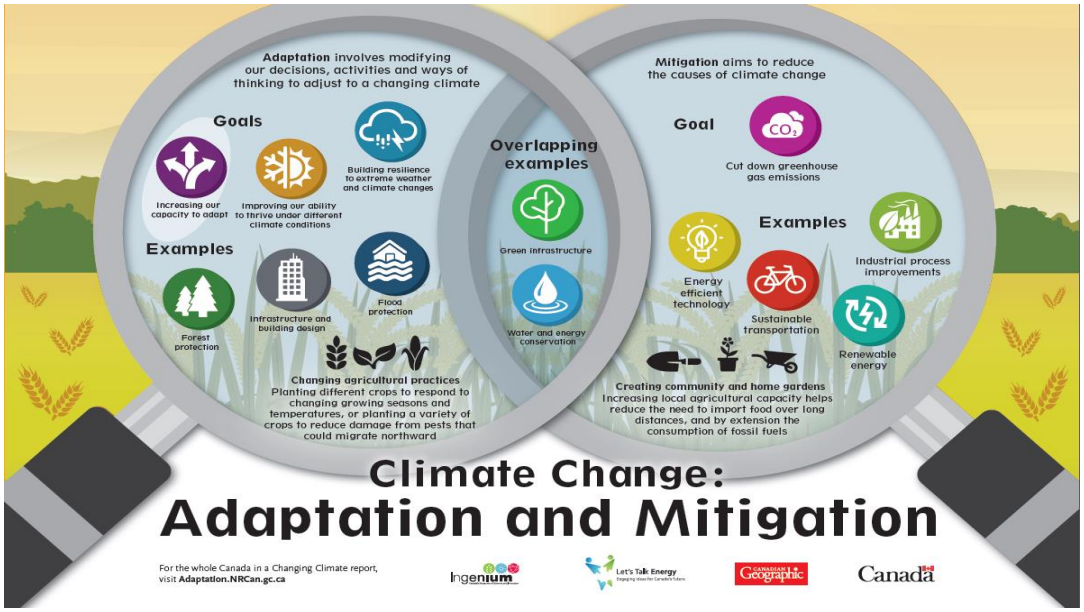

Figure 1 – Climate change: adaptation and mitigation

Possible adaptation measures are (the list is far from being exhaustive):

- Erecting buildings and infrastructure that are safer and only in areas that are not prone (or at least less prone) to extreme events
- Building green roofs to reduce urban heat island effects
- Developing and disseminating Early-Warning Systems
- Replanting forests (and countering deforestation)
- Restoring damaged ecosystems also thanks to the adoption of nature-based solutions
- Developing blue-green infrastructures for strengthening coastal defence
- Building seawalls to protect against sea level rise
- River Basin Management Plans/Flood Risk Management Plans
- Planting drought-resistant crops
- Developing Community-Based Risk Management schemes tailored to each specific territorial context and in close cooperation with the involved communities
- More generally, all the awareness-raising and training/capacity-building activities aimed at increasing the level of preparedness of communities prone to risk (actually and eventually).

Mitigation policies or measures focus on addressing the root cause of climate change by reducing greenhouse gas emissions and enhancing carbon sinks. These

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policies cover various sectors, including energy, transport, buildings, industry, agriculture, and waste management.

Possible mitigation measures are (the list is far from being exhaustive):

- Improving energy efficiency and opting for renewable energy in enterprises and in buildings (also in relation to the introduction of new codes and standards compatible with 0 emissions or very low emissions)
- Introduction of energy management systems (also voluntary) in the enterprises
- Brokerage for industrial cooperation
- Introduce new taxes, such as carbon tax, fuel tax and other fossil energy taxes, fertilizer or nitrogen taxes, sprawl tax
- Introduce/remove subsidies, such as fossil fuel subsidy removal, biofuel subsidies, subsidies or tax exemptions for investment in efficient buildings, retrofits and products, subsidies for energy audits for enterprises and buildings, credit lines for low-carbon agriculture
- Enforcement of fuel and vehicle standards compatible with zero emissions or very low emissions
- Emission credits
- Regulatory restrictions to encourage modal shifts (road to rail)
- Restriction on use of vehicles in certain areas/urban planning and zoning restrictions
- Provision of utility infrastructure, such as electricity distribution, district heating/cooling and wastewater connections, etc.
- Reforestation and reduction of deforestation (also in relation to improved laws/regulatory frameworks)
- Investment in improvement and diffusion of innovative technologies in agriculture and forestry
- Information policies to support REDD+ (Reducing emissions from deforestation and forest degradation in developing countries), including monitoring, reporting and verification
- Labelling programmes for efficient buildings
- Promotion of sustainability by developing standards and educational campaign
- Energy advice programmes.

As already stated in the “thematic framework”, there are trade-offs and overlaps between these policies.

Finally, we mean by “institutional framework”:

- The set of public, private and non-profit actors that play a relevant role (e.g., as main promoters and/or implementers and/or implementation supervisors or evaluators) in relation to the policies/measures that are identified and analysed; these actors may be central government entities, regional and local public bodies, semi-public bodies, non-profit/civil society organisations, business bodies, scientific community, media
- The relationships between the identified actors.

Institutional frameworks should be drawn up at the EU (and at the global) level and in each of the countries included in the territorial scope. Specific institutional frameworks could also be drawn up at the regional and local level with reference to the territories involved in the CROSSEU case studies. The institutional framework in each country (or at the European or the global level) draws the governance framework of the climate policies in the corresponding related context.

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ANNEX A2 – THE INTERNATIONAL CONTEXT OF THE CLIMATE POLICIES

1. Introduction

1.1. Overview of M&A Strategies

The increasing severity of global climate change impacts, which are widely occurring within Europe, highlights the urgent need for coordinated strategies that combine mitigation (reducing greenhouse gas (GHG) emissions) and adaptation (strengthening resilience against climate-related risks such as extreme weather events, rising sea levels, and ecosystem degradation). Together, these twin approaches underpin global climate action, balancing the imperative to limit warming to the Paris Agreement target of 1.5° with the necessity to cope with its inevitable consequences.

1.2. Global Context and Challenges

The WMO Global Annual to Decadal Climate Update 2024-2028 states that "*it is likely (80% chance) that global mean near-surface temperature will exceed 1.5°C above the 1850-1900 average levels for at least one year between 2024 and 2028*". Although this threshold was already temporarily exceeded in 2024, it does not mean that the 1.5°C target of the Paris Agreement has been breached. However, we can safely say that it is increasingly at risk. According to the latest Intergovernmental Panel on Climate Change (IPCC) AR6 reports, global emissions are still far from declining at the scale required to achieve net-zero by mid-century. At the same time, adaptation efforts face barriers such as insufficient financing, fragmented governance, and limited capacity in vulnerable regions. These challenges demand strengthened international cooperation, innovative financing mechanisms, and a more integrated approach to mitigation and adaptation.

1.3. Purpose and Scope

This Annex analyses the international (global, not merely in Europe) context of mitigation and adaptation strategies, focusing on governance frameworks, implementation dynamics, and practical outcomes. It highlights the role of international organisations, such as the World Meteorological Organisation (WMO – a partner in the CROSSEU consortium), and explores lessons learned from European and global contexts. By examining key outcomes from the UNFCCC COP29 in November 2024, the (other two) Rio Conventions, and other governance and political processes, this Annex aims to offer insights for academics, policymakers, and practitioners seeking to advance climate resilience, and contribute to the T4.1 deliverable for the CrossEU project.

2. Global Mitigation and Adaptation Strategies

2.1. Mitigation Strategies

Mitigation strategies aim to reduce GHG emissions and enhance carbon sinks to address the root causes of anthropogenic climate change – the emission of CO_2 and other GHGs such as methane primarily resulting from humanity's burning of fossil fuels and our impact on global ecosystems. These strategies are vital to achieving

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the temperature thresholds set by the 2015 Paris Agreement, particularly its goal of limiting global warming to 1.5°C.

Key mechanisms for mitigation include:

- Nationally Determined Contributions (NDCs): As the foundation of the Paris Agreement, NDCs reflect each country's commitments to reducing emissions. While recent updates demonstrate increased ambition, a UNFCCC synthesis report indicates that current trajectories still fall short of the global targets.
- Carbon Markets and Pricing: The operationalisation of Article 6.4 of the Paris Agreement at COP29 enables international carbon trading, providing a pathway for developed nations to finance mitigation in low-income countries. Such mechanisms offer a dual benefit: generating revenue for large-scale emissions reduction projects while ensuring accountability and transparency in carbon credit generation.
- Nature-Based Solutions (NbS): NbS are increasingly recognised as cost-effective and scalable strategies for carbon sequestration. Initiatives such as reforestation, wetland restoration, and regenerative agriculture enhance carbon sinks while delivering additional environmental benefits, including improved biodiversity, soil health, and water quality. By integrating NbS into urban and rural landscapes, mitigation strategies can address both emissions reduction and ecosystem degradation.

2.2. The role of Nature-based Solutions

Nature-Based Solutions (NbS) play an increasingly central role in addressing the interlinked challenges of climate change mitigation and adaptation, across the world. By leveraging natural systems and processes, international policy now recognises that NbS delivers measurable climate benefits while simultaneously enhancing resilience, biodiversity, and human well-being. Seen as cost-effective, scalable, and multifunctional, NbS align closely with sustainable development priorities and are critical to achieving the goals of the Paris Agreement, both in Europe and globally.

In urban environments, NbS have been implemented to manage the growing challenges of heatwaves, flooding, and air pollution. Urban forests, green corridors, and green roofs reduce urban heat island effects, sequester carbon, and improve air quality while enhancing the liveability of cities. For example, increasing urban greenery – through parks, tree planting, and vegetated infrastructure – provides natural cooling, reducing energy demand for air conditioning during extreme heat. Additionally, permeable pavements and water-sensitive urban design help manage stormwater, lowering the risk of flash flooding in densely populated areas.

In coastal regions, NbS such as tidal marsh restoration, managed floodplains and deltas, and the natural flooding of lands formerly reclaimed from the oceans, play a dual role in carbon sequestration and disaster risk reduction. For example, although outside the scope of climate M&A, such efforts are also vital to help protect communities against seismogenic tsunamis. Allowing floodplains to absorb excess water naturally, for instance, provides a buffer against coastal flooding while restoring ecosystems that act as carbon sinks. Coastal ecosystems like mangroves and wetlands are also essential for stabilising shorelines, protecting communities from storm surges resulting from extreme events such as tropical cyclones, and enhancing biodiversity.

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For wetlands and peatlands, restoration efforts focus on rewetting and protecting these vital ecosystems, which serve as critical carbon stores. Degraded peatlands are significant sources of carbon and methane emissions, and their restoration – through water retention and habitat rehabilitation – delivers substantial mitigation benefits while improving water quality, reducing flood risks, and restoring biodiversity.

In agricultural landscapes, NbS include agroforestry and regenerative agricultural practices that enhance soil health, prevent erosion, and increase carbon sequestration. Agroforestry combines trees, crops, and livestock in integrated systems that reduce emissions and build ecosystem resilience. Regenerative agriculture, meanwhile, focuses on restoring soil carbon, improving water retention, and supporting sustainable food systems – particularly in areas vulnerable to desertification.

In mountain ecosystems, NbS are designed to address problems resulting from glacial melt and downstream impacts while supporting local economies. In the European Alps, for example, substantial glacial retreat in the 21st Century resulting from a rapidly warming climate is literally changing national borders. Reforestation efforts stabilise soil, reduce erosion, and mitigate the risk of landslides, while sustainable tourism practices and conservation programmes ensure ecosystem health and resilience in alpine regions.

The integration of digital tools and innovations further enhances NbS's effectiveness. Predictive climate models, geospatial mapping, and nature-based infrastructure dashboards enable decision-makers to design and implement targeted solutions. These tools assist in identifying areas for intervention, assessing risks, and monitoring NbS's long-term effectiveness across diverse geographic and climatic contexts.

By bridging the gap between mitigation and adaptation, NbS provide co-benefits that extend well beyond carbon sequestration and resilience-building. They offer natural, durable, and adaptable solutions to pressing climate challenges while supporting biodiversity conservation, improving livelihoods, and creating healthier environments. With continued investment, innovation, and implementation, NbS will remain an essential component of integrated climate strategies at local, regional, and global levels.

2.3 Adaptation Strategies

Adaptation strategies are essential to manage the impacts of climate change, particularly in vulnerable regions, sectors, and communities. Nature-Based Solutions (NbS) are central to these efforts, offering natural buffers against extreme weather events while enhancing the resilience of human and ecological systems.

Key mechanisms for adaptation include the following measures.

- Ecosystem-Based Adaptation: Ecosystem-Based Adaptation integrates natural systems, such as wetlands, forests, and mangroves, into adaptation planning. These ecosystems act as buffers against flooding, sea-level rise, and extreme heat, while also delivering co-benefits like improved water quality and biodiversity conservation.
- Urban Resilience Initiatives: In cities, NbS such as vegetated walls, green corridors, and water-sensitive urban design help manage extreme rainfall and mitigate urban heat islands. Integrating NbS into grey infrastructure enhances

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climate resilience by reducing stormwater runoff, improving cooling effects, and lowering energy demand.

- National Adaptation Plans (NAPs): More than 90 countries have developed NAPs to guide climate-resilient investments. Many of these plans incorporate NbS as a key adaptation mechanism, recognising their ability to provide long-term, cost-effective solutions for building resilience in rural and urban settings.

Emerging innovations in adaptation strategies include multi-hazard risk assessments, which incorporate NbS into disaster risk management frameworks to address overlapping climate threats, such as floods and droughts. Community-based adaptation approaches are also gaining prominence, ensuring that local populations are involved in the design, implementation, and maintenance of NbS.

Governments and organisations can maximise the effectiveness of climate resilience measures by embedding NbS within national and regional adaptation strategies. This integrated approach reduces exposure to climate hazards and strengthens ecosystems, livelihoods, and infrastructure to withstand future impacts.

3. International Governance Framework for M&A Strategies

The governance of climate mitigation and adaptation (M&A) strategies is anchored in key international frameworks that together form the basis of collective action. These frameworks include the United Nations Framework Convention on Climate Change (UNFCCC) with its annual Conference of the Parties (COP), the resultant Paris Agreement of 2015, the Sendai Framework for Disaster Risk Reduction, and the separate Conferences of the Parties (COPs) of the United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD). Together, these structures constitute a cohesive, albeit complex, architecture for addressing the interlinked crises of climate change, biodiversity loss, and land degradation.

3.1. The Paris Agreement and UNFCCC Processes

The Paris Agreement, adopted at COP21 in 2015, is the most comprehensive and legally binding international treaty for climate action. Its overarching goals include:

- Limiting global warming to well below 2°C above pre-industrial levels, with efforts to cap it at 1.5°C
- Achieving net-zero emissions by mid-century
- Mobilising at least $100 billion annually in climate finance to support mitigation and adaptation in developing countries.

However, the global commitment to the 1.5°C target is increasingly under threat. The IPCC's Sixth Assessment Report highlights that the world is on track for a 2.4–2.7°C temperature rise by 2100 under current policies, necessitating drastic action to close the emissions gap. According to the State of Global Climate 2024 report, the year 2024 was the first calendar year (in the 175-year observational record) to exceed 1.5° of warming, with a global mean near-surface temperature of 1.55 ± 0.13 °C above the 1850-1900 average.. While the Paris Agreement's mechanisms, such as the Global Stocktake and NDCs, offer pathways for iterative improvement, uneven implementation and lack of ambition remain critical challenges.

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The UNFCCC's institutional architecture plays a central role in driving international climate action, and much media reporting focuses on negotiations and outcomes from the annual COP (see section 5.5).

- Annual COPs: These meetings serve as the decision-making platform for global climate policy. COP29 in Baku in November 2024 underscored the challenges of reconciling diverse national interests, particularly on issues of fossil fuel dependency and carbon finance. COP30, held in Belém in November 2025, shifted attention toward implementation and delivery, with a strong emphasis on translating the first Global Stocktake outcomes into enhanced national action. Parties were encouraged to submit strengthened NDCs aligned with the 1.5 °C goal, and progress was reviewed on closing the remaining ambition and implementation gaps. While COP30 reinforced the urgency of accelerating mitigation and adaptation efforts, it also highlighted persistent limitations, including the absence of binding commitments on fossil fuel phase-out.
- Article 6 Mechanisms: COP29 also advanced market-based mechanisms for carbon trading, unlocking new potential for funding global mitigation projects. COP30 continued technical and governance discussions on operationalizing Article 6, with a focus on environmental integrity, transparency, and equitable participation. The role of carbon markets was reinforced as a complementary tool – rather than a substitute – for ambitious domestic mitigation policies.

3.2. The Rio Conventions: Synergies and Challenges

The 1992 Rio Earth Summit (United Nations Conference on Environment and Development) marked a significant step in international cooperation to address environmental challenges. Recognising the interconnected issues of climate change, biodiversity loss, and land degradation, the Summit established three parallel multilateral environmental agreements: the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the United Nations Convention to Combat Desertification (UNCCD). Each convention was designed to address a specific, yet overlapping, global challenge – limiting greenhouse gas emissions and adapting to climate change (UNFCCC), conserving biodiversity and promoting its sustainable use (CBD), and combating desertification to protect land and livelihoods (UNCCD). Collectively, these frameworks aim to support sustainable development by ensuring the resilience of natural systems, recognising that environmental crises are interlinked and require coordinated action.

Together, the three Rio Conventions (UNFCCC, CBD, and UNCCD) reflect the interconnectedness of climate change, biodiversity, and land management; all must be effective so that the international community can work together to mitigate anthropogenic climate change and adapt people and communities, especially the most vulnerable, to its consequences. While these frameworks operate independently and were designed to operate in concert, greater integration is essential to address the overlapping drivers and impacts of environmental degradation.

Opportunities for Synergy:

- Aligning NDCs with LDN and biodiversity goals to create co-benefits for mitigation and adaptation
- Leveraging innovative finance mechanisms, such as blended finance, to fund cross-cutting solutions

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- Expanding the role of international organisations like WMO to provide technical expertise and coordination across the conventions.

Challenges:

- Fragmentation of governance structures
- Limited coordination between convention secretariats
- Persistent funding shortfalls for biodiversity and land restoration projects.

3.3. Monitoring Systems: Global and Regional Mechanisms

Robust monitoring and evaluation frameworks are essential to ensure the success of M&A strategies. These systems, summarised here, provide the data needed to assess progress, identify gaps, and refine national and international level approaches to mitigation and adaptation strategies over time.

- Global Mechanisms: The UNFCCC's Global Stocktake – next scheduled for completion in 2028 – evaluates collective progress toward the Paris Agreement goals every five years, while the IPCC provides comprehensive scientific assessments. WMO's Global Greenhouse Gas Watch (G3W) complements these efforts by delivering real-time emissions data to inform mitigation planning.
- Regional Mechanisms: Regional initiatives such as the European Union's Climate Adaptation Monitoring Mechanism track progress at a subnational level, providing granular insights into the effectiveness of adaptation measures.
- Challenges: Many developing countries (such as SIDS, Small Island Developing States) face barriers to effective monitoring, including limited technical capacity, inconsistent data collection, and insufficient financing. International organisations, including WMO, are addressing these challenges through capacity-building programmes, programmes like the Systematic Observations Financing Facility (SOFF) which support climate monitoring infrastructure and the deployment of scalable, cost-effective monitoring tools.

3.4. The Sendai Framework for Disaster Risk Reduction

The Sendai Framework (2015–2030) is a pivotal instrument that links disaster risk reduction (DRR) to climate adaptation. Its four priorities focus on:

- Understanding disaster risk
- Strengthening disaster risk governance
- Investing in DRR for resilience
- Enhancing disaster preparedness and "building back better."

The framework's emphasis on early warning systems (EWS) aligns closely with the UN's Early Warnings for All Initiative, which aims to protect vulnerable communities from climate-induced hazards. However, achieving full integration of DRR and adaptation policies requires increased financing and stronger institutional linkages at national and local levels.

3.5. UNCCD COP16 in Riyadh: Key Outcomes

UNCCD COP16 took place in Riyadh, Saudi Arabia in December 2024. It was expected to significantly shape global land management policies, considering that land degradation, exacerbated by unsustainable agricultural practices and climate change, is a critical driver of biodiversity loss and desertification, and reversing land degradation is an important facet of climate mitigation; while healthy land acts as a carbon sink.

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Key expectations from COP16, in advance of the meeting's conclusion, included:

- Enhanced Commitments to Land Degradation Neutrality (LDN) – Parties are expected to integrate LDN targets into their NDCs and climate adaptation strategies
- Drought Resilience – The development of frameworks for drought preparedness will be central, particularly for regions in Africa and the Middle East
- Financing Mechanisms – Innovative funding solutions, including public-private partnerships, are likely to be explored to scale up land restoration projects.

For WMO and other international organisations, aligning UNCCD outcomes with broader climate action plans offers a significant opportunity to integrate land restoration into mitigation strategies, particularly as healthy soils act as critical carbon sinks.

Key outcomes from COP16 subsequently included the following elements.

- Drought Resilience Framework: Despite extensive discussions, delegates did not reach a legally binding agreement on a global framework to tackle drought. The primary contention was whether the framework should be legally binding, with African nations advocating for binding commitments and others, including the US and EU, favouring non-binding measures. The decision has been deferred to COP17, scheduled for 2026 in Mongolia (the UNCCD COP is biennial).
- Financial Commitments: Significant financial pledges were made to combat land degradation and enhance drought resilience. Notably, over USD 12 billion was committed through the Riyadh Global Drought Resilience Partnership to support land restoration and drought preparedness initiatives, particularly in vulnerable regions.
- Inclusion of Indigenous Peoples and Local Communities: The conference established a Caucus for Indigenous Peoples and a Caucus for Local Communities, ensuring their perspectives and challenges are adequately represented in future UNCCD processes.
- Science-Policy Interface Continuation: Delegates agreed to continue the Convention's Science-Policy Interface, aiming to strengthen decision-making in combating desertification and promoting land restoration.
- Private Sector Engagement: The conference underscored the critical role of the global private sector in advancing land restoration and sustainable management goals. Through initiatives such as Business4Land, COP16 encouraged businesses to integrate land degradation neutrality (LDN) objectives into their operations and investment strategies. Delegates emphasised the importance of innovative financing mechanisms, including green bonds and sustainability-linked investments, to mobilise private capital for large-scale restoration efforts. Clear frameworks and measurable targets were proposed to ensure private sector contributions align with the broader objectives of the UNCCD, enhancing accountability and transparency in land restoration activities.

3.6 CBD COP16 in Cali: Key Outcomes

The 16th COP of the Convention on Biological Diversity (CBD), held in Cali, Colombia (21 October – 1 November 2024), marked a pivotal moment for implementing the Kunming-Montreal Global Biodiversity Framework (KMGBF) adopted in 2022. The

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KMGBF's ambitious targets to halt biodiversity loss by 2030 align with both mitigation and adaptation priorities, recognising the role of ecosystems in climate resilience.

Major Outcomes of COP16 included the following elements.

- Progress on National Biodiversity Strategies and Action Plans (NBSAPs): While many countries have aligned their NBSAPs with the KMGBF, significant gaps in reporting and implementation remain. Only 44 out of 196 parties have submitted updated strategies, making very clear a need for acceleration.
- Financial Resource Mobilisation: Discussions highlighted the urgent need for increased funding for biodiversity conservation. Current investments remain well below the $200 billion annual target set under the KMGBF.
- Inclusion of Indigenous Peoples: A landmark agreement was reached to establish a subsidiary body ensuring Indigenous peoples' active participation in biodiversity governance.
- Monitoring Frameworks: Efforts to enhance monitoring mechanisms for biodiversity targets were prioritised, though a unified framework remains in development.

The outcomes of CBD COP16 reinforce the importance of biodiversity in supporting ecosystem services essential for adaptation, such as water regulation and disaster risk reduction. However, the challenges in mobilising sufficient funding and achieving alignment with climate policies remain critical barriers.

3.7. ESG, B Corp Certification, and Greenwashing

The private sector plays an increasingly visible role in M&A strategies through the adoption of Environmental, Social, and Governance (ESG) criteria. ESG frameworks encourage companies to integrate sustainability into their operations, offering a valuable complement to government-led efforts. Certifications like B Corp provide rigorous validation of a company's social and environmental impact, helping to distinguish genuine commitments from superficial claims.

However, greenwashing – where organisations exaggerate or misrepresent their sustainability credentials – remains a pressing concern for policymakers. The proliferation of unverified ESG claims risks undermining trust in private sector contributions to climate action. Addressing this issue requires:

- Clearer regulatory standards for ESG reporting
- Enhanced accountability mechanisms, such as independent audits
- Greater alignment with internationally recognised frameworks, including the Task Force on Climate-Related Financial Disclosures (TCFD)
- Improved transparency and public disclosure.

4. Dynamic Aspects of M&A Strategies

The dynamic nature of mitigation and adaptation (M&A) strategies reflects the evolving challenges posed by climate change and the corresponding need for integrated, forward-thinking solutions. These strategies must balance short-term urgency with long-term planning, leverage emerging technologies, and adapt to diverse local and regional contexts. This section explores the evolution of integrated approaches, phased implementation periods, and the importance of robust monitoring systems to ensure accountability and progress.

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4.1. Evolution of Integrated M&A Approaches

Historically, mitigation and adaptation have been treated as distinct components of climate policy, often developed and implemented in isolation. However, the interdependencies between these strategies have become increasingly apparent. For example, nature-based solutions (NbS) such as regenerative agriculture, and afforestation and reforestation, address mitigation by sequestering carbon while simultaneously supporting adaptation through flood control, soil stabilisation, and biodiversity conservation.

Similarly, urban resilience projects now often integrate mitigation measures. Green roofs, for instance, reduce urban heat islands (adaptation) while decreasing energy demand for cooling and contributing to emissions reductions (mitigation). This integration is critical for maximising the effectiveness of investments, particularly in resource-constrained environments.

The evolution of these approaches is also driven by advances in technology. Artificial intelligence (AI) and machine learning are enabling more precise climate modelling, while geospatial data from Earth Observation satellites support the monitoring of GHG emissions and the tracking of land-use changes. These tools enhance the ability of the international community to design interventions that align with both mitigation and adaptation goals.

International organisations like the World Meteorological Organization (WMO) play a crucial role in promoting integrated approaches. Through initiatives like the Early Warnings for All programme, WMO demonstrates how adaptation tools (early warning systems) can support mitigation by reducing the economic losses that hinder investments in low-carbon transitions.

4.2. Implementation Periods: Short-, Medium-, and Long-Term Goals

Effective M&A strategies require phased implementation plans that balance immediate needs with long-term aspirations.

- Short-Term Goals: These include urgent actions such as deploying early warning systems, protecting critical infrastructure, and rolling out pilot projects for renewable energy and ecosystem restoration. Short-term efforts often focus on areas with the highest immediate vulnerability, such as Small Island Developing States (SIDS) and least-developed countries (LDCs).
- Medium-Term Targets: These actions typically involve integrating climate resilience into national development plans, scaling up renewable energy, and implementing large-scale reforestation and wetland restoration projects. For example, Denmark's storm surge protection initiatives and Germany's urban flood management systems illustrate medium-term adaptation in action.
- Long-Term Visions: These involve transformative actions aimed at achieving net-zero emissions by 2050 and enhancing societal and ecosystem resilience over decades. Long-term planning must incorporate scenarios for shifting climate baselines, such as the increasing frequency of extreme weather events and sea-level rise.

Adopting a phased approach allows governments and organisations to align their climate strategies with broader development goals, such as those outlined in the United Nations' 2030 Agenda for Sustainable Development.

As the climate crisis evolves, monitoring systems must also adapt to account for emerging risks and opportunities. For instance, the integration of social metrics,

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such as equity and inclusivity, into monitoring frameworks ensures that M&A strategies address not only environmental but also socio-economic vulnerabilities.

The dynamic aspects of M&A strategies reflect the complexity and urgency of addressing climate change. Integrated approaches, phased implementation plans, and robust monitoring systems are foundational to ensuring that these strategies achieve their intended outcomes. By leveraging advancements in technology, fostering international cooperation, and maintaining a focus on equity, M&A strategies can evolve to meet the challenges of a changing climate while supporting sustainable development.

5. UNFCCC Santiago Network

The Santiago Network for Loss and Damage, established at COP25 in Madrid (2019), has been instrumental in addressing the adverse impacts of climate change, particularly in developing countries. Its primary function is to catalyse technical assistance from various Organisations, bodies, networks, and experts to support nations in averting, minimizing, and addressing loss and damage associated with climate change.

5.1. Operationalisation and Governance

At COP28 in December 2023, significant progress was made in setting up the Santiago Network. The United Nations Office for Disaster Risk Reduction (UNDRR) and the United Nations Office for Project Services (UNOPS) were selected to co-host the network's secretariat, providing the necessary administrative and infrastructural support for its effective functioning.

In September 2024, the Santiago Network Advisory Board convened in Bonn, Germany, for its third meeting. During this session, the board approved key guidelines and processes essential for the network to begin delivering technical assistance to countries and communities most vulnerable to climate change. This included establishing guidelines for responding to requests for technical assistance, managing funding, and preventing conflicts of interest.

5.2. Membership and Engagement

The network has actively sought to expand its membership base. In July 2024, it launched a call for expressions of interest from Organisations, bodies, networks, and experts working in loss and damage. Becoming a member enables entities to respond to calls for technical assistance, exchange knowledge, and contribute to the global effort in addressing climate-induced loss and damage.

5.3. Recent Developments

By November 2024, the Santiago Network had established its secretariat in Geneva, Switzerland, under the leadership of Director Carolina Fuentes. This development marked a significant milestone in the network's operationalization, positioning it to effectively coordinate technical assistance and support to vulnerable countries.

The Santiago Network's evolution reflects a concerted effort by the international community to provide structured and effective support to nations

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disproportionately affected by climate change, ensuring that technical assistance is both accessible and impactful.

COP29 operationalised financing channels for the Santiago Network, including:

- Private Sector Contributions: Encouraging businesses to fund projects addressing loss and damage, particularly in high-risk sectors
- Multilateral Financing: Leveraging contributions from developed nations and international development banks to ensure sustainable funding for technical assistance and capacity-building projects.

5.4. Key Outcomes and Challenges for the Network

Progress Achieved:

- Governance Finalisation – The Santiago Network's governance framework has provided much-needed clarity on roles and responsibilities
- Operational Efficiency – The establishment of a dedicated secretariat ensures streamlined coordination of technical assistance and funding.

Remaining Challenges.

- Funding Adequacy – Despite operational progress, the overall funding for loss and damage remains insufficient to meet the needs of vulnerable countries. Many developing nations have expressed concerns about the limited contributions from high-emitting nations.
- Implementation Bottlenecks – Limited technical capacity in recipient nations and delays in fund disbursement have hindered the full realisation of the network's potential.
- Equity Concerns – Ensuring that resources reach the most affected communities requires robust monitoring and transparent allocation mechanisms.

The Santiago Network operationalisation delivers a vital step forward in addressing climate-related loss and damage, particularly for vulnerable nations disproportionately affected by climate change. While the operationalisation at COP29 marked a milestone in governance and capacity-building efforts, significant challenges in funding and equitable implementation are outstanding. Strengthening collaboration between international organisations, governments, and the private sector will be essential to maximising the network's impact in the years to come.

6. The Role of WMO in M&A

The World Meteorological Organization (WMO) occupies a central role in global efforts to address climate change: its comprehensive work on global climate monitoring, observation, and free data exchange underpins international efforts on mitigation and adaptation. By leveraging its scientific expertise and global partnerships, WMO supports nations in developing robust policies and practical tools to combat climate-related challenges. This section describes WMO's contributions, with a focus on its collaboration with other UN system entities, and its flagship initiatives like Early Warnings for All and the Global Greenhouse Gas Watch (G3W).

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6.1. Enhancing Cooperation with UN Entities on Mitigation and Adaptation

WMO recognises a need for a unified approach within the UN system to achieve meaningful progress in climate action and has outlined (and is delivering on) several strategies to strengthen collaboration with other UN entities, focusing on alignment, resource sharing, and technical integration.

Key areas of collaboration include:

Integration with UN Climate Policy Frameworks

- WMO aligns its climate data and forecasts with the UNFCCC processes, ensuring that Nationally Determined Contributions (NDCs) are informed by the latest climate science
- The organisation contributes to the Global Stocktake under the Paris Agreement by providing assessments on climate observations and trends

Joint Projects with UN Partners

- United Nations Development Programme (UNDP): WMO works with UNDP to integrate climate risk data into national adaptation plans (NAPs), enhancing resilience planning for vulnerable regions
- United Nations Office for Disaster Risk Reduction (UNDRR): Collaboration focuses on disaster risk reduction frameworks that incorporate WMO's hazard monitoring systems
- International Telecommunications Union (ITU): Work on standards, such as those related to the use of Common Alerting Protocols in early warning systems, or in the use of AI for weather and climate-related technologies.

WMO, UNDRR, and ITU (along with IFRC) are pillar leads in the UN's Early Warnings for All initiative, which seeks to ensure global coverage by early warning systems before the end of 2027.

- Capacity Building Across Member States: Through partnerships with UN Environment Programme (UNEP) and UN-Habitat, WMO provides technical support for urban climate resilience projects, particularly in cities exposed to extreme weather events.
- Enhancing Data Sharing Across UN Agencies: WMO spearheads the consolidation of meteorological and hydrological data across UN systems, ensuring that (specialised UN) agencies like the Food and Agriculture Organisation (FAO), the World Food Programme (WFP) and the International Fund for Agricultural Development (IFAD) can address climate impacts on agriculture and food security effectively.
- Climate and Health Nexus: WMO and the World Health Organisation (WHO) collaborate through the Joint Climate and Health Programme to address the health impacts of climate change, particularly in urban settings, with a focus on issues including extreme heat and air quality. This partnership has led to the development of the Global Heat Health Information Network, enhancing capacities to protect populations from extreme heat. Additionally, the ClimaHealth portal provides actionable information linking climate and health data. Their joint efforts focus on improving air quality monitoring and early warning systems, integrating meteorological and health data to mitigate risks associated with heatwaves and pollution in urban environments. This collaboration aims to strengthen resilience against climate-related health challenges in cities worldwide.

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6.2. Early Warnings for All Initiative

The Early Warnings for All initiative is a critical adaptation strategy aimed at providing universal access to early warning systems by 2027. In partnership with UN agencies such as UNDRR, the initiative addresses key challenges in disaster preparedness and response, with progress tracked and monitored using a comprehensive dashboard.

Key Achievements and Goals:

- Establishing regional early warning systems in vulnerable areas, such as Small Island Developing States (SIDS) and sub-Saharan Africa
- Developing standard protocols for multi-hazard early warning dissemination, ensuring alignment with UN disaster risk management frameworks
- Strengthening community engagement through localized early warning mechanisms, particularly in regions prone to cyclones, floods, and heatwaves.

6.3. Global Greenhouse Gas Watch (G3W)

The Global Greenhouse Gas Watch is WMO's flagship initiative for climate mitigation, providing accurate and actionable data on greenhouse gas (GHG) concentrations. The G3W program is instrumental in supporting UN-led mitigation efforts by enhancing the transparency and accountability of GHG emissions reporting. Its collaborative Focus Areas include:

- Monitoring and Verification of NDCs – WMO works with UNFCCC to validate emissions reduction claims made in NDCs, ensuring consistency and scientific accuracy
- Strengthening Satellite Observation Networks – In coordination with space agencies like NASA and ESA, WMO integrates satellite data with surface-based monitoring systems to provide comprehensive GHG assessments
- Data-Driven Climate Action – WMO collaborates with UNEP to use GHG data in identifying high-priority areas for renewable energy deployment and energy efficiency programs.

6.4. Emerging Areas of Focus

From its 78th Executive Council meeting in June 2024, WMO identified several emerging areas critical to advancing climate mitigation and adaptation:

- Urban Climate Adaptation – WMO plans to expand its collaboration with UN-Habitat and WHO to develop urban heat resilience strategies, integrating meteorological data with city planning tools
- Water Resources Management – Partnerships with FAO and UNESCO aim to improve climate-informed water resource management, addressing the growing impact of droughts and floods on global water systems
- Climate Services for Agriculture – Collaborating with WFP and FAO, WMO seeks to enhance agro-meteorological services to safeguard food security in climate-vulnerable regions.

The 79th Session of the WMO Executive Council (EC-79) in June 2025 focused on strategic priorities like Artificial Intelligence in weather prediction, accelerating the "Early Warnings for All" initiative, implementing the Global Greenhouse Gas Watch, and enhancing youth engagement. Key discussions included leveraging Artificial Intelligence for better forecasting, strengthening global partnerships, and setting

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the course for WMO's Strategic Plan 2028-2031, marking a significant step in advancing weather, climate, and water services globally.

6.5. Effectiveness and Future Directions

WMO's growing collaboration with UN system entities underscores its commitment to advancing mitigation and adaptation efforts. The focus on harmonised data sharing, joint capacity building, and integrated policy frameworks ensures that climate action is both science-driven and equitable.

Key next steps include:

- Expanding early warning systems to cover 100% of the world's population by 2027, under the Early Warnings for All initiative
- Scaling up the operationalisation of G3W, ensuring that all 193 WMO member states can access high-quality GHG data for mitigation planning
- Strengthening partnerships with regional Organisations to localize UN initiatives and make them more accessible to vulnerable communities.

By working closely with partner organisations in the UN system, WMO acts as a fulcrum of global climate action, supporting impactful and coordinated responses to the pressing challenges of climate mitigation and adaptation with accurate, timely, and universally shared weather and climate data and observations.

7. Effectiveness of Current M&A Strategies

Both globally and within Europe, the effectiveness of mitigation and adaptation (M&A) policies and strategies is a critical determinant of the global community's efforts to adhere to the Paris agreement and limit warming to 1.5°C. While there has been notable progress globally in deploying renewable energy, advancing carbon market mechanisms, and enhancing resilience through adaptation projects, significant gaps remain. This section evaluates the effectiveness of current strategies in achieving their goals, highlighting successes, challenges, and opportunities for improvement.

7.1. Assessment of Mitigation Progress

International scale mitigation strategies have seen significant advancements in recent years, particularly in the areas of renewable energy adoption, emissions reductions in key sectors (for example, the IMO ruling on the reduction of sulphur in ships' fuel oil from 2020), the operationalisation of carbon markets, and improvements in carbon capture and storage pilot programmes. However, these achievements must be measured against a backdrop of rising global emissions, which continue to outpace reductions in many regions. Some examples are presented below.

Successes

- Renewable Energy Deployment: Renewable energy sources now account for most new power capacity globally. Nations such as Denmark and Morocco have set benchmarks for integrating wind and solar power, demonstrating the feasibility of transitioning away from fossil fuels. Most prominently, China is expected to install 3,207 GW of new renewable electricity capacity between 2024 and 2030, more than tripling growth of 2017-2023.

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- Carbon Market Mechanisms: The finalisation of Article 6.4 of the Paris Agreement at COP29 represents a major step forward in leveraging international carbon trading to finance mitigation projects. Countries can now generate carbon credits through projects that reduce emissions and trade them on global markets, unlocking new revenue streams for developing nations.
- Nature-Based Solutions (NbS): NbS, such as reforestation, soil carbon sequestration, or the practice of regenerative (rather than intensive) agriculture, are gaining prominence as cost-effective, scalable options for mitigation. These solutions simultaneously address biodiversity loss and land degradation, offering co-benefits that extend beyond emissions reductions.

Challenges

- Insufficient Ambition in NDCs: Many countries' Nationally Determined Contributions (NDCs) lack the ambition needed to align with the 1.5°C target. A UNFCCC synthesis report highlights that current commitments, if fully implemented, would still result in warming of 2.3–2.5°C by 2100.
- Fossil Fuel Dependency: Despite progress in renewables, fossil fuels remain the dominant energy source in many regions. Subsidies for coal, oil, and gas exacerbate this dependency, undermining global mitigation efforts.
- Equity in Carbon Markets: Ensuring that carbon markets benefit the most vulnerable remains a challenge. Transparent mechanisms and robust safeguards are needed to prevent exploitation and inequitable outcomes.

7.2. Gaps in Adaptation Financing and Implementation

Adaptation strategies are critical for managing the impacts of climate change, particularly in vulnerable regions such as Small Island Developing States (SIDS) and sub-Saharan Africa. While adaptation finance and implementation have improved, they remain inadequate compared to the scale of the challenge.

Successes

- Urban Adaptation Projects – In Europe, cities like Rotterdam and Copenhagen have implemented innovative adaptation measures, such as multifunctional water plazas and green roofs, to mitigate the impacts of flooding and heatwaves.
- Early Warning Systems – WMO's Early Warnings for All initiative has already significantly expanded access to early warning systems, particularly in developing countries. By reducing vulnerability to extreme weather events, these systems exemplify the intersection of adaptation and disaster risk reduction.
- National Adaptation Plans (NAPs) – Over 90 countries have submitted NAPs, which provide frameworks for integrating adaptation into national development plans. These plans are increasingly aligned with broader climate and biodiversity goals, offering a more holistic approach.

Challenges

- Funding Gaps – Adaptation finance continues to be lagging mitigation funding. While COP29 pledged to increase climate finance commitments, current levels remain insufficient to meet the estimated $340 billion annually needed for adaptation by 2030.

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- Implementation Barriers – Many developing countries face challenges in implementing adaptation projects, including limited technical capacity, governance issues, and inadequate data. These barriers hinder the effectiveness of even well-funded initiatives.
- Monitoring and Evaluation – The lack of robust metrics to assess the effectiveness of adaptation measures complicates efforts to scale up successful projects. Monitoring systems must capture not only environmental but also social and economic outcomes to ensure that adaptation strategies address vulnerabilities equitably.

7.3. Opportunities for Improvement

To enhance the effectiveness of current M&A strategies, several key actions are broadly accepted as being needed.

- Scaling Finance – Meeting global adaptation and mitigation goals requires significant increases in climate finance. Innovative mechanisms, such as blended finance and public-private partnerships, can help bridge funding gaps.
- Strengthening International Cooperation – Greater alignment across international frameworks, such as the Paris Agreement, Sendai Framework, and Rio Conventions, can leverage synergies and streamline implementation.
- Integrating Equity – Addressing inequities in funding distribution and project outcomes is essential for ensuring that M&A strategies deliver benefits to the most vulnerable.
- Harnessing Technology – Advances in AI, satellite monitoring, and climate modelling offer opportunities to improve the precision and scalability of interventions.

While significant progress has been made in implementing mitigation and adaptation strategies, the global response remains insufficient to meet the scale and urgency of the climate crisis. Addressing gaps in financing, ambition, and implementation is critical to ensuring that M&A strategies achieve their intended outcomes. By leveraging international cooperation, fostering innovation, and prioritising equity, these strategies can better align with the goals of the Paris Agreement and the broader sustainable development agenda.

As the global community grapples with the complexities of climate change, mitigation and adaptation (M&A) strategies must counter the multifaceted challenges that hinder cohesive action. In addressing these obstacles, it is equally critical to identify future directions that can strengthen the effectiveness and inclusivity of climate policies.

7.4. Current barriers to Improvement

The implementation of effective M&A strategies is impeded by systemic barriers, with funding shortfalls and political divisions vying as two of the most significant challenges.

Funding Shortfalls: Climate finance remains inadequate relative to the scale of the crisis. While COP29 in Baku marked progress with the pledge to mobilise $300 billion annually by 2035, this commitment falls short of the estimated $3 trillion per year needed by 2050 to meet global climate goals. Specific issues include the following elements.

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- Insufficient Adaptation Finance – Adaptation projects receive only a fraction of total climate finance, with the vast majority allocated to mitigation. This disparity leaves vulnerable populations underprepared for climate impacts.
- Delayed Disbursements – Many pledged funds remain undelivered or tied to lengthy bureaucratic processes, undermining timely implementation.
- Private Sector Hesitation – Despite increased interest in climate investments, many private financiers remain reluctant to engage in adaptation projects due to perceived risks and lower returns compared to mitigation initiatives.

Political Divisions: Climate action requires coordinated efforts across national, regional, and global levels, yet political divisions often obstruct progress.

- Geopolitical Tensions – Disagreements between developed and developing countries over issues such as climate finance, loss and damage, and historical emissions responsibility create significant roadblocks in negotiations. For example, debates at COP29 over fossil fuel phase-outs revealed persistent rifts.
- Domestic Policy Inconsistencies – Even within individual countries, conflicting policies can undermine climate strategies. For instance, subsidies for fossil fuels in some nations coexist with ambitious renewable energy targets, creating policy incoherence.
- Erosion of Multilateralism – Rising populism and nationalism in key nations threaten global cooperation, as seen in the policy shifts under the renewed Trump administration.

These challenges underscore the urgency of strengthening international solidarity, fostering innovative financing solutions, and aligning national policies with global commitments.

7.5. Future Directions

To overcome these challenges, future M&A strategies must prioritise equity, innovation, and collaboration. Key areas of focus could include the following elements.

Strengthening Equity in Climate Finance: Equity must be at the forefront of climate finance, ensuring that resources are distributed fairly and effectively:

- Prioritising Vulnerable Populations – Targeted financing for least-developed countries (LDCs), small island developing states (SIDS), and marginalised communities can address disproportionate vulnerabilities. Mechanisms like the Santiago Network for Loss and Damage exemplify how equitable frameworks can support those most affected by climate impacts
- Innovative Financing Mechanisms – Blended finance models, which combine public and private funding, can unlock resources for adaptation and mitigation projects. Sovereign risk pools and catastrophe bonds also offer innovative approaches to mobilising finance for disaster-prone regions
- Transparent Reporting – Enhanced monitoring of climate finance flows, including independent audits, can build trust and accountability, reducing inefficiencies and ensuring that funds reach intended beneficiaries.

Fostering Public-Private Partnerships (PPPs): The private sector has a crucial role to play in scaling up M&A strategies. Public-private partnerships (PPPs) can leverage the resources and expertise of businesses while aligning their efforts with public goals.

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- Technology Deployment – Collaboration between governments and technology companies can accelerate the adoption of AI, satellite monitoring, and clean energy solutions. For example, partnerships under the World Meteorological Organisation's Global Greenhouse Gas Watch (G3W) provide high-quality data for emissions tracking.
- Incentivising Private Investment – Regulatory frameworks and risk-sharing mechanisms can encourage private financiers to invest in adaptation projects. Tax incentives, green bonds, and sustainability-linked loans are proven tools for driving private-sector engagement.
- Localised Approaches – Encouraging private sector participation at the community level can amplify the impact of PPPs, ensuring that projects address local needs while benefiting from global expertise.

Expanding Multilateral Collaboration: Strong partnerships between international organisations, governments, and civil society are essential for addressing systemic barriers.

- Integrating Frameworks – Aligning the objectives and avoiding duplication of effort and activities between the Rio Conventions, Sendai Framework, and can streamline efforts and reduce duplication.
- Capacity Building – Supporting developing countries through training, knowledge-sharing, and technical assistance can strengthen institutional capacities to implement and monitor M&A strategies.
- Youth and Indigenous Engagement – Amplifying the voices of youth activists and Indigenous leaders in climate decision-making processes fosters inclusivity and innovation, drawing on diverse perspectives and traditional knowledge.

Addressing funding shortfalls and political divisions is vital to ensuring the effectiveness of M&A strategies. By prioritising equity in climate finance, fostering public-private partnerships, and strengthening multilateral collaboration, the global community can overcome these challenges and chart a more inclusive and resilient path forward. Future strategies must embrace innovation and inclusivity, recognising that collective action and equitable resource allocation are foundational to achieving global climate goals.

8. Conclusions

8.1. Summary of Key Findings

This Annex has underscored the critical importance of integrating mitigation and adaptation (M&A) strategies to address the escalating impacts of climate change. Key findings include the following.

- Global Progress and Gaps: While significant strides have been made in renewable energy deployment, carbon market mechanisms, and urban adaptation projects, these efforts remain insufficient to achieve the Paris Agreement's 1.5°C target. Emissions continue to rise, and adaptation financing lags far behind what is needed to build resilience in vulnerable regions.
- Governance Frameworks: International agreements such as the Paris Agreement, Sendai Framework, and Rio Conventions provide essential structures for collective climate action. However, persistent challenges, including insufficient ambition in Nationally Determined Contributions (NDCs) and geopolitical tensions, hinder cohesive implementation.

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- The Role of International Organisations: The World Meteorological Organisation has demonstrated leadership through initiatives such as Early Warnings for All (EW4All) and the Global Greenhouse Gas Watch (G3W), which enhance global capacity for mitigation and adaptation. These programmes make clear the importance of robust data, monitoring systems, and early warning mechanisms in reducing vulnerabilities. In addition, the active involvement of WMO and other international organisations in EU Horizon funded projects such as CrossEU allows a closer exchange of expertise with national, regional, and even local stakeholders that international organisations otherwise struggle to engage with.
- Emerging Challenges: Funding shortfalls and political divisions continue to impede progress. The underrepresentation of adaptation finance and the inequitable distribution of climate resources exacerbate vulnerabilities in low-income and high-risk regions.

Despite these challenges, the extensive M&A policy and practice work being funded under EU Horizon programme projects, showcase how integrated M&A strategies can deliver tangible benefits, combining emissions reductions with enhanced resilience, in Europe and globally.

8.2. Opportunities for Integrated Approaches to M&A

In the coming years, the integration of M&A strategies offers a pathway to more effective and equitable climate action. Key opportunities include the following.

- Equity-Driven Climate Finance: Scaling up finance for adaptation, particularly in vulnerable regions, is essential. Mechanisms such as blended finance, catastrophe bonds, and sovereign risk pools can help bridge funding gaps while ensuring equitable distribution.
- Leveraging Technology and Data: Innovations in artificial intelligence, satellite monitoring, and data analytics can enhance the precision and scalability of M&A strategies, and are a strong focus for international organisations, including UN system entities and pan-European organisations such as ECMWF, Copernicus, and ESA. Programmes like WMO's G3W, or the DestinE programme, demonstrate how high-quality data can inform both mitigation planning and adaptation measures.
- Public-Private Partnerships (PPPs): Strengthening PPPs can mobilise private sector resources for climate resilience projects. By aligning corporate sustainability goals and funding with public policies at international and national scales, such partnerships can drive innovation and expand the reach of climate solutions.
- Multilateral Collaboration: Enhancing alignment across global frameworks, including the Paris Agreement and Sendai Framework, can maximise synergies and streamline efforts. Capacity-building initiatives and inclusive decision-making processes can further strengthen the implementation of integrated strategies.

Integrated approaches not only address the interconnected challenges of climate change but also unlock co-benefits such as improved public health, biodiversity conservation, and economic stability. By prioritising inclusivity, innovation, and collaboration, the global community can achieve more sustainable and resilient outcomes.

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Is the COP process delivering M&A goals?

Despite its acknowledged slow and incremental nature, the COP process under the UNFCCC continues to hold significant value as the leading global platform for negotiating climate change policies. However, its effectiveness and ability to meet urgent climate goals are increasingly under scrutiny, with the three most recent COPs (Dubai in 2023, Baku in 2024, and Bélem in 2026) being hosted by countries economically bound to fossil fuel extraction. Additionally, the UNFCCC COPs overshadow COPs for the other two Rio Conventions – on biodiversity (CBD) and desertification (UNCCD) – due to structural, political, and thematic factors.

Is the COP Process Still Valuable? Why the COP Process Remains Valuable?

Global Visibility and Political Momentum: The UNFCCC COPs, including COP29, bring together heads of state, negotiators, activists, and business leaders to create visibility for climate action. Even partial progress – such as operationalising Article 6 carbon markets or the Santiago Network for Loss and Damage at COP29 – provides frameworks that nations and stakeholders can build upon.

Universal Participation: The COP process uniquely convenes nearly every nation on Earth and is designed to progress based on consensus. It ensures that both developed and developing nations have a voice, offering a forum for smaller or vulnerable states, such as Small Island Developing States (SIDS), to demand accountability (and financing) from larger emitters.

Incremental Progress in Key Areas: Although slow, the COP process has achieved significant milestones over time, such as the Paris Agreement, regular NDC updates, and the establishment of the Loss and Damage Fund. These achievements would likely be unattainable without such a broad, multilateral forum.

Catalyst for Parallel Action: The COPs foster initiatives outside the formal negotiation process. For example, non-state actors often announce major commitments at COPs, such as private-sector decarbonisation pledges, regional adaptation strategies, and partnerships like the Race to Zero campaign.

Challenges to Effectiveness

Geopolitical Stalemates: The consensus-driven nature of COPs often leads to watered-down agreement language (e.g., 'phase-out' being replaced by 'phase-down' as a phrase). At COP29, the inability to agree on an unequivocal timeline for phasing out fossil fuels highlighted the limits of the process, especially in the face of opposition from fossil-fuel-dependent economies.

Insufficient Financing Commitments: Climate finance remains a chronic issue, with pledges like the $300 billion annually by 2035 at COP29 falling short of what developing nations say they need. This mismatch creates dissatisfaction and deepens trust deficits between developed and developing nations.

Incrementalism Amid Urgency: The COP process's incremental nature often fails to match the urgency of the climate crisis. Scientific reports warn that current trajectories make limiting warming to 1.5°C unlikely, yet decisive action, such as phasing out fossil fuels or significantly scaling up adaptation finance, remains elusive.

Overwhelming Complexity: The sheer scale of negotiations – covering finance, loss and damage, mitigation, adaptation, technology transfer, and more – can dilute focus and make outcomes feel insufficient or overly bureaucratic. A further issue is

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the complexity of event attribution: currently an emerging facet of climate science, extreme event attribution seeks to determine to what extent specific events are directly the result of, or made more intense, by anthropogenic climate change.

Why Does the UNFCCC COP Overshadow the Other Rio Conventions?

Structural Factors

Climate Change as a Global Crisis: Climate change has become the defining global challenge for humanity in the 21st. Its existential nature and immediate impacts – extreme weather, sea-level rise, and heatwaves – affect all sectors and nations, giving the UNFCCC an outsized role.

UNFCCC's Broader Scope and Ambition: The UNFCCC tackles issues with far-reaching implications, including energy transitions, industrial policy, and economic systems. In contrast, the CBD and UNCCD, while crucial, focus on biodiversity conservation and land management, which may seem less urgent to policymakers, the global public, and the private sector. They also lack a simple, single, and clear target, such as the Paris Agreement's 1.5°C.

Political and Financial Investment: The UNFCCC COPs command significantly more political and financial investment, reflected in larger delegations, higher-profile attendance by heads of state, and greater media coverage. The financial mechanisms (e.g., the Green Climate Fund) and market-based solutions discussed at UNFCCC COPs also attract more private-sector engagement).

Thematic and Procedural Challenges in CBD and UNCCD COPs

Fragmented Linkages to Broader Agendas: The CBD focuses on biodiversity, which, despite its clear links to climate resilience, is often relegated to a niche or secondary concern in global governance. The UNCCD deals primarily with desertification and land degradation, issues that are vital but regionally focused, affecting arid and semi-arid countries disproportionately.

Weaker Institutional Frameworks: The UNFCCC benefits from robust mechanisms such as the Paris Agreement, NDC processes, and the Global Stocktake. By contrast, the CBD and UNCCD lack similarly high-profile, binding frameworks, reducing their visibility and perceived effectiveness.

Lower Public Awareness: Biodiversity and desertification receive less attention in the global public discourse compared to climate change, limiting the pressure on governments to prioritise the CBD and UNCCD COPs.

Bolstering the Rio Conventions

To ensure the UNFCCC COPs do not overshadow the broader goals of sustainable development, several steps could serve to strengthen the Rio Conventions' overall impact and raise up their role in mitigation and adaptation policy.

- Integrate Climate, Biodiversity, and Land Goals: Enhance synergies between the conventions by aligning NDCs, National Adaptation Plans (NAPs), and biodiversity strategies. For example, integrating Land Degradation Neutrality (LDN) targets with carbon sequestration goals could simultaneously address desertification and climate mitigation.
- Unified Reporting Mechanisms: Create streamlined reporting frameworks for countries to align their commitments across the UNFCCC, CBD, and UNCCD, reducing administrative burdens and fostering collaboration.

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- Increase Financing for Biodiversity and Land Restoration: Scaling up investment in initiatives like the Kunming-Montreal Global Biodiversity Framework (CBD) or drought resilience programmes (UNCCD) could elevate the importance of these conventions.
- Leverage High-Profile Champions: Greater involvement of high-profile figures and cross-sector partnerships in CBD and UNCCD COPs could enhance visibility and political engagement.

The annual UNFCCC COPs remain essential for advancing global climate action, but their limitations highlight the need for reform. Meanwhile, the lower visibility of the CBD and UNCCD COPs makes clear the importance of integrating efforts across the Rio Conventions. Greater synergies, stronger financing mechanisms, and elevated political support for biodiversity and land restoration could ensure that the Rio Conventions collectively address the interlinked crises of climate change, biodiversity loss, and desertification.

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ANNEX B1 – CLIMATE POLICIES AT THE EU LEVEL

1. Introduction: The European Green Deal

The approach at the European Union level to tackling and responding to climate change is first based on acts from a plurality of actors, of which, in this Annex, only a few have been taken into consideration: European Commission, European Parliament, European Investment Bank and European Central Bank. For all these actors, the general context is presently the European Green Deal, even if many of the policies (or individual measures) we will discuss have an origin prior to the birth of the EGD. Through the EGD, EU was the first major economy to submit its emissions reduction goal under the Paris agreement reached at the UNCoP in 2015 (see the previous chapter) and signed by 194 countries as well as the European Union, promising to reduce its CO2 emissions 40% by 2030, compared to 1990 levels. Broadly speaking, the whole EU climate strategy is aligned with the UNFCCC process and aims to align the policies of all the EU member states (with all the many difficulties that will be seen, partly in this chapter and partly in the following ones dedicated to the policies in the various countries).

The European Green Deal, approved in 2020 (presented at the end of 2019), is a set of policy initiatives by the European Commission with the overarching aim of making the European Union (EU) climate neutral in 2050.

Such an objective was and is far removed from the real situation. For example, we can consider the situation of housing. Before 1970, almost half of all European residential structures were built. At the time, no consideration was given to the amount of energy used by materials and standards. At the present rate of refurbishment, reaching a highly energy-efficient and decarbonised building stock might take more than a century. So, one of the major aims of the European Green Deal is to "at least double or even triple" the current refurbishment rate of approximately 1%. This is also true outside of the EU. In addition to rehabilitation, investment is required to enable the development of new efficient and ecologically friendly structures.

The European Green Deal entails the review of each existing law on its climate merits, and also introduces new legislation on the circular economy, building renovation, biodiversity, farming and innovation.

The EU should finance the policies set out in the Green Deal through an investment plan – InvestEU, which forecasts at least €1 trillion in investment. Furthermore, for the EU to reach its goals set out in the deal, it is estimated that approximately €260 billion a year is going to be required by 2030 in investments.

The EGD "history" of implementation can be summarised as follows.

- 11 December 2019: The European Green Deal was presented.
- 14 January 2020: The European Green Deal Investment Plan as well as the Just Transition Mechanism were presented.
- 4 March 2020: There was a proposal for a European climate law to ensure a climate neutral European Union by 2050.

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- 10 March 2020: The European Industrial Strategy was adopted (which is a plan for a future ready economy).
- 11 March 2020: There was a proposal for a Circular Economy Action Plan that focused on sustainable resource use.
- 20 May 2020: The 'Farm to fork strategy' was presented in order to increase the sustainability of food systems. The EU Biodiversity Strategy for 2030 was presented which focuses on the protection of fragile natural resources.
- 8 July 2020: Adoption of the EU strategies for energy system integration and hydrogen to pave the way towards a fully decarbonised, more efficient and interconnected energy sector.
- 12 July 2020: The taxonomy for sustainable activities comes into force, to reduce greenwashing and help investors choose green options.
- 17 September 2020: The 2030 Climate Target Plan was presented.
- 9 December 2020: The European Climate Pact was launched.
- 14 July 2021: The "Fit for 55" Package was presented by the European Commission, containing a large number of legislation proposals to achieve the EU Green Deal.
- 5 April 2022: Adoption of several initiatives under the action plan, including:
  - Legislative proposal for substantiating green claims made by companies
  - Review of requirements on packaging and packaging waste in the EU
  - New policy framework on bio-based, biodegradable and compostable plastics
  - Measures to reduce the impact of micro-plastic pollution on the environment.
- 21 December 2024: The European Union Green Bonds Regulation comes into force, allowing the issue of "European Green Bond" (or "EuGB") by companies, regional or local authorities and EEA supra-nationals.
- February 2025: Presentation of the Clean Industrial Deal with the aim of better combining the competitiveness needs of industry with environmental ones.
- July 2025: proposed amendment to the Climate Law (see Section 2 below)

All the strategies and policies presented below (starting from Section. 2) should be understood in this broad framework.

The plan also includes potential carbon tariffs for countries that don't curtail their greenhouse gas pollution at the same rate. The mechanism to achieve this is called the Carbon Border Adjustment Mechanism. It also includes:

- A circular economy action plan
- A review and possible revision (where needed) of the all-relevant climate-related policy instruments, including the Emissions Trading System
- A Farm to Fork strategy along with a focus shift from compliance to performance (which will reward farmers for managing and storing carbon in the soil, improved nutrient management, reducing emissions, …)
- A revision of the Energy Taxation Directive which is looking closely at fossil fuel subsidies and tax exemptions (aviation, shipping)
- A sustainable and smart mobility strategy
- An EU Forest strategy, having as its key objectives' effective afforestation, and forest preservation and restoration in Europe.

It also leans on Horizon Europe, to play a pivotal role in leveraging national public and private investments more related to concrete results of R&I. Through partnerships with industry and member States, it will support research and

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innovation on transport technologies, including batteries, clean hydrogen, low-carbon steel making, circular bio-based sectors and the built environment, as well as on Nature-based Solutions (NBS), which, as stated in the previous chapter, play an increasingly central role in addressing the interlinked challenges of climate change mitigation and adaptation, across the world.

2. Strategies of Mitigation and Adaptation

Climate strategies will be presented below divided into "mitigation" and "adaptation", while being aware of the overlaps and trade-offs between these two pillars, and therefore aware that this division is partly artificial.

2.1. The EU Mitigation policy

The EU mitigation policy has been formalized through the European Climate Law (published in the Official Journal on 9 July 2021 and entered into force on 29 July 2021) and through multiple collateral and subsequent provisions that we will talk about in this sub-section.

Specific aims of the EU Mitigation policy are:

- Set the long-term direction of travel for meeting the 2050 climate neutrality objective through all policies, in a socially fair and cost-efficient manner
- Set a more ambitious EU 2030 target, to set Europe on a responsible path to becoming climate-neutral by 2050
- Create a system for monitoring progress and take further action if needed
- Provide predictability for investors and other economic actors
- Ensure that the transition to climate neutrality is irreversible.

The European Climate Law writes into law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels ('Fit for 55' legislation), in a fair, cost effective and competitive way. The EU Institutions and the Member States are bound to take the necessary measures at EU and national level to meet the target, taking into account the importance of promoting fairness and solidarity among Member States.

The Climate Law includes:

- A legal objective for the Union to reach climate neutrality by 2050
- An ambitious 2030 climate target of at least 55% reduction of net emissions of greenhouse gases as compared to 1990, with clarity on the contribution of emission reductions and removals
- Recognition of the need to enhance the EU's carbon sink through a more ambitious LULUCF regulation, for which the Commission made a proposal in July 2021, and which entered into force in May 2023
- A process for setting a 2040 climate target, taking into account an indicative greenhouse gas budget for 2030-2050 to be published by the Commission
- A commitment to negative emissions after 2050
- The establishment of European Scientific Advisory Board on Climate Change, that will provide independent scientific advice
- Stronger provisions on adaptation to climate change
- Strong coherence across Union policies with the climate neutrality objective

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- A commitment to engage with sectors to prepare sector-specific roadmaps charting the path to climate neutrality in different areas of the economy.

In 2025, the EU proposed a significant amendment to its Climate Law in July, aiming for a 90% reduction in net greenhouse gas (GHG) emissions by 2040, a proposal now under discussion by the European Parliament and Council.

The EU has legally binding climate targets covering all key sectors of the economy. The overall package includes:

- Emissions reduction targets across a broad range of sectors
- A target to boost natural carbon sinks
- An updated emissions trading system to cap emissions, put a price on pollution and generate investments in the green transition, and
- Social support for citizens and small businesses.

Member States should spend 100% of their emissions trading revenues on climate and energy-related projects and the social dimension of the transition.

Adopted measures are listed below.

a) EU Emissions Trading System reform (EU's key tool for reducing greenhouse gas emissions): The reform of the system is a part of the 'Fit for 55' package – a set of proposals to revise and update EU climate, energy and transport legislation, which will contribute to the EU's climate goals of reducing net greenhouse gas emissions by at least 55% by 2030 and reaching climate neutrality by 2050 (see also following items).
b) New EU Emissions Trading System for building and road transport fuels (from 2027, building and transport fuels will be covered by emissions trading, putting a price on pollution, stimulating cleaner fuel use, and re-investing in clean technologies. Moreover, to complement new EU rules on buildings and guide Member States' efforts, there is a new indicative national benchmark of 49% of renewable energy in the buildings sector. The public sector will also be subject to a new annual energy consumption reduction target of 1.9%. The obligation of Member States to renovate each year at least 3% of total floor area of buildings owned by the public administration is extended from the central government to all levels of public administration).
c) Energy Performance of Buildings Directive (to gradually improve the energy performance of buildings across Europe, taking carefully into account national circumstances. The necessary improvements can be achieved through several individual measures, such as installing insulation, replacing old windows or doors, upgrading heating systems, or installing solar panels). On 30 June 2025, the European Commission adopted a support package offering practical guidance to help EU countries implementing and transposing the Energy Performance of Buildings Directive into national law by 29 May 2026[9].
d) Social Climate Fund *(SEE BOX 1)* and Just Transition Mechanism *(SEE BOX 5)*
e) Effort Sharing Regulation (set a target for each member state to cut greenhouse gas emissions in several economic sectors, which currently represent 60% of the total EU emissions).
f) Regulation on Land Use, Forestry and Agriculture *(see BOX 2)*.

[9] The EU's updated Alternative Fuels Infrastructure Regulation (AFIR) and Energy Performance of Buildings Directive (EPBD) introduce mandatory smart and bi-directional charging requirements for electric vehicle (EV) charging infrastructure, enabling EVs to not only draw power but also return it to the grid, facilitating greater integration of renewable energy and grid stability.

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g) CO2 emissions standards for cars and vans (new cars and vans registered in Europe will be zero-emission by 2035. As an intermediary step towards zero emissions, average emissions of new cars will have to come down by 55% by 2030, and new vans by 50% by 2030. This will put road transport on a firm path to zero-emission mobility in 2050).
h) Presently (end 2025) The EU is also focused on boosting sustainable mobility with new rules for electric vehicle charging and building automation, and on promoting the circular economy through the Ecodesign for Sustainable Products Regulation (ESPR[10]). The process started with a prioritisation exercise, following this, the Commission adopted the first ESPR and Energy Labelling Working Plan in April 2025, setting out which products will be prioritised over the coming years. Product rules will then be developed based on inclusive planning, detailed impact assessments, regular stakeholder consultation within the Ecodesign Forum, and specific consultations. The ESPR will also introduce mandatory Green Public Procurement rules, steering public spending towards sustainable and circular products and boosting demand. Moreover, the Commission has started work on a legislative proposal to decarbonise corporate fleets, with the aim of setting out measures to support the uptake of zero-emission vehicles by corporate buyers, without putting unnecessary burden on SMEs and taking into account criteria on amongst others sustainability and resilience. To build momentum as quickly as possible, the EC is publishing (March 2025) alongside this Action Plan a Communication to decarbonise corporate fleets, which outlines actions that national, regional, and municipal authorities can already take to accelerate the uptake of zero-emissions vehicles.
i) Carbon Border Adjustment Mechanism/CBAM (the new Carbon Border Adjustment Mechanism will ensure that imported products will also pay a carbon price at the border in the sectors covered. This is a valuable tool for promoting global emissions reductions and leveraging the EU market to pursue our global climate goals). In February 2025, the EC proposed a set of changes to simplify CBAM. Moreover, A public consultation was launched in August to gather feedback on the rules for calculating emissions embedded in CBAM goods and other technical aspects of the mechanism[11].
j) Renewable Energy Directive and Energy Efficiency Directive (and the Net-Zero industry Act adopted in April 2024 – See Box 4).
k) Alternative Fuels Infrastructure Regulation.
l) ReFuel EU Aviation Regulation (To promote sustainable aviation fuels (SAF), the minimum share of SAF required to be blended with kerosene by aviation fuel suppliers and supplied to EU airports has been increased; Carbon pricing also applies to the aviation sector. Until now, it applied to flights within

[10] The Ecodesign for Sustainable Products Regulation (ESPR), which entered into force on 18 July 2024, is the cornerstone of the Commission's approach to more environmentally sustainable and circular products. Products and the way we use them can significantly impact the environment. Consumption in the EU can, therefore, be a major cause of climate change and pollution. The ESPR is part of a package of measures that are central to achieving the aims of the 2020 Circular Economy Action Plan and fostering the transition to a circular, sustainable, and competitive economy. It will contribute to helping the EU reach its environmental and climate goals, double its circularity rate of material use and achieve its energy efficiency targets by 2030.
[11] Consultation aimed to gather the opinions of all stakeholders on the rules on the methodology for calculating emissions embedded in CBAM goods, rules on the adjustment of CBAM certificates to reflect the EU ETS free allocation, and rules on the deduction of the carbon price paid in a third country

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the EEA and departing flights to Switzerland and the UK. From 2024, non-domestic flights to and from outermost regions are covered too).

m) Fuel EU Maritime Regulation. A target for gradual reductions for the annual average greenhouse gas intensity of the energy used onboard by ships has been established to promote the uptake of renewable and low-carbon fuels).
n) Updated EU rules to decarbonise gas markets and promote hydrogen.
o) EU Methane Regulation for the energy sector.
p) Net-Zero Industry Act (presented in March 2023, is part of the Green Deal Industrial Plan to scale up manufacturing of clean technologies in the EU, create green jobs and make sure the Union is well-equipped for the clean-energy transition. It will create better conditions to set up net-zero projects in Europe and attract investments).
q) Biodiversity strategy for 2030 *(See BOX 3)*.

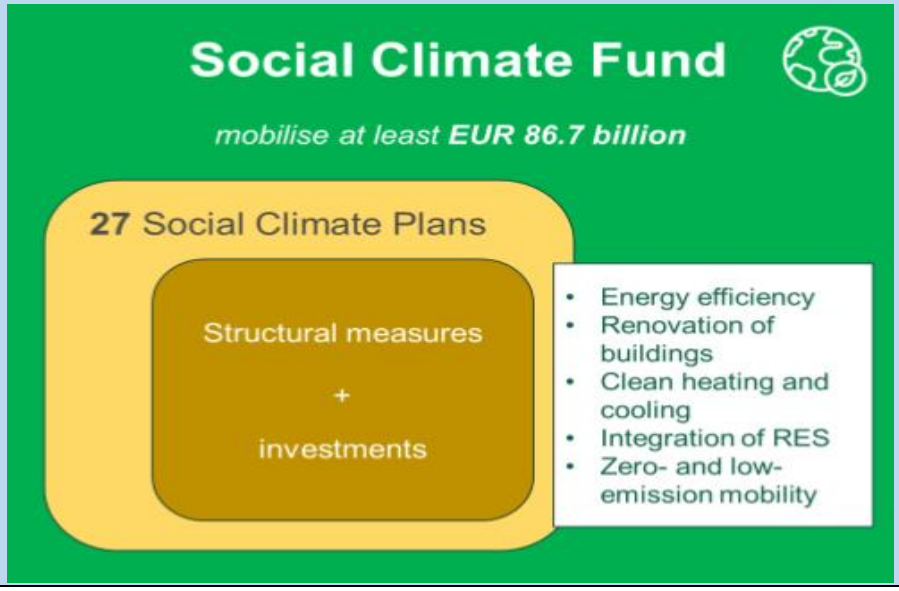
BOX 1 – THE SOCIAL CLIMATE FUND

The Social Climate Fund is a funding programme designed to contribute to a socially fair transition in the Union's effort to reach climate neutrality by 2050. It aims to address the social and economic impact of the climate transition on vulnerable groups. Notably, it aims to tackle energy and transport poverty and counterbalance the rising costs of fossil fuels resulting from extending the scheme for greenhouse gas emission trading to additional sectors in the European Union.

The general objective of the Social Climate Fund is to contribute to a socially fair transition towards climate neutrality by addressing the social impacts of the inclusion of greenhouse gas emissions from buildings and road transport. To this end, the Fund aims at mitigating the adverse impact of the climate transition on vulnerable groups.

The specific objective of the Fund is to support vulnerable households, vulnerable micro-enterprises and vulnerable transport users, through temporary direct income support and through measures and investments intended to increase the energy efficiency of buildings, decarbonisation of heating and cooling of buildings, including through the integration in buildings of renewable energy generation and storage, and to grant improved access to zero- and low-emission mobility and transport. It will provide Member States with financial support with a view to achieving milestones and targets set out in Social Climate Plans.

Visual representation of the structural set-up



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The Social Climate Fund allows the Commission to disburse funds to support Member States in implementing structural measures and investments, which contribute to a socially fair transition towards climate neutrality by addressing the social impact of the inclusion of greenhouse gas emissions from buildings and road transport. The plan should help Member States reach the EU's 2030 climate and energy targets and, ultimately, achieve climate neutrality by 2050. Moreover, the plan should be in line with the reforms and commitments included in Member States' updated integrated national energy and climate plans, and also with the directive on energy efficiency, the European Pillar of Social Rights action plan, the cohesion policy programmes, the territorial just transition plans ***(see BOX 5)***, the recovery and resilience plans, the Modernisation Fund and the Member States' long-term building renovation strategies.

The Social Climate Fund provides non-repayable financial support (grants) to Member States to support the public investments and structural measures set out in the national Social Climate Plans. This will be generated on an exceptional and temporary basis through the auctioning of allowances under the emissions trading system. Notably, the fund will make available a maximum amount of EUR 65 billion for its implementation for the 2026-2032 period, and together with the mandatory co-financing from Member States it will mobilise at least EUR 86.7 billion.

The Commission will adopt before the end of 2025 a Recommendation on Transport Poverty, encouraging Member States to adopt social leasing schemes for new and second-hand zero-emission vehicles, targeted to vulnerable transport users as part of the implementation of their national plans under the Social Climate Fund.

The Social Climate Fund is a new Fund. Each Member State is expected to submit a Social Climate Plan detailing structural measures and investments it plans to implement between 2026 and 2032. To facilitate process, the Commission launched a dedicated initiative to help Member States develop their Social Climate Plans under the Technical Support Instrument. 10 Member States (Belgium, Czechia, Denmark, Greece, Finland, Croatia, Lithuania, Latvia, Romania, and Slovakia) are being supported through this instrument over the 2024-2025 period.

Sources: https://commission.europa.eu/social-climate-fund_en; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R0955; https://op.europa.eu/en/publication-detail/-/publication/af68b4c7-3508-11ef-b441-01aa75ed71a1/language-en; https://ec.europa.eu/commission/presscorner/api/files/attachment/869947/Social_factsheet_EN.pdf.

BOX 2 – THE EU forest strategy

The Forest strategy aims to contribute to the reduction of EU net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. Moreover, it aims to increase the size and quality of Europe's forests and improve their resilience to challenges such as climate change; while also supporting communities whose livelihood depends on forestry. The Strategy was adopted by the EU Council on November 15, 2021.

The measures proposed by the Commission to restore Europe's forests and protect forest-based industries include:

- Promoting sustainable forest management (SFM), including by encouraging the sustainable use of wood-based resources
- Providing financial incentives for forest owners and managers to adopt environmentally friendly practices such as those linked to carbon storage and sequestration
- Improving the size and biodiversity of forests, including by planting 3 billion new trees by 2030
- Promoting alternative forest industries such as ecotourism, as well as non-wood products such as cork, honey and medicinal plants
- Encouraging the take-up of financial support under the Common Agricultural Policy, which can help forests and forest-based industries mitigate against climate change

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- Providing education and training for people working in forest-based industries and making these industries more attractive to young people
- Establishing a legally binding instrument for ecosystem restoration
- Protecting the EU's remaining primary and old-growth forests.

The Strategy also entails the need to strike a balance between the environmental, social and economic aspects of sustainable forest management, and stresses the importance of respecting and maintaining the diversity of forests and forest management practices in different member states and regions.

Sources: https://www.consilium.europa.eu/en/press/press-releases/2021/11/15/council-adopts-conclusions-on-the-new-eu-forest-strategy-for-2030/; https://data.consilium.europa.eu/doc/document/ST-13537-2021-INIT/en/pdf; https://www.consilium.europa.eu/en/policies/deforestation/; https://www.consilium.europa.eu/en/policies/green-deal/; https://www.consilium.europa.eu/en/policies/climate-change/

BOX 3 – THE EU's biodiversity strategy for 2030

The EU's biodiversity strategy for 2030 is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. It includes the issue "Restoring nature and enabling biodiversity to thrive again offers a quick and cheap solution to absorb and store carbon"; so, it is included in the broad EU mitigation policy. The strategy includes the first ever Nature Restoration Law currently under negotiation. Moreover, bioenergy contributes to the phase-out of fossil fuels and the decarbonisation of the EU economy. But it must be used sustainably. A strict, new criteria to avoid unsustainable forest harvesting and to protect areas of high-biodiversity value will be applied in line with the increased climate and biodiversity ambition.

The biodiversity strategy aims to put Europe's biodiversity on the path to recovery by 2030 for the benefit of people, climate and the planet. In the post-COVID-19 context, the strategy aims to build our societies' resilience to future threats such as (i) the impacts of climate change; (ii) forest fires; (iii) food insecurity; (iv) disease outbreaks – including by protecting wildlife and fighting illegal wildlife trade.

The EU biodiversity contains specific commitments and actions:

- Enlarging the existing Natura 2000 areas, the EU-wide network of protected land and sea areas
- Launching an EU nature restoration plan, including the first ever Nature Restoration Law adopted on June 24, 2024
- Unlocking funding for biodiversity, to enable the necessary transformative change
- Introducing measures to tackle the global biodiversity challenge.

In particular, nature restoration plays an important role in limiting the progress of global warming by capturing and storing carbon, and in adapting to climate change, as well as in mitigating the impact of increasingly violent natural disasters such as floods, droughts and heat waves. Additionally, the unsustainable use of natural resources, in particular the degradation and pollution of soils, is a major driver of the climate and biodiversity crises. To tackle this, the Commission proposed a Soil Monitoring Law, which will put the EU on a pathway to healthy soils by 2050, by gathering data on soil health and making it available to farmers and other soil managers. Enhancing net carbon removals and boosting carbon sinks in the EU is paramount. The EU target for net carbon removals by natural sinks will increase to 310 million tons of CO2 equivalent by 2030. Member States share responsibility for removing carbon from the atmosphere, they are responsible for caring for and expanding their carbon sinks to meet the new EU target.

This Nature Restoration Law lays down rules to contribute to:

- The long-term and sustained recovery of biodiverse and resilient ecosystems across the Member States' land and sea areas through the restoration of degraded ecosystems

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- Achieving the Union's overarching objectives concerning climate change mitigation, climate change adaptation and land degradation neutrality
- Enhancing food security
- Meeting the Union's international commitments.

This Regulation establishes a framework within which Member States shall put in place effective and area-based restoration measures with the aim to jointly cover, as a Union target, throughout the areas and ecosystems within the scope of this Regulation, at least 20 % of land areas and at least 20 % of sea areas by 2030, and all ecosystems in need of restoration by 2050.

The European Commission's Nature Restoration Law is the first continent-wide, comprehensive law of its kind. It is a key element of the EU Biodiversity Strategy, which calls for binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters.

Biodiversity is also addressed by all the projects that promote Nature-based-Solutions[12]/NBS (e.g., in the Horizon Europe program, being NBS one of the key mechanisms for promoting mitigation and facilitating adaptation.

Last but not least, it should be recalled that the European Union is a key actor in the framework of the Convention on Biological Diversity (CBD – described in the previous chapter), based on its ambition and accomplishments of the European Green Deal, thanks to the EU Biodiversity Strategy for 2030 and the comprehensive Nature Restoration Law with its binding targets to restore degraded ecosystems provide a strong basis to deliver on international commitments.

Sources: https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en; https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal; https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en; https://biodiversity.europa.eu/natura2000/en/natura2000#:~:text=The%20Natura%202000%20network%20is%20the%20biggest%20network,and%20around%209%20percent%20of%20its%20marine%20area; https://wwfeu.awsassets.panda.org/downloads/assessment_of_the_2030_eu_biodiversity_strategy_wwf_eu.pdf; https://environment.ec.europa.eu/news/eu-submits-targets-implement-global-biodiversity-framework-2024-08-02_en

BOX 4 – The Net-Zero Industry Act

The Net-Zero Industry Act is an initiative stemming from the Green Deal Industrial Plan which aims to scale up the manufacturing of clean technologies in the EU. This means increasing the EU's manufacturing capacity of technologies that support the clean energy transition and release extremely low, zero or negative greenhouse gas emissions when they operate.

This Act will attract investments and create better conditions and market access for clean tech in the EU. The aim is that the Union's overall strategic net-zero technologies manufacturing capacity approaches or reaches at least 40% of annual deployment needs by 2030. This will accelerate the progress towards the EU's 2030 climate and energy targets and the transition to climate neutrality by 2050. It will also boost the competitiveness of EU industry, create quality jobs, and support the EU's efforts to become energy independent.

[12] NBS are defined by the European Commission as: "Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions". See: https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en

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The Act also simplifies the regulatory framework for the manufacturing of these technologies. This will help increase the competitiveness of the net-zero technology industry in Europe and also accelerate the capacity to store CO2 emissions.

The Act addresses technologies that will make a significant contribution to decarbonisation. It supports, in particular, strategic net-zero technologies that are commercially available and have a good potential for rapid-scale up. Such technologies strengthen the EU's industrial competitiveness and energy system's resilience while allowing the clean energy transition.

On 6 February 2024, the European Parliament and the Council reached a political agreement on the Net-Zero Industry Act. Once formally adopted, the Act will enter into force.

Sources: https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en.

BOX 5 – The EU Just Transition Mechanism

The Just Transition Mechanism addresses the social and economic effects of the (ecological/energy) transition, focusing on the regions, industries and workers who will face the greatest challenges, through three pillars

1. A new Just Transition Fund of €19.7 billion in current prices, which should mobilise (as co-funding) around €7.3 billion of national co-financing, amounting to a total of €27 billion. The Just Transition Fund counts €20.28 billion in grants for the period 2021-2027. This sum is invested in the regions and territories most affected by the transition into a climate-neutral economy. For that purpose, the EU has mobilized €20.28 billion in current prices. To be precise, the Just Transition Fund comprises €9248 million from the EU's financial programme, €10872.9 million from Next Generation EU funds, and €167.7 million stemming from other countries and entities' contributions. Access to the fund is conditional to the adoption of the European Union's 2050 climate objectives and the Commission's approval of the individual Territorial Just Transition Plans drafted by the Member States through the European Semester Framework. Each Territorial Just Transition Plan should detail the national strategies for transitioning into a more sustainable economy, identifying the regions and communities most affected by the phase out of high-carbon industries. These plans include measures for economic diversification, job creation, retraining programs for workers, infrastructure development for clean energy, and other projects that will facilitate the transition to a greener economy.

2. InvestEU "Just Transition" scheme will provide a budgetary guarantee under the InvestEU programme across the four policy windows and an InvestEU Advisory Hub that will act as a central entry point for advisory support requests. It is expected to mobilise €10-15 billion in mostly private sector investments. Through the InvestEU Just Transition Scheme, the European Investment Bank (EIB) will provide technical support and budgetary guarantees to incentivize investment in those areas that will bear the brunt of the green transition. It is expected to mobilize €15 billion in mostly private sector investments. These funds should be directed towards the development of sustainable energy infrastructures, transport, small business and education programs; targeting the territories identified in the Territorial Just Transition Plans prepared by the Member States.

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3. A new Public Sector Loan Facility will combine €1.5 billion of grants financed from the EU budget with €10 billion of loans from the European Investment Bank, to mobilise €18.5 billion of public investment. The Public Sector Loan Facility is the third pillar of the Just Transition Mechanism. It involves a sum comprising €1.5 billion in grants, financed by the EU budget, and €10 billion in loans, from the European Investment Bank, mobilizing €18.5 billion of public investment. These funds aim to incentivize investment and economic growth in those areas most concerned by the green transition. These loans and grants are only accessible by legal entities established under the public or private law regimes of the different Member States; on the condition that their investment projects contribute to addressing the social, economic and environmental challenges deriving from the implementation of the Union's 2030 climate and energy targets.

The timeframe of the Just Transition Mechanism is 2021-2027.

Sources: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en; https://www.europarl.europa.eu/factsheets/en/sheet/214/just-transition-fund

Last but not least, in February 2025, the European Commission adopted the Omnibus I package, a legislative initiative grouping together several text amendments under a single proposal, specifically targeting sustainability regulations. The Omnibus I package softened some sustainability reporting and due diligence requirements, and the phased-out financial incentives for fossil fuel boilers from January 1; and adjusted some sustainability regulations, including the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD). The number of companies covered by the CSRD was reduced. The CSRD, originally intended to apply to around 50,000 companies, will now cover only 10,000. The due diligence obligation under the CSDDD remains in force but is now limited to direct suppliers, whereas it previously covered entire value chains. Finally, taxonomy reporting requirements have been eased, reducing data provision by around 70%.

2.2. REPowerEU – Affordable, secure and sustainable energy for Europe

REPowerEU[13] is a European Commission initiative to respond to the energy crisis caused by Russia's invasion of Ukraine. It aims to reduce gas demand, diversify supplies, secure affordable energy and accelerate the clean energy transition. These are measures adopted because of an unforeseen situation, which, however, should have considerable effects in terms of climate change mitigation. Indeed, if the general objective is "to safeguarded EU citizens and businesses from energy shortages, supported Ukraine by weakening Russia's war chest, accelerated the transition to clean energy and stabilised prices", the specific objectives are to help the EU to save energy; diversify energy supplies; produce clean energy (so, all with actual or potential effects on mitigation).

So, EU countries added specific chapters to their National Recovery and Resilience Plans (NRRPs) under Next Generation EU to finance key investments and reforms that will help achieve the REPowerEU objectives. These objectives include energy

[13] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131; https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en; https://energy.ec.europa.eu/topics/markets-and-consumers/actions-and-measures-energy-prices/repowereu-2-years_en; https://www.consilium.europa.eu/it/policies/eu-recovery-plan/repowereu/

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savings, diversification of energy supplies and faster deployment of renewable energy. Specifically, reforms and investments should focus on:

- Improving energy infrastructure and facilities to meet immediate needs for security of supply of gas, including liquefied natural gas, in particular to enable diversification of supply, in the interests of the EU as a whole
- Increasing energy efficiency in buildings
- decarbonising industry
- Increasing the production and deployment of sustainable biomethane and renewable or fossil-free hydrogen
- Increasing the share and faster deployment of renewable energy
- Tackling energy poverty
- Incentives to reduce energy demand
- Removing internal and cross-border bottlenecks in energy transmission and distribution and supporting zero-emission transport and related infrastructure, including railways.

2.3. The EU strategy on adaptation to Climate Change

The European Commission adopted the new EU Strategy on Adaptation to Climate Change in February 2021[14], as an integral part of the European Green Deal and the European Climate Law. The 2021 Strategy sets new, more ambitious goals than the 2013 EU Adaptation Strategy. The 2021 strategy is, among others, connected with the Sendai Framework for Disaster Risk Reduction 2015-2030 (mentioned in the previous chapter)[15].

The Strategy outlines a long-term vision for the EU to become a climate-resilient society, fully adapted to the unavoidable impacts of climate change by 2050. Complementing the EU's ambitious goal to become climate neutral by mid-century, this strategy aims to reinforce the adaptive capacity of the EU and the world and minimise vulnerability to the impacts of climate change, in line with the Paris Agreement and the European Climate Law. The Strategy seeks to step up action across the economy and society in synergy with other Green Deal policies such as biodiversity protection and sustainable agriculture. This should be done by making adaptation smarter, swifter and more systemic, as well as stepping up international action on adaptation. This means improving our knowledge of climate impacts and adaptation solutions; stepping up adaptation planning and climate risk assessments; accelerating adaptation action; and helping to strengthen climate resilience globally. This strategy sets out a whole-economy approach, with particular consideration for those among us who are most vulnerable to guarantee that resilience is achieved in a just and fair way.

The EU adaptation strategy claims that the EU can move closer to its overarching goal of a climate-resilient society only by achieving progress on all the following four objectives.

1) Smarter adaptation focuses on improving knowledge and data and supporting digital innovation to boost understanding of present and future climate impacts at planetary and local scale (since there are gaps in data and

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0082&from=EN
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2021:26:FIN
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN
[15] European Commission (2023). Sendai Framework for Disaster Risk Reduction Midterm Review 2023 – Working towards the achievement of the Sendai priorities and targets.

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methodologies to underpins decision making, due to insufficient knowledge and awareness on climate change adaptation, risk, vulnerability and resilience).

2) More systemic adaptation aims to support national, regional and local authorities in further developing adaptation strategies at all levels and enhancing frameworks for adaptation monitoring and reporting, building on national adaptation plans and other efforts (considering weaknesses in planning, monitoring, reporting and evaluating climate change adaptation, including the low priority and commitment given to adaptation in some regions, which have led to the generally slow pace of adoption and implementation of local adaptation strategies).
3) Faster adaptation is about increasing support for adaptation solutions through innovation and enabling activities, resilient infrastructure and resilient use of water resources (having noted the slow pace of action due to inadequate public and private-sector investment, and a lack of awareness or implementation of cost-effective solutions, which all hinder action).
4) Stepping up international action for climate resilience aims to support sub-national, national and regional approaches to adaptation, with a specific focus on adaptation in Africa, Small Island Developing States (SIDS), and Least Developed Countries (LDCs) (considering climate impacts generated outside the EU, which the 2013 adaptation strategy did not take into account or address, with international policy developments and increasing spillovers).

Under this strategy, the Commission should:

1. Help to close knowledge gaps on climate impacts and resilience, including on oceans, through Horizon Europe, Digital Europe, Copernicus and EMODnet
2. Improve the state of the art on adaptation modelling, risk assessment and management tools – towards "asset-level modelling"
3. Promote and support the use of its Risk Data Hub to harmonise the recording and collection of comprehensive and granular climate-related risk and losses data, and promote national level public-private partnerships to collect and share such data
4. Explore with EIOPA (European Insurance and Occupational Pensions Authority) and industry the best ways to improve the collection of uniform and comprehensive insured loss data, and will empower EIOPA as needed
5. Extend the scope of public access to environmental information in the INSPIRE Directive to include climate-related risk and losses data
6. Update and expand Climate-ADAPT as source of knowledge on climate impacts and adaptation, including by federating various sources of information, and as monitoring and reporting mechanism (see below)
7. Establish a European climate and health observatory under Climate-ADAPT
8. Stimulate cooperation regionally and across borders and enhance the guidelines on national adaptation strategies in cooperation with the Member States
9. Upgrade adaptation monitoring, reporting and evaluation by using a harmonised framework of standards and indicators
10. Provide ex-ante project assessment tools to better identify co-benefits and positive impacts on the economy of adaptation and prevention projects
11. Update its Better Regulation guidelines and toolbox to better reflect the principles of climate-risk management policy coherence

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12. Step up support to planning and implementation of local adaptation and launch an adaptation support facility under the EU Covenant of Mayors
13. Support the reskilling and requalification of workers for a just and fair resilience with education and training through ESF+, Erasmus+ and European Solidarity Corps
14. Continue to ensure the enforcement of existing employment and social legislation, and, where relevant, consider proposing new initiatives that increase workers' protection from climate impacts
15. develop ways to measure the potential impact of climate-related risks on public finances, develop tools and models for climate stress testing, and engage in discussions with Member States on better take into account climate change in national reporting and fiscal frameworks
16. Explore and discuss with Member States actions to dampen the fiscal impact of climate-related events and reduce fiscal-sustainability risks
17. Explore with Member States whether and to what extent Stability and Convergence Programmes could factor in the climate adaptation dimension
18. Promote better coordination and complementarity between the post-disaster emergency and recovery operations supported by the European Union Solidarity Fund and other EU funds to encourage the "build back better" principle
19. Propose nature-based solutions for carbon removals, including accounting and certification in upcoming carbon farming initiatives
20. Develop the financial aspects of nature-based solutions and foster the development of financial approaches and products that also cover nature-based adaptation
21. Continue to incentivise and assist Member States to rollout nature-based solutions through assessments, guidance, capacity building, and EU funding
22. Implement the planned Horizon Europe Mission on 'Adaptation to Climate Change' and other adaptation-relevant Missions, including on soil health, climate-neutral cities, and oceans once these are endorsed (see Box 6)
23. Support the development of further adaptation solutions, including rapid response decision support tools to enrich the toolbox for adaptation practitioners
24. Integrate adaptation in the update of Natura 2000 and climate change guidance, and in guidelines on biodiversity-friendly afforestation and reforestation, and in the forthcoming Forest Strategy
25. Strengthen its support to protect the potential of genetic resources for adaptation, including by proposing legislation on the production and marketing of seeds
26. Further develop the EU taxonomy for sustainable activities for climate adaptation
27. Enhance climate proofing guidance, and promote its use in Europe and abroad
28. Develop an EU-wide climate risk assessment and strengthen climate considerations in EU disaster risk prevention and management
29. Address EU-level preparedness and response to climate-related health threats, including through the EU Framework on Health Threats and, as relevant, the planned Health Emergency Preparedness and Response Authority
30. Increase cooperation with standardisation organisations to climate-proof standards and to develop new ones for climate adaptation solutions

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31. Support the integration of climate resilience considerations into the criteria applicable to the construction and renovation of buildings and critical infrastructure
32. Help to examine natural disaster insurance penetration in Member States, and promote it, for example through guidelines and invite EIOPA to develop its natural catastrophe dashboard allowing country-level assessments
33. Strengthen dialogue between insurers, policymakers and other stakeholders
34. Identify and promote best practices in financial instruments for risk management, in close cooperation with EIOPA
35. Explore the wider use of financial instruments and innovative solutions to deal with climate-induced risks
36. Help ensure climate-resilient, sustainable use and management of water across sectors and borders by improving coordination of thematic plans and other mechanisms, such as water resource allocation and water-permits
37. Help reduce water use by raising the water-saving requirements for products, encouraging water efficiency and savings, and by promoting the wider use of drought management plans as well as sustainable soil management and land-use
38. Help to guarantee a stable and secure supply of drinking water, by encouraging the incorporation of the risks of climate change in risk analyses of water management
39. Strengthen the support for the development and implementation of Nationally Determined Contributions NDCs) and National Adaptation Plans (NAPs) in EU partner countries and mainstream conflict-sensitive, anticipatory and preventive climate resilience and preparedness in relevant EU policies and instruments for external action (as established by the UNCoP – see the previous chapter -, NDCs should reflect each world country's commitments to reducing emissions; while NAPs should guide climate-resilient investments)
40. Intensify and broaden adaptation support to local authorities in EU partner countries and develop regional programmes, including for countries in the EU Southern and Eastern neighbourhoods, and in candidate countries and potential candidates
41. Include climate change considerations in the future agreement on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction
42. Aim to increase international climate finance for adaptation through the EU instruments for external action and by leveraging private sector investments
43. Promote the design and implementation of disaster risk finance strategies to increase macroeconomic climate resilience in partner countries
44. Support partner countries in the design of policies and incentives to promote climate-resilient investment, including in nature-based solutions
45. Enhance the climate-proofing of all EU external investments and actions
46. Submit the EU's adaptation plans and actions under the Paris Agreement
47. Deepen political engagement on climate change adaptation with international and regional partners, and partner countries
48. Increase the pool of knowledge and tools on adaptation available to non-EU countries and promote adaptation in Green Alliances and partnerships.

Financial support for adaptation is made available through the European Structural and Investment Funds, the Common Agricultural Policy, the LIFE Programme, and the Recovery and Resilience Facility. The Horizon Europe Mission on Adaptation to

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Climate Change also leverages significant resources in the effort to make Europe climate resilient.

BOX 6 – EU Mission on Adaptation to Climate Change by 2030

The EU Mission on Adaptation to Climate Change by 2030 aims to help at least 150 European regions and communities become climate-resilient by the end of the decade. Launched in 2021, the mission is part of the European Union's Horizon Europe research and innovation program and contributes to the broader goals of the European Green Deal.

The mission works by providing support and funding to local and regional authorities to help them better understand and prepare for the impacts of climate change, such as heatwaves, floods, and droughts. It also focuses on testing and demonstrating innovative solutions and accelerating the transformation to a climate-resilient future.

Primary goals

The initiative seeks to help regions in a three-step process:

1. Understand climate risks: Assist regions and local authorities in assessing the specific climate risks they face, including vulnerabilities and potential impacts.
2. Develop adaptation pathways: Guide communities in creating strategic plans and pathways to prepare for and cope with the changing climate.
3. Implement innovative solutions: Support the deployment of innovative, real-world solutions that build resilience on the ground.

Key focus areas

The mission addresses climate change impacts across several key areas:

- Infrastructure: Making critical infrastructure – including energy, transport, and water systems – more resilient to extreme weather.
- Health and well-being: Protecting vulnerable groups and increasing resilience to climate-related health risks, such as heatwaves and diseases.
- Food systems and land use: Developing climate-resilient practices for agriculture and forestry to ensure sustainable food systems.
- Water management: Improving resilience to droughts and floods by rethinking water allocation and supporting water-saving practices.

How the mission works

The EU Mission functions as a collaborative framework for all relevant stakeholders, including local authorities, policymakers, research institutions, and businesses.

Key mechanisms include:

- Funding and Tenders: Research and innovation projects are funded primarily through the Horizon Europe program, with specific calls for proposals published annually.
- Online Portal (MIP4Adapt): An online platform provides resources, tools, data, and examples of best practices to help regions plan their adaptation strategies.
- Community of Practice: The mission fosters a strong network for collaboration and knowledge-sharing among participating communities and regions.
- Inclusive Governance: It promotes engagement and dialogue with citizens and stakeholders to ensure that adaptation strategies are co-created and supported at the local level.

Sources: https://research-and-innovation.ec.europa.eu/system/files/2021-09/climat_mission_implementation_plan_final_for_publication.pdf; https://www.climaax.eu/eu-mission-on-adaptation-to-climate-change/#:~:text=Climate%20change%20affects%20regions%2C%20sectors,implementing%20innovative%20solutions%20by%202030

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The EU strategy on adaptation includes the set-up of the "Climate Adaptation Investment Advisory platform (Climate Adapt) – Sharing adaptation knowledge for a climate-resilient Europe". This is an Adaptation Support Tool (AST) that assists policy makers and coordinators on the national level in developing, implementing, monitoring and evaluating climate change adaptation strategies and plans. The AST was developed as a practical guidance tool for national level actors for all steps needed to develop, implement, monitor and evaluate a national adaptation strategy. It also supports sub-national actors and trans-national actors to prepare for, develop, implement and monitor and evaluate adaptation strategies. Furthermore, ADAPT will provide advisory on tailored financial instruments in climate change adaptation, including advisory services for Financial Intermediaries, for example National Promotional Banks, to pilot support for the design, launch and implementation of adaptation financing products.

The platform also includes detailed description of Case studies i.e., flagship of the Climate-ADAPT platform and showcase initiatives that are already being carried out in Europe. They have a comprehensive structure that covers all the key aspects in the implementation cycle of adaptation. Finally, the country profiles showcase the current status of national adaptation actions reported under the Governance Regulation per country.

Last but not least, the European Union promotes adaptation policies at a global level and therefore well beyond the territory of the European Union. This corresponds, among other, to multiple projects promoted and financed outside Europe, also in collaboration with other international organisations. Examples are the "Building Disaster Resilience to Natural Hazards in Sub-Saharan African Regions, Countries and Communities Program" from 2016 to 2021; or the "Regreening Africa programme", which second phase was launched in December 2024), Actions are promoted also in the framework of the UNCCD (see previous chapter), e.g., recently, pushing for increased global cooperation on desertification, drought and land degradation at UNCCD COP16.

BOX 7 – THE EIB ADAPTATION POLICY

The European Investment Bank (EIB), as EU institution, has a long track of engagement on climate issues and so in the implementation of climate policies through its operations and in general, both in Europe and in countries outside EU. In particular, EIB launched an ambitious new climate strategy and Energy Lending Policy at the end of 2019 and the EIB Climate Strategy was formalized one year later accompanied by the set-up of a Roadmap 2021-2025. The strategy and the roadmap are now (summer – autumn 2025) under revision for the next years.

Beyond his notable commitment on the Mitigation side (e.g., EIB is particularly engaged in operations related to the coal and carbon transition), EIB is also committed to ensuring that all the operations it supports are adapted and build greater resilience to current weather variability and future climate change, in line with the adaptation goals of the Paris Agreement. This objective aims to ensure that public and private sector projects financed by the EIB can perform well under a changing climate and contribute to protect people, businesses, infrastructure and ecosystem from the impacts of climate. It is anchored in the project-level assessment of physical climate risk, strengthened internal training and leveraging the latest climate data and science for the benefit of clients' and EIB's own decision-making. Moreover, EIB aims to catalyse further investment in adaptation and projects that build climate resilience. This involves actively pursuing investment opportunities in the development and deployment of technologies, products and services

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that enable adaptation and resilience. By supporting private sector companies and solution providers, EIB looks to play a key role in driving forward technological innovation, and supporting transformative solutions for climate adaptation. And finally, EIB aims to work with public and private sector clients to further develop their capacity and approaches to climate resilience. By providing advisory services to businesses, financial institutions and public authorities, EIB can improve understanding on how climate change may impact clients' activities and support the development of adaptation investment plans.

So, the EIB has developed tools to manage physical climate risks at project and portfolio level. At project level, the EIB introduced the Climate Risk Assessment System (CRA) – a tool to systematically assess physical climate risk in direct lending operations. The CRA system is a business process that helps the EIB and its clients understand how climate change may affect investments and identify adaptation responses. Through the knowledge partnerships with climate service providers described above, the EIB will leverage the latest findings in climate science. As the science on the impacts of a changing climate advances, the EIB will improve and further enhance the Bank's CRA systems.

By 2025, the EIB will: (i) Grow the share of EIB climate action for adaptation to 15% of EIB's overall climate financing (against 4-5% in 2012-2019); (ii) Ensure high impact and measure the results of adaptation finance through a series of new dedicated indicators.

Key investment areas are as follows.

A) Coping with water scarcity and the increased risk of flooding

i. Coastal and inland flood prevention, preparedness and protection
ii. Urban storm-water management and sustainable drainage systems
iii. Water storage, supply and efficiency to manage water scarcity and droughts

B) Protecting energy and transport sectors

i. Enhancing the climate resilience of electricity systems
ii. Protection of transport infrastructure networks

C) Greater resilience in cities and regions

i. Urban regeneration, water and storm-water management, including nature-based solutions to address more severe flooding, heat waves, storm surges, and droughts
ii. Protecting urban infrastructure and buildings

D) Strengthening climate resilience of food systems, forest and ecosystems

i. Sustainable production and food value chain that can withstand extreme weather
ii. Afforestation, reforestation, climate resilient land management practices, land and marine ecosystem protection and restoration

E) Health, education and public research

i. Prevention and care for people confronted with climate-induced diseases and heat stress
ii. Increasing the understanding of climate change and its impacts

F) Innovation

i. Research and development in innovative technologies and solutions
ii. Research on the effects of climate change on health

iii. Climate resilience innovation

G) Disaster risk management

i. Supporting water-related disaster management, emergency response and recovery in regions that are vulnerable to flooding
ii. Disaster risk management for anticipating and responding to extreme weather events

H) Promoting gender-responsive adaptation financing

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2.4. The European Central Bank Climate Agenda

The ECB Climate Agenda has been adopted in May 2022 with the aim of playing its role in the fight against climate change, as a European institution supporting general economic policies which contribute towards the achievement of the EU's Treaty-based objectives (considering that such objectives include protecting the environment).

ECB work on climate change focuses on three main areas.

1) Managing climate-related risk –ECB works to better understand, monitor and manage climate-related risks in monetary policy and investment operations, and in the financial system. We also assess the economic impact of climate-related policies and explore the relationship between climate, nature and the economy.
2) Support the green transition – ECB supports an orderly transition to a carbon-neutral economy using measures within our mandate. This includes promoting the development of sustainable finance and creating incentives for a greener financial system.
3) Fostering wider action – ECB helps improve general understanding of climate and nature-related risks and work closely with European and international partners on climate and sustainable finance topics. We also work to improve the transparency of our activities and reduce our own environmental impact.

In relation to these three areas, ECB action is articulated according to six priorities.

1) Assess the macroeconomic impact of climate change and mitigation policies on inflation and the real economy
2) Improve the availability and quality of climate data to better identify and manage climate-related risks and opportunities
3) Enhance climate change-related financial risk assessment
4) Consider options for monetary policy operations and assess the impact of climate change on monetary policy
5) Analyse and contribute to policy discussions to scale up green finance
6) Increase transparency and promote best practices to reduce the environmental impact.

3. Governance framework

As already mentioned, there are many actors among the European institutions who have contributed to designing and are contributing to implementing policies related to the mitigation of or adaptation to climate change. We have mentioned the European Commission, the European Parliament (which has adopted or is discussing the Laws, Directives and Regulations we have quoted, together with the European Council – representing directly the Member States, often in a dialectical relationship[16] in search of specific agreements), the European Investment Bank and the Central European Bank.

[16] Sometimes even in a polemical way, as in the case of the EU Forest strategy. In this respect, the EU council "REGRETS that the new EU Forest Strategy was not developed together with the Member States and stakeholders and EXPRESSES willingness and readiness to cooperate with the Commission

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The European Economic and Social Committee (EESC) is also very active on climate issues in support of the Paris Agreement, with meetings organised to encourage active civil society participation. The EESC produces opinions that cover a wide range of issues such as climate justice, a fair transition to a low-carbon economy and the need for multi-stakeholder, multi-level climate governance collaboration. The EESC takes part in the annual UNFCCC Conferences of the Parties and in climate-oriented civil society summits that bring together non-state players.

The same can be said about the European Committee of the Regions (CoR). The Commission for the Environment, Climate Change and Energy of the CoR is responsible for coordinating the Committee of the Regions' work in fields related to the European Green Deal, which include the environment, biodiversity, circular economy, zero pollution, climate change, energy, and space policies. The commission is also responsible for the Green Deal Local Working Group and other networks and platforms, such as the Covenant of Mayors National Ambassadors, CoR Climate Pact Ambassadors, and the Zero Pollution Stakeholder Platform. At the global level, the commission plays a leading role in CoR's involvement at UN conferences for climate change and biodiversity.

Coming back to the European Parliament, it has a Committee on Environment, public health and food safety. Moreover, many other European Parliament Committees are dealing with climate change issues ("Development", "Industry, research and energy", "Agriculture and rural development", and others).

Speaking of the European level, the entity to which we must pay most attention for drawing the governance framework, is still the Commission.

One among the Directorate General of the European Commission is CLIMA (Climate Action). DG CLIMA leads the European Commission's efforts to fight climate change at EU and international level. Its key mission is to formulate and implement EU climate policies and strategies, so that the EU can turn into the first climate-neutral and climate-resilient continent by 2050. DG CLIMA plays a leading role in developing and facilitating the implementation of cost-efficient policies and legislation to deliver the European Green Deal. The DG promotes innovative decarbonisation technologies to tackle global warming. It aims at ensuring prosperity and wellbeing, instilling a new climate culture in Europe, changing behaviours across our society. It maintains an ambitious global leadership in climate action, protecting the ozone layer, enhancing the international and domestic carbon market. It contributes to greening finance, ensuring the mainstreaming of climate action into the EU budget, into EU and Member States policies.

Mitigation and/or adaptation policies related to climate change are also taken into account by other Directorate Generals, *in primis*:

- The DG Energy, which deals with issues such as Energy Efficiency, Renewable Energy, and Carbon management and fossil fuels
- The DG Environment, who proposes and implements policies that ensure a high level of environmental protection (e.g., Nature and biodiversity and Forests)

and RECOGNIZES that there is shared interest in working together on implementing the New EU-forest Strategy for 2030 in an integrated manner. In this regard, STRESSES the importance of cooperation, coordination and joint activities between Member States, the European Commission as well as other important partners in the pan- European region on forest policy related matter". See: https://data.consilium.europa.eu/doc/document/ST-13537-2021-INIT/en/pdf

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- The DG AGRI (Agriculture and Rural Development), who supports and promotes a knowledge and evidence-based green and digital transition towards a sustainable, competitive, and resilient EU agriculture, rural areas and food systems
- The DG ECHO (European Civil Protection and Humanitarian Aid Operations). Which, among others, manage the EU Civil Protection Mechanism that includes all EU Member States, as well as 10 participating states (Albania, Bosnia and Herzegovina, Iceland, Montenegro, North Macedonia, Moldova, Norway, Serbia, Türkiye, and Ukraine), and acts worldwide; moreover, through this DG, the European Union works with national civil protection authorities also to support, complement, and coordinate their efforts in prevention and risk management planning, including financing relevant prevention and preparedness projects
- The DG MOVE (Mobility and transports), who deals, among other, on issues, such as clean transport and sustainable transport
- The DG RTD (Research & Innovation), responsible for EU policy on research, science and innovation and more specifically of the Horizon Europe program, which include a specific cluster on "Climate, energy and mobility" and a further one on "Food, bioeconomy, natural resources, agriculture, and environment"
- The Directorate General for International Partnership (INTPA). INTPA includes one branch (INTPA-F) dealing with Green Deal and the digital agenda. INTPA focus is the world beyond Europe and so, support multiple programs mainly in Africa, but also in other world regions. In connection with the Green Deal, these programs are also functional to the obligations established within the framework of the United Nations mechanisms described in the previous chapter in relation to climate strategies (UNFCCC, UNCCD, and CBD) and the achievement of the climate goals set by the parties within the framework of these instruments in developing, emerging and transition countries[17].

Coming back to the European region, an important role is also played by the European Climate, Infrastructure and Environment Executive Agency (CINEA), which manages European Commission programmes contributing to decarbonisation and sustainable growth (among others, the Just Transition mechanism mentioned above; the Horizon Europe's projects on Mobility and transport, Energy, and Climate action; and the LIFE program[18]).

Looking at the European Commission, we have also to mention the Recovery and Resilience Task Force (RECOVER) established within the EC's Secretariat-General. RECOVER is responsible for steering the implementation of the Recovery and

[17] In 2023, the European Union and its 27 member states contributed €28.6 billion in climate finance from public sources (funds have more than doubled in the last 10 years, being €9.6 billion in 2013), including the EU budget, the European Development Fund and the European Investment Bank and mobilised an additional €7.2 billion in private finance to support developing countries to reduce their greenhouse gas emissions and adapt to the impacts of climate change. Half of the public funding was dedicated to either climate adaptation or cross-cutting action (involving both climate change mitigation and adaptation initiatives) in developing countries.

[18] The LIFE Programme is the EU's funding instrument for the environment and climate action. One of the four sub-programs of LIFE is the Climate Change Mitigation and Adaptation sub-programme, which, on one hand supports projects in the areas of farming, land use, peatland management, renewable energies and energy efficiency and promotes integrated approaches, to implement climate change mitigation strategies and action plans at regional or national level; on the other, co-finances projects on urban adaptation and land-use planning, resilience of infrastructure, sustainable management of water in drought-prone areas, flood and coastal management, resilience of the agricultural, forestry and tourism sectors, and preparedness for extreme weather events, notably in coastal areas in the EU's outermost regions.

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Resilience Facility, which has the aim to make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions.

Finally, we have also to mention the European Environment Agency (EEA). It is an agency of the European Union that delivers knowledge and data to support Europe's environment and climate goals. In collaboration with its partner European Environment Information and Observation Network (Eionet)[19], the EEA informs decision-makers and the public about the state of Europe's environment, climate change and wider sustainability issues. The EEA's core tasks include: (i) supporting policy development and key global processes; (ii) offering analytical expertise; (iii) providing and maintaining an efficient reporting infrastructure for national and international data flows. Finally, EEA is responsible for the European Commission of Climate-Adapt (see above).

The related adaptation and mitigation policies we discussed in the Para. 2 do not involve only bodies at the European level, such as the ones mentioned above, but also at the national level in the EU Member States. Indeed, climate change policies need strong cooperation.

More specifically, to help the EU reach its 2030 climate and energy targets (i.e., EU mitigation policy and EU adaptation policy), the "Regulation on the Governance of the Energy Union and Climate Action" set common rules for planning, reporting and monitoring. The Regulation also ensures that EU planning and reporting are synchronised with the ambition cycles under the Paris Agreement. Under the Governance Regulation, EU Member States develop integrated national energy and climate plans based on a common template. The plans cover the five dimensions of the Energy Union: (i) decarbonisation (greenhouse gas reduction and renewables); (ii) energy security; (iii) energy efficiency; (iv) internal energy market; (v) research, innovation and competitiveness.

Member States had to submit their 2021-2030 draft plans by the end of 2018 and final plans by the end of 2019. The Commission has assessed these both at EU and Member State level. Member States had also to update their national energy and climate plans by the end of June 2023 in a draft form and by 30 June 2024 in a final form in order to reflect an increased ambition. Member States are also required to develop national long-term strategies and ensure consistency between these strategies and their national energy and climate plans. Member States will report on the progress made in implementing their energy and climate policies, including their national energy and climate plans.

The EU Forest strategy should be implemented in each Member State under EC coordination. Nevertheless, the Member States expressed doubt about the value of developing national strategic plans for forestry, as envisaged in the Commission's communication, and encouraged the use of existing international monitoring and reporting processes.

Finally, looking at the Nature Restoration Law (EU Biodiversity strategy for 2030) Member States are expected to submit National Restoration Plans to the Commission within two years of the Regulation coming into force (so by mid-2026), showing how they will deliver on the targets. They will also be required to monitor and report on their progress. The European Environment Agency will draw up

[19] Eionet is a partnership network of the EEA and its 38 member and cooperating countries. EEA and Eionet gather and develop data, knowledge, and advice to policy makers about Europe's environment.

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regular technical reports on progress towards the targets. The Commission, in turn, will report to the European Parliament and to the Council on the implementation of the Nature Restoration Law.

Of course, as we'll see in the next chapters, "Member States" means very complex and articulated contexts. So, in each Member State, there are specific branches (Ministries, Directorate-General, Authorities or anything else that are responsible for a specific policy in the country.

For instance, with respect to the implementation of the EU Social Climate Funds, the following table illustrates the responsible authorities for these strategies at the national levels (some of them also having further responsibilities).

Table 1 – Competent authorities by Member State

Member State	National authorities responsible for the Social Climate Plans
Austria	Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology and Ministry of Finance
Belgium	Federal Public Service (FPS) Health, Food Chain Safety and Environment; Flemish Energy and Climate Agency; Walloon Agency for Air & Climate (AWAC); Brussels Environment
Bulgaria	Council of Ministers Administration
Croatia	Ministry of Environmental Protection and Green Transition
Cyprus	Ministry of Finance
Czechia	Ministry of Environment
Denmark	Ministry of Climate, Energy and Utilities
Estonia	Ministry of Finance
Finland	Ministry of Environment
France	Prime Minister's office – General Secretariat of European Affairs
Germany	Ministry for Economic Affairs and Climate Action
Greece	Vice-Presidency of the Government
Hungary	State Secretariat for Energy and Climate policy
Ireland	Department of Climate, Energy, and the Environment
Italy	Ministry of Environment and Energy Security
Latvia	Ministry of Climate and Energy
Lithuania	Ministry of Environment
Luxembourg	Ministry of the Environment, Climate and Biodiversity (MECB)
Malta	Ministry for EU Funds
Netherlands	Ministry of Social Affairs and Employment
Poland	Ministry of Development Funds and Regional Policy
Portugal	Ministry for Territorial Cohesion and Ministry for Environment and Energy
Romania	Ministry of Investments and European Projects
Slovakia	The National Implementation and Coordination Authority under the Office of the Deputy Prime Minister for Recovery Plan and Knowledge Economy.
Slovenia	Ministry of Environment, Climate and Energy
Spain	Ministry for the Ecological Transition and the Demographic Challenge
Sweden	Ministry of Climate and Enterprise

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4. The main dynamic aspects of these policies/strategies

The policies designed at the EU level were characterized by some interesting dynamics in the last years based on the interaction among the various actors composing the Governance Framework briefly described above.

4.1. Mitigation

As a further step on the path towards climate neutrality, the Commission presented its assessment of the EU mitigation policy for a 2040 climate target for the EU in February 2024. It recommended reducing net greenhouse gas emissions in the EU by 90% by 2040 compared to 1990 levels, which is in line with recent scientific advice and the EU's commitments under the Paris Agreement. The European Parliament and Member States will discuss this target, and the next Commission will put forward legislative proposals on that basis.

At the end of 2025, the European targets were slightly scaled back, in view of COP30 (the United Nations climate conference) in Brazil in November 2025, foreseeing a reduction of between 66.25% and 72.5% in greenhouse gas emissions by 2035, but confirming the binding target of a 90% reduction in emissions by 2040.

4.2. Adaptation

The EU strategy on Adaptation to Climate Change was designed after an open public consultation between May and August 2020. Two policy options were assessed against their potential impact and achievement of these objectives, compared to a baseline to continue action under the 2013 strategy.

- Option 1 (more ambition) proposes making ambitious changes to both the form and nature of the eight actions in the 2013 strategy. It also proposes a wide range of new measures to deepen their impact. This represents a clear step up in ambition, with commensurate increases in visibility and effectiveness for EU-level action while remaining well within the policy scope of the 2013 strategy.
- Option 2 (more ambition and change) includes the changes proposed under Option 1 and adds 6 new actions to the strategy, each of which include several new measures. This represents a higher level of political ambition in EU adaptation policy, including in its international commitments. It expands into thematic areas of prime importance (e.g., innovation, ecosystem services, closing the climate protection gap) and by seeking to add greater policy coherence to EU actions on adaptation, including internationally, it constitutes a clear step up from the baseline.

Option 2 performs best on almost all measures and is therefore the preferred option. The assessment was made in the context of different climate (temperature) scenarios and shows robustness to this sensitivity check. Economic modelling and qualitative analyses estimate that it would yield the greatest benefits for economic welfare, reducing losses to economic welfare and employment compared to the baseline. It would also generate a more positive impact overall than Option 1 on the economic impacts of competitiveness, trade and investment, and innovation and research. Option 2 identifies positive social impacts in terms of income distribution, welfare and social inclusion, as well as major positive impacts for public health and safety. The assessment of Option 2 was also positive on environmental impacts, in terms of its impact on climate resilience, the quality and availability of natural resources, reducing pollution, and on biodiversity and ecosystem services. Lastly, it was assessed to generate considerably more positive impacts in non-EU countries

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and international relations. The benefits of both options increase at higher temperature (where climate damages are higher), but Option 2 remains best.

4.3. Just Transition Fund

The Just Transition Fund experienced several hurdles during its implementation. Initially, Eastern Member States proposed delaying implementation of the EU's green agenda to focus instead on the economic repercussions of the Covid-19 pandemic. Additionally, the deadlock at the Next Generation EU negotiations further complicated the fund's deployment.

One of the main points of contention during the negotiation was the discrepancies between Western and Eastern Member States regarding the framing of the EU's climate-neutrality objectives. A group of countries including Sweden, Austria, Luxembourg, Denmark and Spain wanted to apply the climate neutrality target to each Member State individually and not just to the EU. Meanwhile Eastern European countries favoured a less ambitious framing that would take into consideration the national circumstances of each Member State, their degree of technological development and their respective capacity to implement the Union's 2030 and 2050 climate objectives.

To ensure better support for workers affected by the transitions, the EC proposed in spring 2025 a targeted amendment to the European Globalisation Fund (EGF) Regulation[20] to make it faster and broader. The scope of EGF will be extended to support companies in restructuring processes to protect employees against the risk of unemployment. This may lead to an earlier mobilisation of available funds. In parallel, the Commission is preparing, in consultation with social partners, a Quality Jobs Roadmap to be published towards the end of the year.

5. Effectiveness of the strategies/policies

The "Regulation on the Governance of the Energy Union and Climate Action" includes the necessary elements to track progress in the implementation of EU climate legislation. It also lays down a monitoring mechanism for greenhouse gas emissions and other climate information so that the EU will be able to comply with its reporting obligations under the UNFCCC and Paris Agreement.

In 2023, for the first time, the Commission assessed progress towards the climate neutrality and adaptation objectives, as required under the European Climate Law. The findings were published as part of the 2023 Climate Action Progress Report and in a separate Staff Working Document on national progress with implementing adaptation.

Although greenhouse gas emissions continue to fall and there are encouraging signs of action on the ground, the Commission's assessment is that current progress towards the EU's climate neutrality objective appears to be insufficient. Action is most needed in areas which still require significant reductions in

[20] The European Globalisation Adjustment Fund Regulation (EU) 2021/691 governs how the EU provides solidarity to workers displaced by major restructuring events. Key aspects of the regulation include its purpose of supporting workers in adapting to structural changes caused by globalization or crises, its 2021-2027 funding period with a maximum annual ceiling of €1.467 billion, and its eligibility criteria for co-financing projects that help displaced workers find new jobs, retrain, or start businesses (http://data.europa.eu/eli/reg/2021/691/oj)

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emissions (e.g., buildings, transport), where progress is too slow (e.g., agriculture), or where, in recent years, there has been a deteriorating trend, as is the case for the carbon sink (e.g., land use, land-use change, and forestry). Numerous technologies and policies exist to reduce Greenhouse gases emissions. Significant technical progress has been made in the last 5 years in areas such as wind turbines, hybrid engine cars, underground CO2 storage, etc. But significant barriers exist. Barriers add to the cost of implementation and reduce the realizable potential implementing mitigation measures can face various barriers, such as financial, technical, social, political, or institutional challenges related to the different sectors. Specific barriers have been identified in relation to the different sectors (e.g., building, transport, energy supply, industry, forestry, agriculture, waste management).

The European Union has made broad progress on adaptation to climate change, in particular through the ongoing implementation of the EU Adaptation Strategy. However, progress has been uneven across areas. The assessment of progress on adaptation at the national level shows that Member States need to take significantly more action to adapt to climate change – for instance, on governance, funding, risk assessments, nature-based solutions, as well as monitoring, reporting and evaluation in order to reduce their social and economic vulnerabilities to the intensifying climate-related risks.

With respect to the "EU Biodiversity strategy for 2030" an ex-ante assessment has been done in 2020 by WWF, called "The European Commission commitment to increase its contribution to global biodiversity finance remains vague, as no specific target is mentioned. Increased financing should go hand in hand with other measures, such as capacity building and promotion of policy reforms especially in the context of EU's cooperation with Least Developed Countries (LDCs), Small Island Developing States (SIDS) and fragile developing partner countries."

An assessment of the just transition policies implemented in 2022 highlighted the characteristics of plans to phase out the fossil fuel industry, spread over several years, and starting with a coal phase-out. This type of just transition policy will derail the development of low-carbon economies worldwide. These policies through the establishment of just transition funds in 2019 and 2020 have (we might say paradoxically) led to subsidizing the fossil fuel industry indefinitely, since it is to this industry that they apply, albeit with a view to its phased out. Proactive policy needs to be developed, and finance re-allocated to deliver the just transition to a low-carbon economy. In essence a just transition policy overhaul is needed to complete revision if society is to achieve Energy & Climate 2030 goals and targets. Recent research has also highlighted the lack of sufficient funding for the Just Transition Fund to meet the EU's 2030 and 2050 climate goals[21]. The Bankwatch Network argued in 2021 that the Just Transition Fund is too minuscule – between 1% and 3% – to effectively support the transition of these regions. The sceptical viewpoint suggests that the Just Transition Fund might serve as a tool for the European Commission to secure political support from Eastern member states for the EU's Climate Law and 2050 carbon neutrality. Another criticism is that the major challenge in achieving a just transition to a low-carbon economy lies in the current financial support for fossil fuels. Critics argue that establishing just transition funds

[21] Pianta, M., & Lucchese, M. (2020). Rethinking the European Green Deal: An industrial policy for a just transition in Europe. Review of Radical Political Economics, 52(4), 633-641.

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will inadvertently lead to the indefinite subsidizing of the fossil fuel industry[22]. Finally, the Just Transition Mechanism's sectorial and territorial focus, seems to favour male-dominated sectors and neglects those where women are disproportionately represented, often characterized by low wages and job insecurity. This trend threatens to reinforce existing gender segregation and other disparities within these sectors and the broader labour market, while a gender-focus, adopting an intersectional approach, is needed.

Finally, an extensive picture can be drawn on the results achieved by the REPowerEU. It emerges that REPowerEU has played a crucial role in safeguarding EU citizens and businesses from energy shortages, while also providing vital support to Ukraine by weakening Russia's war chest. Through joint efforts, Europe has not only made a massive cut in Russian energy imports but has also accelerated its transition to clean energy. Among the results achieved, we highlight those that are most related to climate change mitigation:

- Saving Energy – Thanks to the actions of citizens, businesses and EU countries alike, the EU has overachieved its voluntary target to reduce gas demand by 15%. Natural gas demand declined by 18% between August 2022 and March 2024. This helped the EU save 125 billion cubic meters (bcm) of gas.
- Renewable Energy – Rapidly increasing renewable energy installation – reaching a record of almost 96 GW of new solar energy capacity installed and increasing wind capacity by 33 GW since 2022. Mid-2024, Europe is producing more electricity from wind and solar than from gas for the first time.

Broadly speaking, two years on, the EU has successfully met most of the ambitious targets set out in the REPowerEU Plan and is now on good track to completely get rid of Russian fossil fuels while continuing to pursue the green transition and supporting Ukraine.

[22] Heffron, R. J., & McCauley, D. (2022). The 'just transition' threat to our Energy and Climate 2030 targets. Energy Policy, 165, 112949.

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ANNEX B2 – CLIMATE POLICIES IN AUSTRIA

1. Introduction

In the previous version of this report (Del.4.1., January 2025), in the Austrian governmental developments, the *Freiheitliche Partei Österreich* (FPÖ) attempted to form a government. The FPÖ is a political party in Austria known for its right-wing populist, Eurosceptic, and nationalist positions. For this report it is important to note that the FPÖ is denying climate change, and its government presumably would have been in favour of dismantling all former efforts in respect to mitigation and adaptation policies. In the 2024 legislative election, the FPÖ became the largest party in parliament with about 29% of the vote, marking its best result historically. The party has a reputation for anti-immigration stances, skepticism towards the European Union, and a political platform often described as far right or extremist.

A three-party centrist coalition government formed without FPÖ participation. This coalition includes the conservative Austrian People's Party (ÖVP), the Social Democrats (SPÖ), and the liberal NEOS party. This government is tasked with addressing key issues such as budget deficits and political stability while explicitly excluding the FPÖ from governing power despite its electoral success.

Thus, while the FPÖ has considerable parliamentary strength and influence, it is not currently part of the federal government formed in 2025 but remains a significant opposition force shaping Austria's political landscape.

Thus, Austria's approach to tackling climate change integrates mitigation and adaptation efforts through the development of its National Adaptation Strategy (NAS) and the Climate Action Plan and its related documents will continue to exist, as described in the previous report (Del. 4.1). This will allow the country to both reduce its carbon footprint and prepare for future climate impacts simultaneously. Austria's climate policies are also aligned with EU-level strategies like the European Green Deal, which aims for a carbon-neutral Europe by 2050.

Both mitigation and adaptation actions are backed by legislation, financial mechanisms, and regular assessments to ensure that Austria meets its climate commitments and builds resilience against climate-related risks. As regards changes and as outlined above, the new government coalition will concentrate more on addressing the budget deficits, which implicitly means that cuts will be carried out and this will also affect the climate mitigation and adaptation measures. These effects are going to be described in the subsequent relevant sections of the report.

2. Strategies of mitigation and adaptation

The objectives of Austria's mitigation and adaptation strategies are designed to address both the reduction of greenhouse gas emissions and the enhancement of resilience to climate change impacts.

The primary objective of Austria's mitigation strategy is to significantly reduce its greenhouse gas emissions by transitioning to a carbon-neutral economy. This includes achieving 100% renewable electricity by 2030, improving energy efficiency across all sectors, and promoting the use of clean energy sources such as solar, wind, and hydropower. Another key objective is to decarbonize the transport sector

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by reducing emissions through the adoption of electric vehicles, expanding public transportation, and promoting sustainable mobility practices. In addition, Austria aims to reduce emissions from agriculture by encouraging sustainable farming practices, such as organic farming and precision agriculture, and minimizing methane and nitrous oxide emissions. The country also seeks to implement market-based mechanisms, such as carbon pricing and participation in the EU Emissions Trading System, to incentivize emission reductions across sectors.

On the adaptation side, the main objective is to build resilience to the impacts of climate change, such as rising temperatures, extreme weather events, and flooding. This involves adapting infrastructure to withstand the changing climate, including upgrading flood protection systems, improving water management, and making buildings more resilient to heatwaves. Austria aims to manage water resources sustainably, ensuring that both urban and rural areas can cope with fluctuating water availability. Another key objective is to protect biodiversity and restore ecosystems that provide essential services, such as carbon sequestration and flood prevention. Adaptation efforts also focus on enhancing public awareness and providing communities with the tools and knowledge needed to cope with climate change impacts. Additionally, the adaptation strategy targets the health sector by strengthening systems to handle heat-related health risks and emerging diseases, particularly for vulnerable populations.

Ultimately, Austria's mitigation and adaptation strategies are interconnected, aiming not only to reduce emissions but also to safeguard the country's ecosystems, infrastructure, and communities from the unavoidable consequences of climate change.

2.1. Rationale and Timeframe

The rationale behind Austria's mitigation and adaptation strategies is rooted in the recognition of climate change as a critical and urgent challenge that poses significant risks to the country's economy, environment, and society. Austria, as part of the European Union, is committed to meeting the EU's climate goals, including the overarching objective of achieving carbon neutrality by 2050. To contribute to this, Austria aims to reduce its greenhouse gas emissions in line with its national climate targets, which involve decarbonizing key sectors such as energy, transport, industry, and agriculture.

Austria is a "Federal State"; which means it has one federal/national government and nine so-called federal "provinces". For the last decades, the federal (=national) and provincial governments (=9 Austrian provinces) have been increasingly cooperating on adaptation under the umbrella of the Austrian Adaptation Strategy. The focus is particularly on cross-sectoral areas of action, the successful implementation of which is accelerated by close cooperation due to their complexity. These activities are presented hereafter.

The development of the precautionary check for natural hazards in climate change was initiated and supported as part of a federal-state working group on the topic of personal precautions. This aims to increase risk awareness and the precautionary capacity of municipalities[23].

Since the start of the KLAR! programme (Climate Change Adaptation Model Regions) in 2016, there has been even closer cooperation between the federal and

[23] Austria to date has 2.095 municipalities (*Ortsgemeinden*).

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provincial governments to counteract the consequences of climate change at regional and local level and exploit opportunities accordingly.

The KLAR! programme aims to:

(i) Strengthen the implementation of the Austrian Strategy for Adaptation to Climate Change at the local level. With local level both the federal provinces as well as the municipal levels are meant
(ii) Foster a process-oriented approach comprising the dimensions adaptation, mitigation, nature conservation and the avoidance of maladaptation
(iii) Raise awareness for climate change and climate change adaptation in regions (across the federal provinces) and municipalities (= the local level)
(iv) Implement findings of the Austrian climate research in practice
(v) Strengthen regions (across the nine federal provinces) and municipalities (= local levels) against climate change impacts and help them to exploit the benefits of climate change.

To raise awareness of the consequences of climate change among stakeholders at regional level, regular dialogue events have been held since 2013 to transfer knowledge and highlight a wide range of options for action in cooperation between the BMK, the Climate and Energy Fund, the federal states and the Federal Environment Agency.

The Austrian "Network of Innovative Climate Change Adaptation for Practitioners at Regional Level" (Adaptation Network, KWAN) was established in 2021 as a platform for the cooperation and exchange of experience.

The BMK, the nine federal provinces and the Climate and Energy Fund support the network activities in the form of a core steering group.

Since 2017, climate status reports have been published regularly on behalf of the nine federal provinces and the Climate and Energy Fund. The reports show how extreme weather events are categorised in the context of climate change and what effects they have.

The EU Climate Change Adaptation Mission aims to support regions and local authorities in their efforts to implement preventive and coping measures and to strengthen resilience to the effects of climate change. As of June 2023, there were 15 Austrian signatories to the mission charter. Since the end of 2021 the Austrian Mission Action Group CCA Climate Change Adaptation has been supporting the national implementation (across the nine provinces) as well.

This holistic approach not only helps mitigate the harmful effects of climate change but also ensures that Austria remains competitive in the global economy by transitioning to sustainable, low-carbon technologies and industries. In parallel, the rationale for adaptation is driven by the need to prepare for the unavoidable impacts of climate change, such as increased extreme weather events, flooding, and heatwaves. These impacts threaten public health, infrastructure, water resources, and agricultural productivity, which makes adaptation strategies essential for protecting the country's well-being and maintaining a high quality of life. Moreover, by investing in resilience now, Austria aims to reduce long-term costs and ensure a sustainable future for its citizens.

The time frame for Austria's mitigation and adaptation strategies is aligned with both national and EU-wide climate objectives. Austria's mitigation efforts are structured around the 2030 climate and energy framework, with clear targets such

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as achieving 100% renewable electricity by 2030. In line with the EU's Green Deal, Austria aims for carbon neutrality by 2050, setting an ambitious trajectory for emissions reductions over the next few decades.

The long-term goal is underpinned by interim targets and policies designed to ensure that the country meets the necessary milestones along the way. Adaptation efforts are also framed within the context of the coming decades, with many actions set to unfold gradually over time.

The National Adaptation Strategy (NAS), which guides these efforts, outlines long-term actions with ongoing assessments and updates to ensure resilience to the evolving climate risks. Austria's strategies are therefore designed to be dynamic, continuously evolving as new scientific data and climate projections become available, with an emphasis on flexibility to respond to the changing nature of climate impacts.

Both the mitigation and adaptation strategies are intended to ensure that Austria is well-prepared to face the challenges of climate change over the coming decades, with an ongoing focus on meeting both short-term and long-term objectives.

2.2. Mitigation strategy in Austria

Austria's mitigation strategy is focused on reducing greenhouse gas emissions across various sectors of the economy, with the ultimate goal of achieving carbon neutrality by 2050. A central component of the strategy is the transition to renewable energy sources. Austria aims to achieve 100% renewable electricity by 2030, relying heavily on hydroelectric power, wind, solar, and biomass energy to replace fossil fuels. The strategy also emphasizes increasing energy efficiency throughout all sectors, including residential, industrial, and transport sectors. For example, Austria promotes the retrofitting of existing buildings to meet higher energy efficiency standards and supports the development and implementation of energy-efficient technologies in industries.

In the transportation sector, Austria seeks to reduce emissions by encouraging the adoption of electric vehicles (EVs) and expanding the necessary charging infrastructure. The country is also enhancing its public transportation network to offer low-emission alternatives to private car use, while promoting cycling and walking as sustainable modes of transport. Alongside these initiatives, Austria aims to reduce emissions from agriculture, which is a significant contributor of methane and nitrous oxide. This is achieved by promoting sustainable farming practices, such as precision agriculture and agroforestry, as well as encouraging the adoption of renewable energy on farms.

Moreover, Austria is required by the EU to submit NECPs (National Energy and Climate Plans) outlining its 10-year strategic plan to contribute to the EU's climate targets. The initial NECP was submitted in December 2019 aimed for a 27% reduction in emissions by 2030 compared to 2005 levels, but this was revised to a 48% reduction target. However, projections indicate that the current and planned policies will still fall short of this ambitious target.

The main novelty since February 2025 is that Austria has extended this goal to reduce greenhouse gas emissions to the non-ETS sectors by 48% by 2030 compared to 2005, which is a more ambitious target than before. A "non-ETS sector" refers to parts of the economy that are not covered by the European Union Emissions Trading System (EU ETS). The EU ETS is a "cap and trade" system that regulates

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emissions from large stationary sources like power plants, heavy industry, and aviation within the EU. It sets a cap on total emissions from these sectors and allows the trading of emission allowances. As outlined in the interviews with Austrian policy experts, emissions from non-ETS sectors are managed by national policies (such as in Austria and Germany) and are subject to separate binding emission reduction targets established under the Effort Sharing Regulation (ESR).

To further drive emission reductions, Austria is also exploring market-based instruments such as carbon pricing and participating in the European Union Emissions Trading System (EU ETS). These measures create financial incentives for businesses and industries to reduce their carbon footprints. In addition, Austria supports innovation in green technologies and is committed to reducing emissions from industrial processes through advancements in clean technologies. Overall, Austria's mitigation strategy is an integrated approach, focusing on both technological solutions and policy measures, aiming to reduce emissions and support the country's transition to a low-carbon, sustainable economy.

2.3. Adaptation strategy in Austria

Austria's adaptation strategy is focused on enhancing the country's resilience to the inevitable impacts of climate change, such as extreme weather events, rising temperatures, and flooding. The central aim of the strategy is to reduce vulnerability and ensure that Austria's infrastructure, ecosystems, and communities can cope with the changing climate. A key aspect of this approach is the modernization of infrastructure to withstand the increased frequency and intensity of climate-related events. For instance, Austria is upgrading its flood protection systems, including the construction of new dams, retention basins, and flood barriers, as well as restoring natural floodplains to mitigate the risk of flooding. Overall, since 1990, Austria has implemented a climate protection act in 2013 with binding targets towards 2020, and the Adaptation Strategy (NAS). This strategy involves the creation of new institutions, programs, and climate change mitigation measures at local and regional levels to address the impacts of climate change and reduce emissions across different sectors.

In the water management sector, for instance, Austria is working to ensure sustainable use and distribution of water resources. This includes enhancing water storage capacity, improving irrigation practices, and developing advanced technologies to manage water more efficiently in agriculture and urban areas. As part of its adaptation strategy, Austria is also addressing the challenge of rising temperatures by making buildings more resilient to heatwaves. This is achieved through measures such as improving insulation, installing green roofs, and promoting the use of cool materials in urban areas to reduce heat islands.

Austria recognizes the importance of preserving biodiversity and protecting ecosystems, which play a vital role in mitigating climate impacts. To this end, the country is focusing on ecosystem restoration, including reforesting areas and protecting wetlands that help regulate the climate and water cycles. Additionally, the adaptation strategy includes efforts to support agriculture, particularly in adapting farming practices to changing weather patterns. This involves promoting drought-resistant crops, improving soil management techniques, and providing farmers with climate data and guidance on sustainable practices.

Public awareness and education are also key components of Austria's adaptation efforts. The government is working to ensure that citizens, businesses, and local

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authorities are well-informed about the risks posed by climate change and are equipped with the knowledge and tools to respond effectively. In the health sector, Austria's adaptation strategy seeks to strengthen the healthcare system's capacity to deal with heat-related health risks, such as heatstroke and vector-borne diseases. This includes improving early warning systems, developing heat action plans, and ensuring that vulnerable groups, such as the elderly, have access to necessary support.

Overall, Austria's adaptation strategy is designed to be flexible and responsive, regularly updated in line with evolving climate risks and scientific knowledge, with the overarching goal of ensuring the country's long-term resilience to climate change.

2.4. Adaptation policies in the nine Federal Provinces of Austria

In Austria, adaptation policies are implemented at both the national (=federal) and at the level of the nine federal provinces, where regional conditions and climate vulnerabilities shape specific actions and strategies. Each of the nine federal provinces has developed its own adaptation measures, tailored to local climate risks, while aligning with the broader objectives of the National Adaptation Strategy. In many provinces, adaptation policies focus on addressing climate-related challenges such as flooding, heatwaves, droughts, and biodiversity loss, which vary depending on the geographical and environmental context of each region.

For instance, in provinces with mountainous terrain like Tyrol and Vorarlberg, the adaptation policies emphasize the protection of landscapes from the impacts of landslides, avalanches, and glacial retreat due to rising temperatures. These regions have invested in infrastructure improvements such as stabilizing slopes, enhancing early warning systems, and restoring natural barriers. In contrast, provinces with large agricultural sectors, such as Lower Austria and Burgenland, have focused on improving water management and promoting climate-resilient farming practices. These measures include drought-resistant crop varieties, efficient irrigation systems, and the use of precision farming technologies to optimize water usage and mitigate the effects of changing precipitation patterns.

In urbanized regions, such as Vienna[24], the adaptation strategy has concentrated on reducing the urban heat island effect and enhancing the resilience of city infrastructure. This includes expanding green spaces, planting more trees, and retrofitting buildings to improve their energy efficiency and heat resistance. The city has also focused on improving public transportation networks to reduce the reliance on private cars, which contributes to both air pollution and increased urban temperatures.

In addition to these region-specific strategies, the nine provinces have collaborated with each other and the federal (=national) government to ensure that adaptation actions are coordinated and that resources are shared. This includes joint initiatives on flood protection, water conservation, and climate risk assessments, which are critical in a country in which river basins, such as the Danube, cross multiple provincial borders. Furthermore, the provinces are actively involved in raising awareness about climate change and its potential impacts, offering training and

[24] In the Austrian political system, Vienna counts as both: A Federal Province and the Capital City. Hence it has two councils: A city council and a federal council.

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educational programs for local authorities, businesses, and citizens to prepare for climate-related disruptions.

Overall, adaptation policies in the nine federal provinces of Austria reflect the diverse challenges posed by climate change in different regions and aim to ensure that each province can effectively respond to the specific risks it faces while contributing to the national goal of building resilience across the country.

3. Governance framework

The governance framework for climate change policies in Austria is structured around a multi-level approach that involves coordination between federal (referring to national), regional (nine federal provinces), and local (municipalities) authorities, ensuring that climate action is both effective and tailored to specific local needs. At the federal level, the Austrian Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (BMK) plays a central role in the development and implementation of national climate policies. This ministry is responsible for overseeing Austria's commitment to international climate agreements, such as the Paris Agreement, and ensuring that national targets for emissions reductions, energy transition, and adaptation are met. The BMK also coordinates with other ministries, such as the Ministry of Agriculture, Forestry, Environment, and Water Management, to address the cross-cutting nature of climate change, ensuring that policies in sectors like agriculture, energy, and transportation align with climate goals.

A key feature of Austria's governance framework is its decentralized structure, with significant responsibilities delegated to the nine federal provinces (*Länder*). Each province has the authority to develop its own climate policies, which are designed to address region-specific vulnerabilities and priorities. This decentralized system allows for greater flexibility and responsiveness to local needs, ensuring that adaptation and mitigation strategies are suited to the geographical, economic, and social context of each region. Provinces, in turn, coordinate with municipalities to implement climate actions at the local level, particularly in urban planning, infrastructure development, and environmental protection.

To facilitate the coordination of climate change policies across levels of government, Austria has established various national and regional platforms. These include the Austrian Climate Change Adaptation Platform Models for regions in Austria, which fosters collaboration between federal and regional authorities, researchers, businesses, and civil society. The platform is funded by the Austrian Climate and Energy Fund and helps align climate policies, share knowledge, and develop joint solutions to address Austria's climate challenges. Additionally, Austria's National Climate Strategy, which is developed by the federal government in consultation with stakeholders, provides a comprehensive framework for action across all sectors and regions.

The governance of climate policies in Austria is also supported by financial mechanisms, including national funds and EU climate funding programs. These funds are used to finance projects related to climate mitigation and adaptation, with a focus on innovation, renewable energy, and sustainable infrastructure. The Austrian government also engages with the private sector and civil society to foster

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climate-friendly practices through incentives, subsidies, and public-private partnerships.

Austria's governance framework is designed to be dynamic and adaptable, allowing for regular updates to policies and strategies based on the latest scientific research and climate data. This includes the periodic review and adjustment of climate targets and action plans, ensuring that Austria's climate policies remain aligned with both national objectives and international commitments. Through this comprehensive and multi-level governance framework, Austria seeks to address the complexities of climate change while fostering broad-based support and participation in climate action.

4. The main dynamic aspects of the strategies

The main dynamics of climate change policies in Austria are shaped by a combination of national commitments, regional initiatives, and international obligations, all aimed at achieving long-term sustainability and climate resilience. At the core of Austria's climate policies is the commitment to meeting European Union climate goals, such as the EU Green Deal and the 2050 carbon neutrality target. Austria's policies are designed to reduce greenhouse gas emissions, transition to renewable energy, and promote energy efficiency across sectors like industry, transportation, and agriculture. This commitment is underpinned by a clear focus on decarbonizing the energy sector, with the goal of achieving 100% renewable electricity by 2030.

Another key dynamic is Austria's emphasis on both mitigation and adaptation. While mitigation efforts focus on reducing emissions through clean energy technologies, sustainable transportation, and energy-efficient infrastructure, adaptation strategies aim to prepare for the inevitable impacts of climate change, such as heatwaves, flooding, and changing precipitation patterns. The country's adaptation efforts are closely aligned with its mitigation strategies, ensuring that climate resilience is built into long-term development plans.

A unique dynamic of Austria's climate policies is the active role of its federal system, where the national government collaborates with regional governments (the nine provinces) to develop and implement climate actions tailored to local needs. Each province is encouraged to create its own adaptation and mitigation plans based on its specific climate vulnerabilities, whether that be in urban areas, agricultural regions, or mountainous terrains. This decentralized approach ensures that climate policies are flexible, context-specific, and responsive to local conditions.

Additionally, Austria's climate policies are characterized by an increasing integration of scientific research and stakeholder involvement. The government works closely with researchers, businesses, local authorities, and civil society organizations to ensure that climate action is informed by the latest data and that policies are inclusive and widely supported. Public engagement and awareness campaigns also play a vital role in fostering climate responsibility at the community level.

Finally, financial dynamics are central to Austria's climate policy implementation. The country uses a mix of public and private investment, including EU funding programs, to support climate action initiatives. This financial support is critical for fostering innovation in clean technologies, improving infrastructure resilience, and

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financing climate adaptation projects. Overall, Austria's climate change policies are dynamic in their integration of science, governance structures, financial mechanisms, and local adaptability, positioning the country to address both the causes and consequences of climate change effectively.

5. Effectiveness of the strategies/policies

Austria's climate change policies reflect a significant commitment to addressing environmental challenges, but their effectiveness is a topic of evaluation and scientific critique (Niedertscheider, Haas and Görg, 2018; Winkler and Winiwarter, 2016[25]; Schaffrin, Sewerin and Seubert, 2014; Kettner and Kletzan-Slamanig, 2018; Steurer and Clar, 2015; Steurer, Clar, and Casado-Asensio, 2020). The Austrian government has aligned its strategies with the European Union's climate goals, including achieving climate neutrality by 2040, which is notably ambitious. Measures such as promoting renewable energy, enhancing energy efficiency, and advancing sustainable transportation are central to its approach.

Some progress has been observed in increasing the share of renewable energy in electricity generation, with a substantial reliance on hydropower and growing investments in wind and solar energy. Austria's expansion of public transport infrastructure, particularly in urban areas, can be seen as a proactive stance on reducing emissions from the transport sector, one of the largest contributors to its greenhouse gas emissions. Moreover, policy frameworks like the Climate and Energy Strategy and the establishment of carbon pricing signal the country's commitment to systemic changes.

Despite these efforts, challenges remain. Austria has struggled with high emissions in sectors like agriculture and transportation, which undermine its overall reductions. Critics argue that while the policies are well-intentioned, implementation and enforcement often lag, and the pace of change may not be sufficient to meet the ambitious 2040 target. Additionally, reliance on voluntary measures in some areas has raised concerns about their adequacy in driving the necessary transformation.

In other words: Despite this target and Austria's non-binding ambition of becoming fully "climate neutral" by 2040, Austria's emissions reductions in 2021 have been slower than the EU average (European Parliament, 2021). Current projections predict that emissions will remain relatively constant in Austria (Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology/ *Bundesministerium fuer Klimaschutz, Umwelt, Energie, Mobilitaet, Innovation und Technologie* 2023), highlighting the need for policy intervention if the country is to meet its climate goals.

The new government's 2025–2029 programme includes a revision of Austria's National Energy and Climate Plan (NECP) in coordination with the provinces to align with government priorities. In concrete terms, this means that the former Austrian strategies are still in force. The exact timeline for this is left open and, according to the interviews with national experts, it does not look at the moment as if there will be some initiatives for change in this respect.

In summary, while Austria's climate policies are commendable for their ambition and alignment with international goals, their ultimate effectiveness will depend on

[25] Winkler, T., & Winiwarter, W. (2016). Greenhouse gas scenarios for Austria: a comparison of different approaches to emission trends. Mitigation and Adaptation Strategies for Global Change, 21, 1181-1196.

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consistent implementation, stronger measures in lagging sectors, and sustained public and political support, which is highly questioned at the moment.

Effectiveness of CC policies in the Austrian Provinces

The effectiveness of climate change policies in Austria's provinces varies significantly, reflecting regional priorities, economic structures, and levels of commitment to sustainability. Some provinces, such as Vorarlberg and Tyrol, have made considerable progress by prioritizing renewable energy and sustainable transport systems. Vorarlberg, for instance, has become a leader in energy-efficient building practices and has significantly increased the share of renewable energy in its energy mix. Tyrol has focused on leveraging its alpine geography to develop hydropower and promote eco-tourism as a sustainable economic model.

On the other hand, provinces like Lower Austria and Upper Austria have made strides in renewable energy production, particularly through wind and solar power projects. Lower Austria stands out for its early achievement of a 100% renewable electricity supply target, underscoring its commitment to sustainable energy transitions. Upper Austria, with its strong industrial base, has invested heavily in energy efficiency programs for businesses, aiming to balance economic growth with environmental responsibility.

However, provinces such as Styria and Carinthia face challenges in addressing emissions from agriculture and transportation, which remain significant contributors to regional greenhouse gas outputs. In these areas, policy implementation has sometimes been slower or less impactful due to conflicting economic interests and the reliance on traditional industries. Similarly, Vienna, as the capital and an urban hub, grapples with reducing emissions from dense traffic and high energy demand, although it has achieved notable success in expanding public transport and energy-efficient housing.

Overall, while Austria's provinces demonstrate varying degrees of effectiveness in implementing climate change policies, the collective impact is hampered by inconsistencies in policy ambition and implementation. Enhanced coordination, greater investment in sustainable infrastructure, and stronger enforcement mechanisms are necessary to ensure that all provinces contribute equitably to Austria's national and international climate targets.

All provinces reported recently in the National report on The Energy and Climate Plan (NAEK).

Lower Austria (*Niederösterreich*): The measures include climate protection, expansion of renewable energy sources, and adaptation to climate change. These efforts are part of the broader strategy to achieve decarbonization by 2040, with climate protection and adaptation being considered equally important.

Carinthia (*Kärnten*): The province has integrated adaptation measures within its existing climate protection strategies under the Klimaagenda Kärnten. This indicates a proactive approach to addressing climate change impacts.

Vienna *(Wien*): Adaptation to climate change is incorporated into overarching strategies such as the Smart City framework. The Klima-Fahrplan (2022) aims for decarbonization by 2040, treating climate protection and adaptation as equally significant. Amongst all the regional policy sections, Vienna is currently the only region that plans further novelties: Vienna is not only the capital city but also a federal state within the Austrian constitution, hence it is planning to introduce its

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own climate law targeting climate neutrality by 2040, with pillars on climate protection, adaptation, and circular economy. The plan was announced in April 2025.

Burgenland: Adaptation measures are directly integrated into other sectoral programs and strategies, reflecting a comprehensive approach to climate change adaptation.

Styria, Vorarlberg and Salzburg (*Steiermark, Vorarlberg, and Salzburg*): These provinces have their own strategies for climate change adaptation, indicating a region-specific approach to addressing climate impacts.

Upper Austria (*Oberösterreich*): The province has updated its strategy to an integrated climate and energy strategy, which includes climate change adaptation measures.

Tyrol (*Tirol*): A new sustainability and climate strategy was published in 2021, which integrates both adaptation and climate protection measures.

As stated above, the effectiveness of these measures will ultimately depend on their implementation and the continuous monitoring and adjustment of strategies based on emerging challenges and progress.

6. Other aspects

Austrian mitigation and adaptation strategy under the new government since February 2025 remains committed to EU and global climate targets but faces tension from political priorities aiming to reduce climate policy costs. The Austrian strategy remains still in force. New legal frameworks for carbon removal and CCUS remain under discussion and are not anticipated in the near or medium-term future. One introduction of the former government has been ceased: The former government had introduced a payout of hundreds of euros a year to each taxpayer intended to redistribute proceeds from carbon-emissions-based taxation introduced by the outgoing OVP-Greens coalition.

This Austrian Klimabonus was a payment introduced as part of the eco-social tax reform in 2022, designed to redistribute revenues generated from CO2 pricing directly to residents. It aimed to compensate households for increased costs due to carbon taxes and incentivize climate-friendly behavior. The payment depended on the recipient's place of residence, with larger amounts for those in regions with less public transport. This bonus was limited to the years 2022, 2023, and 2024, and payouts for these years continued into early 2025. However, from 2025 onward, the Klimabonus has been abolished as part of the new government's budget savings measures expected to save approximately 1.8 billion euros. With the new government, people can still claim unpaid bonuses from previous years until December 31, 2027. However, it will especially negatively affect low-income households, who will on average lose about 1.75 percent of their household income. The original idea of the Klimabonus was to socially cushion the burdens caused by CO2 pricing, but due to high expenditures and overruns of the CO2 tax revenues, it was decided not to continue the bonus. The abolition is assessed by experts as socially problematic, because without the Klimabonus, the CO2 pricing financially burdens poorer households more strongly.

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Retrospectively, despite the implementation of various climate strategies, adaptation strategies, and climate change mitigation measures at national, local and regional levels, the overall impact has been limited. This will also not change under the new government. Emissions in Austria peaked in 2005 and have generally fallen since[26], but this reduction is attributed more to short-term drivers and structural changes in the economy rather than effective policy measures. The reasons for the failure of Austrian climate policy include inconsistency across policies, low commitment levels, and the federalist political system, which has led to watered-down policies at the provincial level to find lowest-common-denominator solutions.

[26] See especially: Niedertscheider, M., Haas, W., & Görg, C. (2018). Austrian climate policies and GHG-emissions since 1990: What is the role of climate policy integration? Environmental science & policy, 81, 10-17; Winkler, T., & Winiwarter, W. (2016). Greenhouse gas scenarios for Austria: a comparison of different approaches to emission trends. Mitigation and Adaptation Strategies for Global Change, 21, 1181-1196.

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ANNEX B3 – CLIMATE POLICIES IN THE CZECH REPUBLIC

1. Introduction

Climate change presents one of the most significant challenges of the 21st century, requiring both global and local action. The Czech Republic (Czechia), situated in Central Europe, faces unique environmental challenges such as a reliance on coal and vulnerabilities to droughts and floods. As a member of the European Union and a signatory to the Paris Agreement, Czechia has committed to ambitious climate goals focused on mitigation and adaptation to combat climate change.

At the international level, national long-term priorities for sustainable development have been addressed by the Strategic Framework Czech Republic 2030 (updated 2024). The document fulfils the Czech obligations coming from the UN's Agenda 2030 and the SDGs. This is the first actualization of the framework (the first version was from 2017) that should secure the inter-sectoral coordination of policy tools. The Strategic Framework is evaluated every 3 years, using a set of indicators. Based on the evaluation reports the national sectoral policies and strategies are corrected.

At the EU level, Czechia's efforts to balance economic growth, environmental sustainability, and societal needs align with broader European objectives such as the European Green Deal and the EU's Fit for 55 targets, which include reducing net greenhouse gas (GHG) emissions by at least 55% by 2030 compared to 1990 levels. This document further explores national strategies for mitigation and adaptation that aim to implement the EU targets and commitments to the Czech legal system.

2. Strategies of Mitigation and Adaptation

Czechia has adopted a dual approach to climate protection, combining mitigation strategies to reduce GHG emissions with adaptation measures to enhance resilience to climate impacts. These efforts are defined by the State Environmental Policy (SEP 2030) that integrates international conventions, strategies, legislation as well as national sectoral strategies and legislation. The SEP 2030 represents a top-level, overarching strategic document and is implemented through other thematic strategies under the responsibility of the Ministry of the Environment (MŽP) and other ministries.

The Mid-term Evaluation of the State Environmental Policy of the Czech Republic 2030 (with a 2050 outlook) assesses the progress of policy implementation during 2020–2024. It is based on regularly updated environmental indicators, sectoral strategies, and research findings, and also highlights emerging environmental and socio-economic challenges as input for the upcoming policy update. The evaluation shows that implementation was significantly influenced by the EU Green Deal and related legislation, as well as external shocks such as the COVID-19 pandemic and the war in Ukraine, which affected the economy, energy security, and the prioritization of environmental measures. At the national level, despite the economy's continued high industrial intensity and resource demands compared to EU averages, a decoupling trend between economic growth and environmental pressures was observed, supported by technological progress and environmental policy. This has led to declining emissions and improved air quality, though the

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transition to renewable energy remains slower than in many EU states due to the Czech Republic's industrial profile. Persistent unsustainable land management continues to undermine landscape resilience and climate adaptation efforts.

Adaptation to climate change in Czechia is framed by the Strategy on Adaptation to Climate Change in the Conditions of the Czech Republic (the National Adaptation Strategy). The strategy reflects the EU Adaptation Strategy and the European Commission's White Paper on Adaptation (2009), while translating international commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement into measures tailored to Czech conditions. Its overarching goal is to reduce vulnerability and strengthen the resilience of society, the economy, and ecosystems against climate impacts by addressing key risks projected for the Czech Republic up to 2050. The implementation framework is provided by the National Action Plan on Climate Change Adaptation (NAP AZK), updated on a five-year cycle, which operationalizes the strategy by assigning responsibilities, timelines, financing sources, and links between measures and specific climate impacts.

2.1. Mitigation Strategies

Mitigation measures in Czechia aim to reduce GHG emissions by 55% by 2030 and achieve carbon neutrality by 2050. These efforts include reforming the energy sector, increasing energy efficiency, promoting renewable energy sources, and reducing emissions from transportation and industrial activities. Two main documents that define mitigation strategies of Czechia are as follows.

Climate Protection Policy (CPP) of the Czech Republic: The policy defines the main objectives and measures of climate protection at the national level to ensure the fulfilment of reducing greenhouse gas emissions in connection with the obligations arising from international agreements (Kyoto Protocol, the Paris Agreement and the European Union legislation) between 2017 and 2030. According to the draft update of CPP from the spring 2024, Czechia committed to reduce its emissions by "55% by 2030 compared to 1990" (which is equivalent to 30% compared to 2005). The updated Climate Protection Policy prepared by MŽP as an implementation plan to the National Energy and Climate Plan was withdrawn from the government agenda after ministries requested more time for comments, further delaying its approval.

The National Energy and Climate Plan (NECP): The document serves as a cornerstone document, outlining targets for achieving the mitigation goals. It contains objectives and policies in all five dimensions of the Energy Union for 2021–2030 with an outlook till 2050. Czechia is committed to meet the EU's climate-energy goals (emission decrease, increase in renewable energy, increase in energy efficiency). The NECP combines the outcomes of the National Energy Policy (NEP) and CPP.

"The Czech Republic's strategic objective is to reduce the share of fossil fuels (used without capture technology) in primary energy consumption to 50 % by 2030 and 0 % by 2050 and to completely phase out the use of coal for electricity and heat production by 2033." These targets are to be achieved via development of renewable energy sources (especially photovoltaic power plants), improved energy efficiency (e.g., decarbonization of the central heating system) and security (e.g., via reducing the import of fossil fuels from geopolitically unstable countries (Russia)

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and strengthening flexibility of transmission networks), and investments to research, development and innovation in the field of sustainable energy.

Transition from Coal

The Czech government recognizes coal as a significant source of energy and emissions, responsible for 43.1% of the country's electricity production in 2020.The decision to remove coal from the energy mix by 2033 is a cornerstone of the country's mitigation strategy. This plan involves:

- Energy Diversification: Energy security is a priority for the Czech government, and the continued diversification of energy sources is crucial in this regard. The National Action Plan for Adaptation to Climate Change (Adaptation Action Plan – AAP) highlights the development of smart grids, decentralised energy sources and the diversification of energy sources as key adaptation measures. Further development of nuclear energy is an important element of the energy strategy. The share of nuclear energy in energy production (already contributing 37% of the country's electricity in 2022) is expected to increase up to 68% by 2040. "This will be achieved through construction of new nuclear reactors and small and medium modular reactors." In the meantime, green hydrogen and natural gas imported from geopolitically stable countries are expected to be used as a transitional fuel for power plants after the coal phase out.
- Support from the Modernization Fund: The transition from coal will be financed primarily from the EU sources. The Modernization Fund financed by the EU Emissions Trading System (ETS) provides approximately €5.76 billion for Czechia (15.6% of the total resources of the Modernisation Fund) to support the replacement of coal-fired power plants with low-carbon alternatives such as renewable energy projects and advanced gas facilities.

Renewable Energy Expansion

Despite a slower adoption rate (16% of total energy consumption (TEC) in 2019), Czechia committed to increase the share of renewables to 23%, 26%, and 41% of TEC by 2030, 2040, and 2050, respectively. Key initiatives include:

- Solar and Wind Energy Development: "Czechia is in the process of revising its legal and regulatory framework for the development of renewable energy sources. Pending the approval of the draft legislation, the sector is left without appropriate operational support programmes, while investment support continues to be available." Despite its stagnation in recent years, "the development of photovoltaic power plants is on the rise. Main efforts should therefore be focused on the development of wind energy." By 2030, the government assumes the installed capacity of 10.1 GW of photovoltaic power plants and 1.5 GW of wind farms involved in the grid.
- Biomass Utilization: Biomass energy has been the key driver of the growth in renewables. Accounting for 92% share of TEC from renewables in 2021, it is being expanded through the use of agricultural and forestry residues. Strategic documents, such as the Biomass Action Plan in the Czech Republic, mention high biomass potential to replace the use of coal in the heating sector.

Energy Efficiency Programmes

"The energy intensity of the Czech economy is among the highest in the EU, mainly due to the presence of large energy-intensive industry sectors." Energy efficiency is

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a critical aspect of mitigation policies in Czechia, targeting both households and businesses:

- Boiler replacement scheme (Kotlíková dotace): Local air pollution remains a key priority of Czechia's energy and environmental policy. "At the heart of the government policy is the boiler replacement scheme in the residential sector that has been operating since 2013" under the Operational Programme Environment (OPE). The programme resulted in the replacement of over 82,000 boilers from 2015 to 2020 and realized yearly emission reductions of "3.4 kilotonnes (kt) of $PM_{2.5}$, 1.8 kt of SO_2 and 512 kt of CO_2." The original goal was to replace 100,000 boilers by 2020. The boiler replacement continues under the programme "Nová zelená úsporám."
- "Nová zelená úsporám (New Green Savings)" Programme: The most effective subsidy programme in the Czech Republic for residential buildings promotes energy savings through insulation, low-energy new constructions, efficient heating, renewable energy, and climate adaptation and mitigation measures. Over its 15-year existence, the programme has disbursed more than 106 billion CZK, improving environmental quality, reducing CO_2 emissions, saving energy, and providing social and economic benefits.
- In addition to the financial incentives, the government also uses regulatory and legal measures. The sale of high emission boilers (Class 1 and Class 2 out of a total of five classes) was banned on 1 January 2014. The sale of Class 3 boilers was banned on 1 January 2018. And finally, from 1 January 2020, only Class 5 (the lowest emission class) can be sold in Czechia. Moreover, the 2019 amendment of the Air Protection Act (No. 201/2012) prohibits the use of Class 1 and Class 2 boilers after September 2024. This legislation affects approximately 450 000 boilers in the country.
- Industrial Efficiency: Industries receive tax incentives and grants to adopt energy-efficient machinery and processes via several subsidy programmes, including Operational Programmes Technologies and Applications for Competitiveness (OPTAK) and Just Transition (OPST), and the EU's Modernization Fund.

Emissions Reduction in Industry and Transport

- Emission Trading System – EU ETS has been considered an important and efficient tool in reducing GHG emissions. As of 2019, the mitigation measures have led to a 38% reduction in GHG emissions since the 1990s and 17% reduction since 2005 (the implementation of EU ETS) in Czechia. While GHG emissions from facilities covered by EU ETS decreased by 33.7% in the period 2005–2020, emissions outside EU-ETS (i.e., especially waste management, agriculture and transport and households) decreased only by 8.4% in the same period. The International Energy Agency's (IEA) Energy Policy Review (2021) recommends to "introduce a carbon tax in sectors not covered by the EU ETS to stimulate further low-carbon investment and reduce fossil fuel consumption in Czechia." To further align with European climate legislation, Act No. 481/2024., effective as of January 1, 2025, amended the Act On Emission Allowances (No. 383/2012). The amendment significantly updates Czech ETS law by extending it to maritime transport and fuel suppliers, tightening rules on revenue use, phasing in new obligations for aviation and shipping, and ensuring full compliance with the reformed EU ETS framework.
- Transport Sector is "Off Track": According to the IEA report, energy-related CO_2 emissions decline across all sectors (electricity and heat generation by 21%,

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industry by 32%) in Czechia between 2009 and 2019, except for the transport sector (increase by 18% since 2013), due to the increasing vehicle fleet and oil consumption. Moreover, the country was not "on track to reach the target for the use of renewables in the transport sector in 2020," while 95% of the renewable energy in transport comes from biofuels. These figures have been reflected in the recent policies and subsidy programmes, in order to support low-emission transport and electric mobility:

- In the 2019 update of the National Action Plan for Clean Mobility (NAP CM), the government has set targets for electric mobility and the promotion of electric vehicles. By 2030, the government aims to have between 220,000 and 500,000 battery-only and/or plug-in hybrid vehicles in Czechia, compared to about 6,000 vehicles in 2020. This would require 35,000 charging points in 2030, while in 2020 there were about 1 000 charging points in the country.

The second update of the NAP CM (2024) provides an overview of the current development of alternative fuels and related infrastructure, with a strong focus on electromobility, hydrogen mobility, and the use of natural gas. It sets ambitious targets, such as reaching 250,000 battery electric vehicles (BEVs) by 2030 and 1,000,000 by 2035, alongside goals for hydrogen vehicles and the expansion of charging infrastructure in line with the EU Alternative Fuels Infrastructure Regulation (AFIR). The updated plan outlines six strategic priorities: scaling up the number of zero-emission vehicles, expanding charging and refuelling infrastructure, increasing biogas consumption, simplifying the regulatory framework, fostering education and awareness, and reducing the energy demand of transport by strengthening rail. Prepared in cooperation with the Ministry of Industry and Trade, Ministry of Transport, Ministry of the Environment, industry, and energy stakeholders, the plan ensures alignment with EU climate and energy legislation and contributes to the NECP.

In order to achieve these ambitious targets, the Parliament has approved the Low-emission Mobility Act (No. 360/2022) that sets the minimum share of no-/low-emission (< 50 g/km CO_2) transport vehicles (e.g., 41% and 60% of public transport vehicles by 2025 and 2030, respectively) purchased in public tenders (i.e., by municipalities, government, or public institutions). Consequently, several subsidy programmes have been opened to facilitate the purchase of low emission vehicles and development of the required infrastructure. Additionally, the new act No. 42/2025., effective from 1 March 2025, amends the Air Protection Act and other related legislation. Key changes include a new requirement for operators of new stationary air pollution sources to apply for an operating permit if they have not already done so. The law also introduces updated rules for emission allowances and fees charged for air pollution. Additionally, it adjusts conditions for vehicle operation and emissions reporting, which may impact emissions from transport and energy sectors. These amendments aim to strengthen air quality management and support the Czech Republic's environmental and climate goals.

The Strategic Framework Circular Czechia 2040 is a national strategic document that defines the goal of developing the circular economy in Czechia by the year 2040. The Strategic Framework was approved by a government decision in December 2021 and serves as a guide for promoting the circular economy in the country by 2040. It is divided into 10 priority areas, including products and design, consumption and consumers, waste management, industry, resources, construction, energy, bioeconomy and food, circular cities and infrastructure, water,

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research, innovation and development, and education and knowledge. The Action Plan Circular Czechia 2040 for the period 2022–2027 is an implementation document. The Action Plan defines in detail how strategic goals, specific goals and types of actions will be implemented, outlining a clear way to achieve them, providing justification, determining the main responsible parties (implementers), estimating their financial costs, and defining measurable indicators.

2.2. Adaptation Strategies

The main adaptation documents in Czechia include:

a. Strategy of Adaptation to Climate Change in Czechia (Adaptation Strategy – AS): First version of the document was prepared in accordance with the EU's Adaptation Strategy in 2015, an updated version was approved in 2021. In addition to the assessment of the expected impacts of climate change in key sectors, it contains proposals for specific adaptation measures for the period 2021–2030, summarizes current legislation and proposals for its amendments, and provides an overview of existing and prospective economic instruments as well as education and public awareness activities. The linkages with mitigation measures are also addressed within all sectors.

- The main climate-change-related challenges that require adaptation measures in Czechia are: prolonged droughts, heavy rainfalls and floods, increasing temperatures, heat waves, extreme windstorms, wildfires.
- The main economic sectors that are at risk of climate change impacts are: forestry, agriculture, water management, biodiversity, public health, urbanized areas, tourism, industry and energy sector, transport, cultural heritage and civil protection.

The strategy has been prepared in collaboration with more than 170 experts in the field, and material provided by the relevant national institutions (Czech Hydrometeorological Institute – CHMI, Czech Environmental Information Agency – CENIA) and by experts from the Czech Academy of Sciences (especially the Global Change Research Institute – CZECHGLOBE).

b. National Action Plan on Adaptation to Climate Change (Adaptation Action Plan – AAP): The document is an implementation document of AS. AAP elaborates the framework of measures for the years 2021–2025 set out in AS into specific tasks, to which it assigns responsibility, deadlines, relevance of measures to individual manifestations of climate change and sources of financing. AAP contains 108 adaptation measures divided into 322 specific tasks, which are assigned to the relevant ministries, and specifies deadlines for implementation, relevance of measures to individual manifestations of climate change, sources of financing and estimated costs until 2025. The development of indicators assessing Czechia's vulnerability to climate change impacts has been monitored in the Information System of Statistics and Reporting (ISSaR) by CENIA.

"The most important principles of climate change adaptation in Czechia include:

- Integrated Approach: Assessing the synergies between adaptation and mitigation measures and evaluating the suitability of proposed actions for various environmental components, the economy, and the social sphere.
- Priority Implementation of Multi-Benefit Solutions: Focusing on "win-win" solutions that offer multiple benefits with minimal risks or costs.

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- Identification of Opportunities: Recognizing opportunities associated with the adaptation process.
- Prevention of Maladaptation: Avoiding inappropriate adaptation measures that could increase vulnerability or have adverse effects.
- Knowledge Base Development: Building a robust knowledge base and providing objective information to support decision-making processes at all levels."

Climate Change Adaptation Report of the Czech Republic (2025). The most recent evaluation further underscores the urgency of adaptation. Based on data up to 2024, it concludes that climate impacts have intensified since the previous 2017 assessment, increasing risks to human health, natural capital, and the economy. A statistically significant rise in annual and seasonal temperatures has been confirmed, with more frequent hot days above 30°C, declining soil moisture, and worsening drought conditions that threaten agriculture, water management, and forestry. Drought and flooding remain the most critical hydrometeorological hazards, with additional risks linked to heatwaves, wildfires, and extreme storms. Socioeconomic vulnerability is shaped by demographic change (such as population ageing), urbanization (and related urban heat island effects), and the resilience of key sectors. Agriculture and forestry are particularly exposed, though trends show some improvements, such as the expansion of permanent grasslands and shifts toward more diverse forest species composition after the peak of the bark beetle crisis in 2020. Water management infrastructure and the Integrated Warning System have strengthened adaptive capacity, yet pressures from land use change and urban sprawl continue to reduce the landscape's resilience. The report stresses that reducing vulnerability through flexible, well-prioritized, and evidence-based adaptation measures is the most effective way to address climate risks in the short to medium term, while mitigation efforts will only manifest in the longer horizon.

The newest evaluation of the National Action Plan for Climate Change Adaptation (NAP CC) shows that out of 322 tasks, 223 (69.2%) have been completed or are being continuously implemented, 59 (18.3%) are partially fulfilled, and 40 (12.4%) remain unfulfilled. The highest levels of progress were recorded in agricultural landscapes (81% fulfilled or ongoing) and forest landscapes (82% fulfilled or ongoing, with no unfulfilled tasks). Water-related ecosystems reached 65% fulfillment, while urban areas and infrastructure lagged behind with 20% of tasks unfulfilled. The category of safe environment achieved the best results overall, with 86% of tasks fulfilled or ongoing. In contrast, cross-cutting tools and measures demonstrated weaker performance, with only 56% of tasks fulfilled or ongoing and a relatively high share of partial or unfulfilled tasks. This assessment highlights significant progress in most areas but also underlines gaps in urban infrastructure and cross-sectoral measures.

The main adaptation measures outlined by AS are as follows (based on a summary by faktaoklimatu.cz) and previous evaluation from 2019 in terms of completed tasks.

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Adaptation Measures	Completed tasks
Forestry	
Cultivating species-diverse forests that are naturally resistant to the manifestations of climate change. An important aspect is the preservation of native plant and animal species. Additionally, emphasis should be placed on nature-friendly forest management	74%
Agriculture	
A necessary condition for future agriculture is sustainable land use and the addition of organic matter. It is also important to implement measures for water retention and to prevent soil erosion. Other adaptation measures include cultivating and breeding resilient agricultural crops and utilizing current technologies and knowledge to optimize production	71%
Water Management	
Adaptation measures focus on retaining water in the landscape, promoting the infiltration of rainwater, reducing potable water consumption, and landscape planning focused on prevention of droughts and floods. Water retention in the landscape should be supported by revitalizing watercourses and existing aquatic biotopes, as well as creating new biotopes such as ponds, oxbow lakes, and other nature-friendly small water reservoirs. Measures to promote infiltration include establishing permeable surfaces in urban areas. An important aspect of a better water management is the separation of rainwater from sewage systems for later use	67%
Biodiversity and Ecosystem Services	
Improved long-term planning, to preserve native species and ecosystems. It is essential to limit landscape interventions that fragment ecosystems and to reconnect those previously divided by human activities. Adaptation efforts should also focus on curbing activities that favour invasive species and conducting regular monitoring of these species	55%
Public Health	
AS emphasize preventing infectious and non-infectious diseases, ensuring adequate healthcare infrastructure, and informing the public about risks and preventive measures	33%
Tourism	
Adaptation measures emphasize educating all participants in the tourism sector. Each stakeholder should be encouraged to consider the consequences of their actions	66%
Transport	
Research into new technologies should aim at enhancing the resilience of infrastructure to temperature fluctuations, torrential rains, frost, high temperatures, and similar challenges. Air conditioning systems in urban public transport vehicles should be optimized in anticipation of projected temperature changes	62%
Industry and Energy	

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Adaptation Measures	Completed tasks
Adapting industry and energy sectors involves ensuring sufficient electricity production for critical state infrastructure, even during extreme weather events. This may include securing adequate reserves and alternative suppliers of imported fuels for electricity and heat generation and maintaining the functionality of the transmission network despite potential failures of individual components. Additionally, optimizing manufacturing processes, particularly concerning water consumption, is essential	89%
Emergency Events and Civil Protection	
AS aims supporting and developing early warning systems for emergency events. The priority should be to establish appropriate crisis scenarios to protect both the population and the environment	80%
Urban Resilience	
Construction and renovation of energy-efficient buildings; improved rainwater management, which includes creating more green areas for water infiltration, separating rainwater from sewage systems, and preventing contamination	58%

Urban areas face unique climate challenges, including urban heat islands and stormwater management issues. By 2022, 57 municipalities counting 3,4 million inhabitants (34% of Czech residents) drafted their adaptation strategies to climate change. Prague, the capital city (and a stand-alone NUTS 3 region), hosting about 1.6 million residents and daily commuters, has been a pioneer of climate mitigation and adaptation strategies among the cities. The main climate policy documents of the City of Prague include:

Prague Strategic Plan

The plan sets a vision for Prague in 2030 with the first pillar "Comprehensive and Health City" that focus on:

- Cohesive City – Prague aims to be an open and socially cohesive city, enhancing the quality of life for all residents. Beyond economic considerations, the city will actively support conditions that enable the elderly and those with health or social disadvantages to remain active in both work and life for as long as possible.
- City of Short Distances – the aim is to increase the quality of life and stop the decline in the number of green areas via prioritizing the city's intensive development in transformation areas over extensive development and further expansion into undeveloped zones.
- Healthy City – the city aims to create a hierarchical structure of green spaces, support its connectivity; prioritize the nature-based water management activities; pooling the technical infrastructure to support the greening of the city; set the index of the greenery per inhabitant; implement sustainable drainage management with infiltration measures; implement new tree species suitable for city conditions, implement agro-technological measures on the agronomic areas, support renewable energy sources and low and zero-emission heat sources.
- Sustainable Mobility – the city will support public transport, electromobility, bicycle transport, walking, park-ride zones, rail transport etc. The aim of the city

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is to "increase the share of public, pedestrian and bicycle transport above 70% by 2030."

Climate Plan of the City of Prague 2030

The document specifies the default state of the city's carbon footprint and indicates the carbon budget for 2030–2050 and how to reach it. The main goals of the document:

- Sustainable Energy and Buildings – new heat producers using renewable energy, renovation of buildings owned by the city, community energy, and modern street lighting system will "reduce the CO_2 emissions from electricity and heating by 60%."
- Sustainable Mobility – support effectiveness and capacity of public transport, increase attractivity and prepare infrastructure for non-motorized transport, decrease automobile transport, support non- and low emission vehicles, and sustainable air transport. The aim is to "reduce the use of fossil fuels by 25% compared to 2010."
- Circular Economy – the main goal, by 2030, is to "reduce the amount of produced municipal waste by half and increase its recycling to 65%, compared to 27% in 2019."
- Heat Adaptation – the plan introduces 10 specific measures with the aim to improve the quality of life in the city via improvement of microclimatic conditions in the city, increased share of greenery, decreased share of impervious surface, implementation of a sustainable drainage system, enhanced adaptation of buildings and public spaces, and improvements of the risk management.

Climate Change Adaptation Strategy of the Capital City of Prague

Introduced in 2015, the strategy focuses on reducing the negative impacts of climate change via using nature-based solutions to preserve water, soil and biological components of the landscape and to preserve and restore ecosystems resistant to climate change and contributing to disaster prevention. Where inappropriate, technical (so-called grey) and soft measures (e.g., early warning systems, information campaigns) are proposed.

The main adaptation measures related to the impacts of climate changes in the city focus on:

- Increased impacts of heat waves, urban heat island and temperatures increase
- Increased impacts of flash floods, river flooding, long-term drought
- Decreased energy consumption and building adaptation
- Improved crisis management and civil protection
- Support of sustainable mobility
- Facilitation of environmental education.

The Strategy is followed by the Implementation Plan of the Climate Change Adaptation Strategy 2020–2024, in which individual measures and their implementation are elaborated in more detail, including the determination of competencies and responsibilities for individual activities and their time frames. An update of the Implementation Plan for years 2025–2029 was approved by the City Council in December 2024 and introduced several key changes compared to the 2020–2024 plan: a simplified structure and shorter length, a focus on selected priority objectives of the Adaptation Strategy, the definition of 25 measures to be

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implemented over five years, and the exclusion of objectives already covered by other approved climate documents of Prague (e.g., transport, energy). It also incorporates the 10 adaptation measures from Prague's Climate Plan 2030, approved in 2021. Further innovations include the creation of a new database of adaptation projects, an emphasis on evaluating the quality of submitted projects by city districts and organizations, and a stronger focus on communication and awareness-raising about adaptation to climate change, including planning, financing, implementation, and maintenance of effective adaptation measures in Prague.

A document for a specific adaptation measure was developed: The Standard for the Planning, Planting, and Maintenance of Street Tree Alleys in Prague defines essential principles for ensuring high-quality urban greenery as a key component of blue-green infrastructure and climate change adaptation. It emphasizes the creation of interconnected tree systems that enhance urban resilience, improve liveability, and function independently without additional energy input. Developed by an interdisciplinary working group, the standard builds on an analysis of existing tree alleys and is presented in two forms: a comprehensive document with in-depth justification and a technical version outlining practical requirements for city authorities, managers, and designers. Serving as a reference for harmonizing municipal policies and regulations, the standard represents best practice, subject to regular review and updates to reflect climate change impacts, new technologies, and legislative developments. Its effective implementation requires a city-level plan with clear indicators and oversight by an independent expert body.

Cultural heritage in Czechia

Energy-efficient renovations of architecturally and historically valuable buildings (2025) addresses the growing demand from owners of architecturally and historically valuable buildings seeking energy-efficient renovations while preserving cultural heritage. It provides guidance on balancing multiple public interests – climate protection, conservation of architectural and cultural values, energy security, and the economic sustainability of property operation. The proposed energy-saving measures respect both heritage preservation principles and building physics, aiming to maintain indoor environmental quality and as much architectural character as possible. The guide summarizes legal requirements related to energy reduction and heritage protection, outlines comprehensive building energy concepts, and presents successful case studies where historical appearance was restored while significantly cutting energy demand through modern materials and techniques.

The memorandum was signed (2025): The national initiative "Putování za kořeny" (Journeying through the roots) connects cultural and natural heritage with sustainable rural development. It aims to establish a network of pilgrimage routes that pass through historical and naturally significant areas, placing emphasis on supporting local farmers, agritourism, nature conservation, and public education. The project promotes more sustainable forms of tourism outside heavily crowded destinations and involves local communities and entrepreneurs. It received the support from the Ministry of Agriculture and the Environment, the Private Agriculture Association, and the Spolek pro obonu venkova.

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Funding

Funding sources for the adaptation measures in Czechia are largely provided through the EU and national grant programmes, such as:

- Podpora obnovy přirozených funkcí krajiny (Support for the Restoration of the Natural Functions of the Landscape) – for adaptation of water, forest and other ecosystems.
- Program péče o krajinu (Landscape Care Programme) – supports non-profit adaptation measures focused on the protection and improvement of biodiversity.
- Program prevence před povodněmi (Flood Prevention Programme) – subsidy programme for national water and forest management companies, and municipalities for flood prevention measures.
- Operational Program Environment (OPE) – EU-funded programme for mitigation and adaptation projects in various sectors.

A list of all relevant grant programmes is available on the websites of the Agency for Nature Conservation and Landscape Protection of Czechia (AOPK), the State Environmental Fund (SFŽP), and DotaceEU.cz.

3. Governance Framework

The governance framework for climate policies in Czechia is multi-tiered, involving national, regional, and local levels. Collaboration with the EU institutions further strengthens these efforts.

3.1. National Governance

The central government plays a critical role. The key actors responsible for adaptation and mitigation policies are:

- Ministry of the Environment (Ministerstvo životního prostředí – MŽP): Oversees the development and implementation of climate policies, including NECP and AS.
- State Environmental Fund (Státní fond životního prostředí – SFŽP): Is the main funding agency that administers financial mechanisms like the Modernization Fund, operational programmes funded by the EU (e.g., Operational Programme Environment) and national subsidy programmes to support climate initiatives.
- Ministry of Industry and Trade (Ministerstvo průmyslu a obchodu – MPO): Oversees the development of climate energy policies and implementation of mitigation strategies via OPTAK.
- Coal Commission: The Coal Commission was established on July 30, 2019 as an advisory body of the Government. The chairpersons of the commission are the Minister of Industry and Trade (MPO) and the Minister of the Environment (MŽP). The commission has a total of 19 members, including the two commission chairpersons and other 17 commission members. The main goal of the commission is to provide the Government of Czechia with objective and, to the maximum extent possible, consensus outputs regarding the future phase out of brown coal in Czechia, including all related aspects.

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3.2. Regional and Local Governance

Regional and municipal governments translate national policies into local actions. For instance:

- Prague's Climate Plan 2030 – Focuses on renewable energy integration, energy-efficient public transport, and urban greenery. Compared to 2010, the plan aims to reduce emissions by 45% and increase the use of renewable energy and heat production by 470% in 2030.
- Regional Adaptation/Transition Plans – Not all the 14 NUTS 3 regions have adopted their own climate plans and adaptation strategies. However, most regions have adopted other strategic documents that also include adaptation and mitigation strategies. For example, an important policy in the mitigation and policy of Czechia is the Regional Just Transition Plan of Czechia, a key framework for implementation of the EU's Just Transition Fund. Its aim is to support the three most disadvantaged regions in the country – Karlovy Vary Region, Ústí and Labem Region, Moravian-Silesian Region – that are expected to be most negatively impacted by national mitigation policies and the coal phase out. The affected regions have adopted their local-specific just transition plans (e.g., the Regional Just Transition Plan for Karlovy Vary region approved in 2021).

Local Adaptation Plans: The number of municipalities that have implemented local-specific adaptation strategies has been increasing. In 2022, 57 municipalities counting 3,4 million inhabitants (34% of Czech residents) introduced their adaptation strategies.

There are supporting publications and organizations for creating adaptation strategies.

The figure below highlights the share of municipalities with extended powers (ORPs) that have a climate change adaptation strategy in the individual regions of the Czech Republic, indicating the changes compared to 2022.

Currently, seven regions in the Czech Republic have no adaptation strategy developed (one of them has a strategy under preparation) and 101 municipalities with extended powers (ORPs; four of them plan to start the preparation of a strategy).

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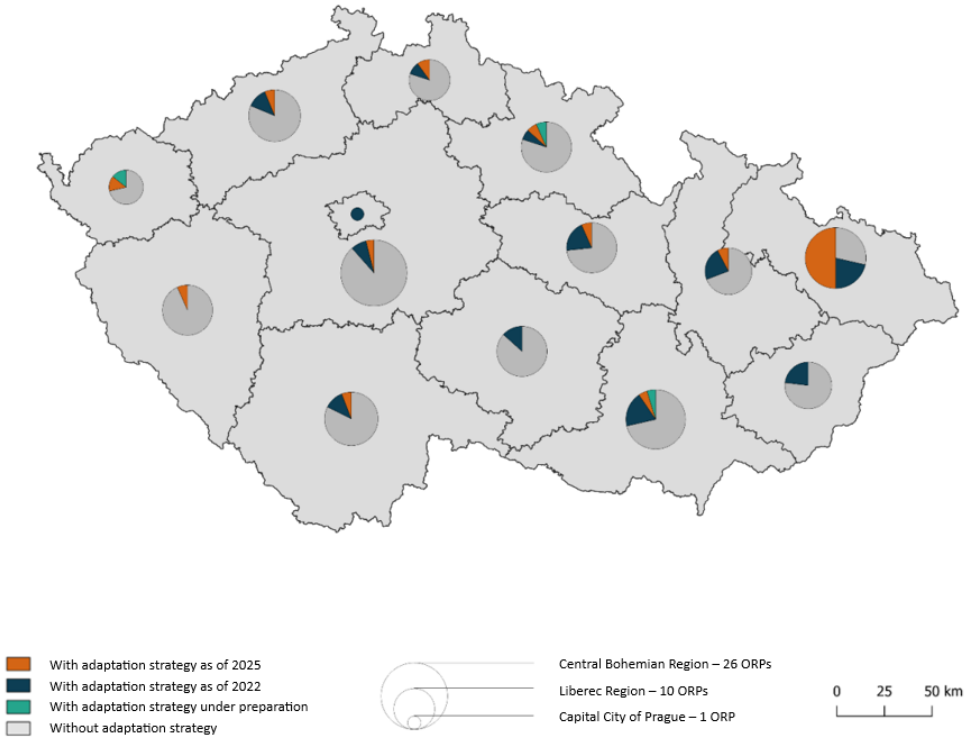

Figure 1 – Share of municipalities with extended powers (ORPs) having a climate change adaptation strategy

Source: Asitis s.r.o., based on questionnaires and information available on regional and ORP websites, 2025.

3.3. International Collaboration

Czechia's alignment with the EU directives ensures its climate policies contribute to broader regional goals. The national climate strategy has been driven mainly by:

- Participation in the European Green Deal
- Compliance with the EU Fit for 55 package.

Czechia has also adopted the United Nations' Agenda 2030 for sustainable development, implemented by the Strategic Framework Czech Republic 2030 (The Czech Republic 2030).

3.4. Dynamic Aspects of Strategies

Climate policies have evolved from basic environmental protections in the 1990s to comprehensive climate action plans today (see Table 1 at the end of the annex). Key mechanisms of monitoring systems include:

- Czech Hydrometeorological Institute (CHMI): Collects and monitors data on GHG emissions, air quality, and climate impacts and provides recommendations for policy adjustments.
- Czech Environmental Information Agency (CENIA): Collects and monitors data about the state of the environment, including selected indicators of the National Adaptation Strategy by the ENVIROMETR system and the Waste Management Monitoring System.
- Supreme Audit Office (Nejvyšší kontrolní úřad – NKÚ): NKÚ is the supreme audit institution in the country with the mission to review the state's management of

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public revenue and expenditure, including effective use of resources for climate mitigation and adaptation policies.

- EU Reporting Requirements: Regular reports to the European Commission ensure transparency of the subsidy policies and alignment with EU standards.

4. Effectiveness of Strategies

Evaluation of the effectiveness of climate policies and mitigation strategies has been based mainly on the Evaluation of the Climate Protection Policy of Czechia (2021), The Czech Republic 2021: Energy Policy Review (2021), and the Update of National Energy and Climate Plan (2024).

4.1. Achievements in Climate Policies and Adaptation Strategies

Emission Reductions

Czechia has demonstrated significant progress in emission reductions, achieving its 2020 targets largely through the implementation of the EU Emissions Trading System (EU ETS). This regulatory framework incentivized shifts away from coal toward cleaner energy sources. "Greenhouse gas emissions from EU ETS facilities have seen a 33.7% reduction since 2005," highlighting the efficacy of this mechanism. These reductions reflect a broader trend of improving carbon efficiency within energy-intensive sectors.

Renewable Energy Development

Renewable energy has been an important part of Czechia's climate strategy, with the share of renewable energy in gross total energy consumption (TEC) reaching 17% in 2021 – an increase by 71% since 2009. Progress has been done particularly due to bioenergy and solar photovoltaic initiatives. These gains position the country for future advancements, with a goal of achieving 23% of TEC and 31% of renewable electricity production by 2030. The government's support for distributed generation and community energy projects has also facilitated local-level participation in the energy transition. President Petr Pavel has signed a new law that aims to speed up the utilization of renewable energy sources in Czechia. The law introduces the concepts of "acceleration zones," where authorities will approve renewable energy projects in a simplified manner, without the need for impact assessments. The aim is to reduce administrative burden for investors and increase the availability of clean energy for businesses and households. The law also introduces a fee for wind energy producers, which will vary depending on the amount of electricity produced and will be collected by municipalities. The rate of the fee and the fee multiplier are fixed by the law.

Energy Efficiency

Energy efficiency improvements have been demonstrated by a "15% reduction in the carbon intensity of the energy mix and a 20% decline in the energy intensity of the Czech economy between 2009 and 2019." Programmes targeting the renovation of buildings have streamlined processes, enabling widespread energy savings across residential and industrial sectors. These efforts not only reduce energy demand, but also alleviate pressure on the power grid, creating a more resilient energy system.

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Coal Phase-Out Strategy

Czechia has set a goal to phase out coal by 2033. This strategy will be supported by investments in alternative energy sources, including natural gas, nuclear power, and renewables. A Regional Just Transition Plan (RJTP) has been introduced by the Ministry of Regional Development to solve the negative impacts of the coal phase out in the three most affected regions of Czechia. The RJTP implements EU's Just Transition fund via the Czech Operational Programme Just Transition (OPST). In total, €1.64 billion (additional to resources from the Modernization Fund) has been allocated to the three regions between 2021 and 2029.

On May 28, 2025, the European Commission published its assessment of Czechia's updated National Energy and Climate Plan (NECP), submitted in December 2024. The Commission highlighted that the Czech target for renewable energy – 30.1% by 2030 – falls short of the EU's collective goal and ignores recommendations to increase ambition to at least 33%. It also noted a lack of concrete measures to accelerate renewable deployment, phase out fossil fuel subsidies, reduce gas consumption, or support energy communities and clean heating. Furthermore, the plan omits details on financing the green transition, raising uncertainty about mobilizing necessary private investments. The Commission recommended stronger measures to boost renewables, energy efficiency in industry and transport, and a clear strategy to tackle energy poverty.

Adaptation Frameworks

Czechia's Adaptation Strategy (AS) and Adaptation Action Plan (AAP) have been pivotal strategic documents in addressing climate risks. Adaptation measures such as enhanced flood protection infrastructure, reforestation programs, and sustainable water management practices have become a priority after the extremely dry period in 2015–2019.

Public Awareness and Monitoring

Efforts to enhance climate data collection and forecasting systems have improved the public ability to plan and respond to climate challenges. Collaboration between government agencies, local stakeholders, and academic institutions has raised public awareness about climate issues, fostering greater community engagement in adaptation initiatives.

The Czech government has approved a new State Environmental Education Program for 2026–2035 to strengthen public and student engagement with nature protection. Building on 35 years of experience, the program sets a vision, indicators, and measures for the next decade, focusing on just transition, circular economy, biodiversity, climate security, and green skills. According to Environment Minister Petr Hladík, environmental education is crucial for developing responsibility toward the environment in everyday life and for future generations. The program continues to support eco-centers, schools, and community initiatives, with the goal of involving at least half of Czech schools in long-term environmental education or "green school" accreditation systems.

4.2. Challenges in Climate Policies and Adaptation Strategies

Insufficient mitigation efforts

Despite significant reduction of CO_2 emissions since the 1990s and meeting the recent targets, "achieving the objectives of the Climate Protection Policy (CPP) for 2030 is dependent on implementing additional mitigation measures." Moreover,

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the carbon intensity of Czechia has been above-average among the IEA countries as coal is still the largest electricity and heat generation source in Czechia.

Based on the Evaluation Report of CPP from 2021, "current policies and measures are projected to fall short by approximately 2.5% in 2030." While significant progress was made between 2005 and 2015 in reduction of industrial emissions, the overall emissions have remained relatively stable since then, mainly due to considerably dry period between 2015 and 2019 that caused increased emissions of CO_2 related to land use, land-use change and forestry (Czech forests remain in poor condition after this dry period). Moreover, "the current trajectory of emission reduction is insufficient to meet the indicative reduction target of 80% by 2050 compared to 1990 levels. Czechia also lacks comprehensive scenarios that would facilitate the attainment of climate neutrality."

Insufficient Renewable Energy Targets

Czechia's renewable energy targets for 2030 could be more ambitious as they fall below the EU average (22% energy consumption from renewables in Czechia by 2030 and EU-wide target of 32%). Additionally, the country is not on track to reach targets for the transport sector. For 2030, Czechia has committed to a 14% share of renewables in transport which is the EU minimum target. Strengthening ambition and addressing barriers to renewable energy deployment will be essential to enhancing alignment with EU objectives.

Energy Security and Dependency

The transition from coal and reliance on Russian gas has underscored the urgency of diversifying energy sources. Despite actions that reduced the dependency of Czechia on the Russian gas supplies after the outbreak of the war in 2022, the share of Russian natural gas on the Czech market was 95% in the last two months of 2024.

Delayed Implementation of Adaptation Strategies

Although the Czech Ministry of Environment's Evaluation Report of the Climate Protection Policy (CPP) considered the implementation of CPP as successful with 73% of measures being "fulfilled" and 22% being "partly fulfilled," an independent report by a consortium of Czech NGOs (Centrum pro dopravu a energetiku and Klimatická koalice), concluded that only 13% (17% based on the EU methodology) of EU's financial resources were used on measures with "clear climate benefits" between 2014-2020 (compared to an EU's target set to 20%).

Below are listed the main socioeconomic barriers that hinder and/or delay implementation of adaptation measures as named by the Supreme Audit Office reports and the Action Plan the Interreg project ADAPTRegion AT-CZ to remove barriers of adaptation measures in boundary regions:

- Limited Knowledge and Engagement: Public understanding and support for climate change related measures and policies remain generally low in Czechia, which lowers the demand for adaptation measures at the local level as well as prioritization of climate-related topics at the national level. Many residents, regional and local policy and decision makers, city planners, as well as local stakeholders are unaware of the specific climate risks facing their communities, such as increased flooding, prolonged droughts, and heat waves, nor effective technological measures to mitigate these impacts. Bridging this gap requires targeted education and outreach campaigns to raise awareness of climate change impacts as well as examples of good practice.

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- Fragmented Governance: Poor coordination between ministries, regional authorities, and municipalities, as well as between public (stakeholders) and local governments, often leads to inefficiencies and inconsistencies in adaptation efforts.
- Limited Financial and Human Resources: Especially in small municipalities, the implementation of adaptation projects is significantly hindered by the lack of specialized staff and limited financial resources, which together obstruct the adoption and implementation of measures addressing climate change.
- Low Motivation of Investors: Among the main technical barriers that limit the motivation of private sector (local businesses, land and building owners, etc.) to implement effective adaptation measures belong:
    - uncertain/slow economic return,
    - lack of well-designed grant programmes,
    - extremely lengthy approval processes due to property disputes, administrative errors, and lengthy negotiations with the relevant state authorities (due to cultural heritage protection, agricultural land preservation, road safety, etc.),
    - large administrative burden related to the granted projects.
- Legislative Barriers: Adaptation strategies and measures are neither legislatively nor substantively reflected in the legal framework – especially the "Building Act" (283/2021) governing urban planning and building regulations. For example, blue-green infrastructure is not legally defined in the Building Act. Similarly, investors in road, railway, or residential building projects have been exempt from the obligation to pay the fee for discharging wastewater into the sewer system, thus they are not motivated to invest in rainwater retention, accumulation, or infiltration systems. Consequently, technical standards mostly do not address blue-green infrastructure, which further fosters doubts and a negative perception of adaptation measures by investors.

Climate law

The absence of a national climate law in the Czech Republic poses a major obstacle to building an effective and long-term stable climate policy. Unlike the EU, which through the European Climate Law establishes a binding framework for emission reduction and climate adaptation, Czech legislation lacks a comprehensive act that would integrate different sectors and set clear legal targets. As a result, policies remain fragmented, dependent on short-term government priorities, and provide less legal certainty for investors, businesses, and public institutions. This complicates the preparation and financing of long-term projects in adaptation and mitigation and increases the risk that the Czech Republic will fail to meet its European commitments. The lack of a climate law also weakens the country's negotiating position at the EU level, slows down innovation, and reduces the predictability of the regulatory environment needed for the transition of the economy towards sustainability.

Climate lawsuit

The climate lawsuit, filed by Frank Bold Lawyers in April 2021, accused the Czech Government and ministries of failing to ensure sufficient mitigation and adaptation to climate change. In June 2022, the Prague Municipal Court ruled partly in favor of the plaintiffs, ordering ministries to adopt a more ambitious climate target of a 55% emissions reduction by 2030, but dismissed claims on adaptation. The ministries

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refused to act despite the judgment being legally binding and appealed to the Supreme Administrative Court (SAC).

In February 2023, the SAC annulled the decision, and the Municipal Court subsequently dismissed the lawsuit in October 2023. The SAC definitively rejected the case in November 2024, ignoring a recent European Court of Human Rights ruling. Believing that government inaction violates fundamental rights, the plaintiffs submitted a constitutional complaint in February 2025, which remains pending.

Recent election

In the recent parliamentary elections in the Czech Republic, Andrej Babiš's ANO movement secured a strong position, reflecting a shift in voter preferences toward economic issues and a growing scepticism toward ambitious environmental agendas. Among the non-governing parties, the Green Party and the Czech Pirate Party emphasized the green transition, renewable energy, biodiversity protection, and sustainable land use as key priorities. In contrast, the newly established party Motoristé sobě, led by Petr Macinka, based its campaign on opposition to the ban on combustion engines and on criticism of existing climate policies, representing a populist backlash against the green transition.

With the party now expected to join the new governing coalition, and taking over the position of Minister of the Environment, there are increasing concerns that Czech environmental policy may be substantially weakened. The party's agenda stands in clear contradiction to the State Environmental Policy of the Czech Republic 2030, which outlines national commitments to climate neutrality and the circular economy. The composition and policy orientation of the upcoming government will therefore be decisive in determining whether the country maintains its trajectory toward climate responsibility or retreats from previously established commitments.

5. The main dynamic aspects of the strategies

The IEA Review Report suggests the following key recommendations in terms of mitigation.

"The government of Czechia should:

- *Anticipate a faster phase-out of coal than is currently envisaged and prepare to accelerate additional deployments of renewable and nuclear power plants*
- *Together with stakeholders, assess the full economic potential of all available forms of renewable energies and develop road maps to fully exploit them*
- *Place energy efficiency at the centre of energy policy making. Create a dedicated body for the implementation of the energy efficiency policy measures*
- *Introduce a carbon tax gradually in sectors not covered by the EU ETS to stimulate low-carbon investment and reduce fossil fuel consumption by stronger price signals, while increasing public acceptance by channelling back revenues to consumers."*

In terms of adaptation policies, the team of the ADAPTRegion AT-CZ project provided a list of recommendations for effective implementation of adaptation measures in regions. The main recommendations are as follows:

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- Strengthen the capacity of municipalities to address climate change adaptation, support systematic education for officials, designers, managers of the adaptation projects.
- Create national and regional agencies that will provide municipalities with advisory services in the preparation of investment projects with high potential for adaptation to the impacts of climate change.
- Create subsidy programmes that will motivate local companies and individual property owners for new technological solutions on their buildings and infrastructure.
- Amend the definition of blue-green infrastructure in the Building Act, expand the responsibilities of urban planning, and revise the definitions of city plans.
- Eliminate the exemption from fees for discharging rainwater into public sewers for road construction and residential buildings.
- Introduce a system of financial compensation, discounts, or incentives for investors implementing blue-green infrastructure for rainwater retention (e.g., green roofs) or utilization (e.g., rainwater for flushing).
- Consider (by law) "adaptation strategy" documents a standardized and binding basis for the preparation of urban planning documents.

Table 1: Main Environmental and Climate Protection Policies in Czechia Since 1990s

Year	Policy/Legislation	Objective
1992	Environment Act No. 17/1992	Establishes basic principles of environmental protection and sustainable development.
1995	State Environmental Policy (SEP) – First Edition	Broad strategy focusing on pollution reduction, biodiversity conservation, and sustainable development.
1992	Environmental Impact Assessment (EIA) Act No. 244/1992	Introduced mandatory EIAs for projects with potential environmental impacts.
2004	State Environmental Policy 2004–2010	Updated policy focusing on compliance with EU environmental standards.
2004	National Programme to Abate the Climate Change Impacts	First national-level strategy addressing climate change mitigation.
2004	Greenhouse Gas Emission Allowance Trading Act No. 695/2004	Established a national emissions trading scheme in alignment with the EU ETS.
2002	Air Protection Act No. 86/2002	Provided measures to reduce air pollution and align with EU directives.
2010	National Renewable Energy Action Plan	Increase the share of renewable energy to meet EU targets.
2015	Strategy on Adaptation to Climate Change	Address climate impacts through sectoral adaptation strategies.
2017	Climate Protection Policy of Czechia	Set national goals for greenhouse gas reduction and low-emission economic transition.
2017	National Action Plan on Adaptation to Climate Change	Implementation measures for the 2015 Adaptation Strategy.
2012	Updated State Environmental Policy 2012–2020	Focus on biodiversity, sustainable resource use, and reducing environmental risks.

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Year	Policy/Legislation	Objective
2019	National Energy and Climate Plan (NECP)	Set 2030 targets for renewables, energy efficiency, and emission reduction.
2021	Updated State Environmental Policy 2030	Align with the European Green Deal to achieve carbon neutrality by 2050.
2022	Low-emission Mobility Act No. 360/2022	Sets the share of low-emission transport vehicles by 2030
2024	Updated National Energy and Climate Plan (NECP)	Set 2030 targets for renewables, energy efficiency, and emission reduction with a 2050 perspective.
2024	Updated Strategic Framework Czech Republic 2030	Ensures coherent, inter-sectoral coordination of national policies
2024	Emission Allowences Act No. 481/2024	Aligns reformed EU ETS by extending its scope and strengthening compliance requirements across key sectors
2024	Updated the National Action Plan for Clean Mobility	Aligns Czech transport policy and targets with EU climate and energy goals
2025	Air Protection Act No. 42/2025	Strengthens air quality management and aligns Czech legislation with climate goals
2025	Strategic Framework Circular Czechia 2040	Outlines the national vision for developing a circular economy

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ANNEX B4 – CLIMATE POLICIES IN DENMARK

1. Introduction

Denmark has a strong foundation for addressing climate change, with extensive experience in both mitigation and adaptation. The country is a leader in renewable energy and energy efficiency, and its mitigation plans focus on accelerating the transition to a low-carbon society through innovation and technological advancements.

On the other hand, Denmark has a long history of managing water resources and protecting its coastline, which informs climate adaptation planning. Previous assessments and strategies have identified key climate risks and vulnerabilities, which are key components in adaptation plans now. The mapping of climate risks and adaptation plans is by law solely the responsibility of the municipalities in Denmark, and there are no formal reporting requirements to the government. All municipalities however have voluntarily signed up to reporting requirements and policy ambitions set up by the C40 Covenant of Mayors. In addition to the C40 reporting (C40 Cities Climate Leadership Group, 2020) that municipalities are responding to, the EU water framework Directive also is a mandatory legal framework for addressing risks in inland and coastal water systems, and to develop response strategies. The Danish Coastal Authority (DCA) is administrating this legal framework and has recently appointed 53 municipalities that have mandatory reporting requirements.

2. Strategies of mitigation and adaptation

Previous climate strategies and plans have laid the foundation for the current plan, which builds on Denmark's successes and lessons learned. Denmark's Climate Act (Klimaloven) aims to accelerate the transition to a low-carbon society by leveraging existing knowledge and expertise while fostering innovation and technological advancements (mitigation); while Climate Adaptation Plan 1 (adaptation) should enhance Denmark's resilience to the impacts of climate change, minimizing risks and damages while maximizing opportunities for adaptation. DK2020, a nationwide commitment to climate action is the overarching national plan for climate action in Denmark, encompassing both mitigation and adaptation efforts

2.1 Objectives of the climate policies

a. Klimaloven

Overall Objective: The overarching goal is to achieve a 70% reduction in greenhouse gas emissions by 2030 compared to 1990 levels, paving the way for climate neutrality by 2050. This ambitious target sets the tone for the entire plan, driving action across all sectors and inspiring innovation and collaboration.

Sector-Specific Objectives.

- Energy: The energy sector is central to the Plan, with objectives focused on increasing the share of renewable energy in gross final energy consumption, phasing out coal-fired power plants, and improving energy efficiency in buildings and industry. This multifaceted approach aims to transform the

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energy landscape, ensuring a cleaner, more sustainable energy supply for Denmark. Klimaloven mandates a phase-out of coal by 2030, promotes the expansion of renewable energy sources, energy saving and consumer behaviour. This implicitly sets targets for the energy sector to decarbonize and increase the share of renewables in the energy mix.

- Transportation: Recognizing the significant contribution of transportation to emissions, the plan aims to reduce national emissions from road transport, shipping, and aviation. This will be achieved through a combination of electrification, biofuels, and other innovative measures, promoting cleaner and more sustainable modes of transportation. Klimaloven emphasizes the need to reduce emissions from the transport sector, which implies setting targets for electric vehicle adoption, promoting public transportation, and improving fuel efficiency standards.
- Agriculture: Klimaloven acknowledges the need to reduce emissions from agriculture. Measures include improving manure management, optimizing fertilizer use, and promoting sustainable farming practices, ensuring that agriculture contributes to a climate-friendly future. These actions contribute to mitigation efforts and may also have adaptation benefits. A new deal has been made in Nov 2024 for a CO2 levy on livestock.
- Industry: The plan acknowledges the need for industrial transformation, aiming to reduce emissions from industrial processes through energy efficiency improvements, CO2 taxation, circular economy initiatives, and the development of new technologies. This sector-specific approach ensures that industry remains competitive while contributing to national emission reduction targets.

The table below provides an overview of the various targets and obligations in the Danish climate policies. The targets, relevant for the Danish climate policies, originate partly in decisions on specific national ambitions and partly in the Danish obligations to comply with a set of international agreements in the energy field within the EU and the UN.

Table 1 – Targets and obligations in the Danish climate policies

Framework	Area	Obligation/target
Government platform 2015	Phase-out of fossil fuels	Denmark is to be climate neutral by 2050
Danish climate law 2020	Low emission society by 2050	Target is not specified
EU: 2020 targets	Greenhouse gas emissions from buildings, agriculture and transportation	To be reduced by 20 % between 2005 and 2020
	Fraction of renewable energy in total energy consumption	30 % by 2020
	Fraction of renewable energy in the transport sector	10 % by 2020
EU: 2030-targets	The total emissions from the EU are to be reduced by 40 % between 1990 and 2030. This includes the following targets for the EU as a whole:	The emission reduction targe ts for the EU as a whole are to be implemented as national reduction obligations for buildings, agriculture and transportation.

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Framework	Area	Obligation/target
	• 43 % reductions from large emitters such as power plants and the oil and gas sectors. • 30 % reductions of emissions from buildings, agriculture and transportation. • At least 27 % renewable energy in total energy consumption by 2030. • At least 27 % increase in energy efficiency by 2030.	The Danish reduction obligations have not yet been negotiated.

Source: Taken from the Danish Energy Agency. (n.d.).

The statutory foundation for Klimaloven was strengthened in 2020 by establishing binding Guiding Principles for climate policy. These principles ensure that non-climate factors, such as cost-effectiveness, competitiveness, employment, cohesion, social balance, and sound public finances, are all integrated into political decisions. This broadened mandate positions the Danish Council on Climate Change (DCCC) as an objective, systemic, and independent advisor for monitoring and guiding the nation's efforts to meet both national targets and international climate obligations

b. Climate Adaptation Plan 1

Overall Objective: The overarching goal is to enhance Denmark's resilience to the impacts of climate change, minimizing risks and damages while maximizing opportunities for adaptation. This broad objective sets the stage for a comprehensive and proactive approach to adaptation, ensuring that Denmark is prepared for the challenges and opportunities of a changing climate.

Specific Objectives.

- Coastal Protection: Protect coastal communities and infrastructure from sea-level rise, storm surges, and erosion through a combination of structural measures (e.g., dikes, seawalls) and nature-based solutions (e.g., dune reinforcement, salt marsh restoration).
- Water Management: Ensure water availability for human consumption, agriculture, and industry while managing flood risks from increased precipitation and extreme weather events. This includes measures to improve water storage, drainage, and flood protection infrastructure. This emphasizes water management as a key component of the adaptation plan, with measures to improve water storage, drainage, and flood protection infrastructure. This directly addresses climate risks and vulnerabilities related to water resources, enhancing adaptation.
- Urban Adaptation: Enhance the resilience of urban areas to heat waves, flooding, and other climate impacts through green infrastructure, sustainable urban planning, and climate-proofing of buildings and infrastructure. This can be interpreted as a policy related to green building, as energy efficiency is a key aspect of green building practices.
- Infrastructure Resilience: Adapt critical infrastructure, such as transportation networks, energy systems, and communication systems, to withstand extreme weather events and changing climate conditions.

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- Ecosystem Resilience: Protect and enhance the resilience of natural ecosystems to climate change, ensuring their continued provision of essential services, such as carbon sequestration, water purification, and biodiversity conservation. This implicitly addresses biodiversity as a key component of ecosystem resilience. Preserving biodiversity aids both adaptation (by maintaining healthy ecosystems that can better withstand climate impacts) and mitigation (by safeguarding carbon sinks and natural processes that regulate greenhouse gases). This implies a strong foundation for environmental conservation in Denmark, reflected in its long history of environmental awareness and action. This supports both adaptation and mitigation efforts.

Note that nature-based solutions also include sustainable forest management. Forests play a crucial role in both adaptation (by regulating water cycles, preventing erosion, and providing cooling) and mitigation (by acting as significant carbon sinks). There is a separate "Green Tripartite Plan" which will seek to establish 250,000 hectares of new forest and convert 140,000 hectares of environmentally damaging low-lying farmland into natural areas, including meadows and wetlands. The state will buy land from farmers for this purpose.

Expectations regarding climate advice have evolved toward a systemic perspective, moving beyond a narrow, sector-based focus. This integrated approach recognizes that climate challenges cannot be addressed in isolation from other global impacts, such as the biodiversity and nature crises. This scientific recognition is crucial for developing genuinely effective future climate policies, including adaptation, as the Earth functions as a complex, interconnected system.

c. DK2020: A Nationwide Commitment to Climate Action

DK2020 is a groundbreaking initiative in Denmark, where virtually all municipalities (95 out of 98) came together to develop ambitious climate action plans aligned with the Paris Agreement. This nationwide effort, a first of its kind globally, aimed to accelerate local climate action and contribute to Denmark's national goal of reducing greenhouse gas emissions by 70% by 2030.

Key Features of DK2020.

- Paris Agreement Alignment: DK2020 ensured that municipal climate plans were compatible with the Paris Agreement's goal of limiting global warming to well below 2 degrees Celsius, aiming for 1.5 degrees. This required municipalities to set ambitious targets for emission reductions and climate adaptation.
- C40 Framework: The project utilized the C40 Climate Action Planning Framework, a globally recognized framework developed by the C40 Cities Climate Leadership Group. This ensured a standardized and robust approach to climate planning across municipalities. This marked the first time the C40 framework was implemented in smaller cities, demonstrating its adaptability and effectiveness beyond large metropolitan areas.

2.2 Rationale and Timeframe of the climate policies

a. Klimaloven

The Danish Climate Council, Klimarådet, plays a crucial role in shaping Denmark's climate action strategy. They don't simply create a one-time plan; instead, they are continuously engaged in developing and refining recommendations to ensure the country stays on track to meet its ambitious climate goals. This ongoing process involves monitoring Denmark's progress, analysing the latest scientific data, and

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providing expert advice to the government on policy adjustments and new initiatives. The plan's timeframe is strategically aligned with both short-term and long-term climate objectives. The immediate focus is on achieving the 70% emission reduction target by 2030, while the goal is to achieve climate neutrality by 2050. This dual focus ensures that Denmark remains on track to meet its international commitments while laying the foundation for a sustainable future. The plan is not static; it is designed to be a living document, subject to periodic reviews and updates to ensure its continued relevance and effectiveness in response to evolving scientific knowledge, technological advancements, and international developments.

The rationale for the ambitious Danish goal is to leverage its status as a frontrunner country to gain soft power and influence global climate action. The strategic choice is not merely to achieve domestic emissions reductions but to demonstrate a viable path—one that preserves prosperity and welfare—that other countries would find attractive and can replicate. The government pursued this through an unprecedented and intense political process, resulting in over 70 concrete political agreements across all sectors following the passage of the Climate Act. The DCCC's role is to continuously monitor progress and provide expert analysis to help politicians manage the necessary, complex balancing act between urgent, short-term demands and enduring long-term objectives

b. Climate Adaptation Plan 1

Denmark is very risk prone to flooding from storm surges and cloudbursts and is among the European countries with the highest reported damage costs from flooding events. There is therefore a very extensive risk assessment and adaptation planning going on at municipal level to avoid high flooding damages. The Danish government issued in October 2023 the so-called "Climate Adaptation Plan 1", which included a few policy options and a very small governmental adaptation fund, which could support 25% of the costs of municipal adaptation projects. The plan acknowledges that Denmark, despite its strong mitigation efforts, is already experiencing the effects of climate change, such as sea-level rise, increased precipitation, and more frequent extreme weather events. It is however criticised for not playing out in relation to critical issues on burden sharing of the very high costs of climate adaptation e.g., on what private property owners, municipalities and the state should pay, and this is in practice a very critical barrier for implementing adaptation projects in practice. The plan has been extensively criticised by both the private and the public sector actors.

Specific actions within the plan are being rolled out, including:

- State assistance to municipalities for coastal protection projects (5 years allocated from 2024 to 2027)
- 150 million DKK allocated to the coastal protection pool for municipalities in 2024
- Pilot project for a comprehensive storm surge protection plan for Copenhagen and surrounding municipalities (already underway)
- 1.1422 billion DKK allocated for sand nourishment on the west coast from 2025 to 2029
- 16.2 million DKK allocated for addressing high groundwater levels in urban areas from 2024 to 2027
- 5.5 million DKK allocated for cross-sectoral collaboration and knowledge sharing from 2024 to 2027

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- 3.2 million DKK allocated for improving the framework for municipal coastal projects from 2024 to 2027.

The Adaptation Plan is designed to prepare Denmark for the unavoidable impacts of climate change, such as sea-level rise, storm surge, extreme weather events, and changes in precipitation patterns. It recognizes the need to protect the country's infrastructure, economy, and natural environment from these impacts, ensuring the well-being of Danish citizens in the face of a changing climate. The plan is an integral part of Denmark's comprehensive climate action strategy, complementing the Mitigation Plan by addressing the unavoidable consequences of climate change. The Climate Adaptation Plan 1 covers the period 2023-2027, providing a medium-term framework for adaptation action. Recognizing the limitations of the plan, the government is planning to issue a new Climate Adaptation plan early in 2025.

The foundational rationale for Denmark's adaptation efforts must now contend with a complex global reality often termed the "wicked circle of risks," which includes the climate, biodiversity, security, and information crises. Successfully navigating these interconnected challenges necessitates a shift in governance and legislation toward systemic thinking. This means integrating climate considerations with nature/biodiversity, security, and industrial policy across all sectors to ensure policy coherence and maximize synergies.

c. DK2020: A Nationwide Commitment to Climate Action

Table 2 – Timeline

Year	Event
2015	Paris Agreement: 195 countries set a goal to limit global temperature rise.
2016	C40 publishes a report, a roadmap for cities to reduce greenhouse gas emissions.
2017	C40 develops Climate Action Planning Framework (CAPF).
2019	Realdania launches DK2020; 20 municipalities join.
2020	Denmark passes its first climate law.
	All Danish municipalities invited to join DK2020.
	44 more municipalities join DK2020.
2021	31 additional municipalities join DK2020.
2023	96 municipalities participate in DK2020.
	Climate Alliance formed to support implementation of plans.
2024	All 98 municipalities are members of the Climate Alliance.
2050	Goal for all DK2020 municipalities to be climate robust and neutral.

Source: adapted from Realdania (2024)

2.3 Mitigation strategy implementation

Denmark's plan (Klimaloven) is a cornerstone of its national commitment to combat climate change by drastically reducing greenhouse gas emissions (Klimarådet 2020). The plan aligns with the Paris Agreement, aiming for a 70% reduction by 2030 (compared to 1990 levels), and ultimately achieving climate neutrality by 2050 which is more ambitious than the Paris agreement. Objectives

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that are important for Danish climate policy: "The goals that are relevant to Danish climate policy follow both from decisions on specific national goals and from Denmark's commitment to contribute to fulfilling a number of international agreements in the climate area in the EU and the UN" (translated from Klimarådet 2020).

The Plan encompasses a wide range of measures, including promoting renewable energy sources such as wind and solar power, improving energy efficiency in buildings and industries, and supporting the development and implementation of green technologies. It outlines policies and initiatives to reduce emissions from various sectors, such as transport, industry, and agriculture, through a combination of regulations, incentives, and voluntary agreements. The plan also emphasizes the importance of research and innovation in developing and implementing climate solutions, fostering collaboration between research institutions, businesses, and government agencies.

Key Instruments and Measures. The Plan aims to employ a diverse toolkit of instruments and measures to achieve its ambitious goals. These include the following.

- Carbon pricing mechanisms: Such as CO2 taxes and emissions trading schemes, to incentivize emission reductions and drive investment in green technologies.
- Support schemes for renewable energy deployment: Including feed-in tariffs and auctions, to accelerate the transition to a renewable energy-based economy.
- Energy efficiency regulations and incentives: Such as building codes and appliance standards, to promote energy conservation and reduce energy consumption.
- Investment in research and development of green technologies: To foster innovation and create new solutions for climate change mitigation.
- Promotion of sustainable transport options: Such as public transport, cycling infrastructure, and electric vehicle incentives, to reduce reliance on fossil fuel-powered vehicles.
- Measures to reduce emissions from agriculture: Such as manure management technologies, optimized fertilizer use, and support for sustainable farming practices.
- Circular economy initiatives: To reduce waste, promote resource efficiency, and minimize the environmental impact of production and consumption patterns. This aligns with both adaptation and mitigation by reducing resource consumption and minimizing the environmental impact of production and consumption patterns.
- Demand side measures: While not explicitly labelled as a demand-side measure, the plan's emphasis on public awareness and education can indirectly influence consumption patterns and lifestyle choices. By informing and engaging citizens about climate change, the plan can encourage more sustainable consumption habits and reduce overall demand for energy and resources.
- Among the instruments employed, CO_2 taxes and emission permits (carbon pricing mechanisms) are considered the most important and effective policy levers. These tools create the essential price signal needed to incentivize emission reductions and ensure that green investments offer a competitive financial return. The DCCC's early analyses and recommendations for green

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taxes and the subsequent uniform carbon tax reform underscore this focus on market mechanisms.

Just transition plan for Denmark

Denmark has adopted a comprehensive approach to ensure a just transition towards a low-carbon economy. This commitment is enshrined in its 2020 climate neutrality law, which mandates considering the social and economic implications of climate policies. The country recognizes the potential for job losses in certain sectors and emphasizes the importance of a smooth and just transition for workers and communities. "*In December 2020, a broad majority of parliamentary parties passed a binding law for climate-neutrality by 2050, and the planned phase out of its oil and gas sector is central to meeting these commitments. With more than 55 platforms in 19 oil and gas fields in the North Sea, Denmark has cancelled all future oil and gas extraction tender rounds. As the agreement notes: "if our children and grandchildren are to live in a world that lives up to the common obligations under the Paris Agreement, fossil fuels must be phased out … It's not a choice we face, it is a bound task". A just transition is central to this transformation. Denmark is committed to helping workers transition to new and well-paying jobs and supporting those regions and communities that are most impacted.*"

Denmark's just transition strategy includes the following elements.

- Strong legal framework: Denmark's commitment to a just transition is embedded in its 2020 climate neutrality law, which legally mandates considering the social and economic impacts of climate policies. This law isn't just symbolic; it sets a concrete foundation for ensuring that the transition is fair and equitable.
- Regional focus: Canadian Climate Institute highlights the importance of a regional focus in Denmark's just transition strategy. This is particularly crucial in areas like Esbjerg, where fossil fuel industries play a significant role in the local economy. In Esbjerg, a hub for oil and gas production, is undergoing a significant shift towards offshore wind energy. This regional approach ensures that communities traditionally reliant on fossil fuels are not left behind in the transition.
- Social dialogue: Denmark actively involves social partners like trade unions (e.g., Fagbevægelsens Hovedorganisation (FH), the Danish Confederation of Trade Unions) and employer organizations (e.g., Dansk Industri (DI), the Confederation of Danish Industry) in climate policy discussions. This collaborative approach ensures that workers' rights and concerns are considered in the transition process. This "Danish Model" of social dialogue is deeply ingrained in the country's policymaking culture and contributes to a more inclusive and equitable transition.
- Reskilling and upskilling: Canadian Climate Institute emphasizes Denmark's efforts to reskill and upskill workers in fossil fuel industries to prepare them for jobs in the renewable energy sector. For example, programs are in place to train oil and gas workers in skills relevant to the offshore wind industry. This proactive approach helps mitigate potential job losses and ensures a smoother transition for workers.
- Community engagement: Denmark recognizes the importance of community engagement and dialogue in ensuring broad support for the transition. This involves actively engaging with local communities, addressing their concerns, and fostering a sense of shared responsibility in the transition process. For

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instance, the government has established partnerships with local authorities and civil society organizations to facilitate community-level discussions and initiatives related to climate action.

This multifaceted approach aims to ensure that the benefits and burdens of the transition are shared equitably, leaving no one behind.

Cross-sectoral interlinkages

The Mitigation Plan recognizes the interconnectedness of climate action with other policy areas, such as energy, transport, agriculture, spatial planning, and environmental protection. It emphasizes the importance of policy coherence and integrated planning to avoid unintended consequences and maximize synergies between different sectors. For example, policies promoting sustainable transport can have positive impacts on air quality and public health, while measures to reduce emissions from agriculture can benefit biodiversity and water quality.

The careful design and execution of Denmark's just transition have been key to its success in mitigating political resistance. By framing the transition as one that safeguards prosperity, welfare, and employment, the government has managed to avoid major public backlash and protests, such as the "yellow vest" movements seen elsewhere in Europe. This approach validates the commitment to a balanced transition and strengthens the country's position as an attractive model for other countries seeking to pursue ambitious climate targets without compromising social stability

2.4 Adaptation strategy implementation

The Adaptation Plan encompasses a wide range of measures, including infrastructure upgrades to improve resilience to extreme weather events, nature-based solutions to enhance natural defences against climate impacts, and risk management strategies to minimize potential damage and disruption. It outlines specific actions to address climate risks in various sectors, such as water resources, agriculture, and health, ensuring a comprehensive approach to adaptation. The plan also emphasizes the importance of research and innovation in developing and implementing adaptation solutions, fostering collaboration between research institutions, businesses, and government agencies.

Key Instruments and Measures: The plan employs a diverse set of instruments and measures to achieve its objectives, including:

- Risk assessments and vulnerability mapping: To identify areas and sectors most at risk from climate change impacts.
- Planning and zoning regulations: To guide development and land use in a way that minimizes climate risks.
- Investment in climate-resilient infrastructure: To upgrade existing infrastructure and build new infrastructure that can withstand climate impacts.
- Nature-based solutions: To harness the power of nature to provide climate adaptation benefits, such as flood protection, heat reduction, and carbon sequestration.
- Public awareness and education campaigns: To inform and engage citizens about climate risks and adaptation measures.
- Research and innovation: To develop new technologies and approaches for climate adaptation.

Cross-sectoral interlinkages

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The Adaptation plan recognizes the interconnectedness of climate adaptation with other policy areas, such as spatial planning, water management, environmental protection, and disaster risk management. It emphasizes the importance of integrated planning and policy coherence to avoid unintended consequences and maximize synergies between different sectors. For example, measures to improve water management can also benefit biodiversity and reduce flood risks, while green infrastructure in urban areas can contribute to both climate adaptation and air quality improvement.

3. Governance framework

National: The plan is guided by Denmark's Climate Act (Klimaloven), which provides a legal framework for climate action. Klimaloven however is only concrete about climate change mitigation targets. It is further supported by national strategies and sectoral plans, such as the Coastal Protection Strategy, ensuring a coordinated and integrated approach to adaptation across different sectors. Actors involved are:

- Government:
  - Ministry of Environment: Leads the coordination and implementation of the adaptation plan.
  - Danish Environmental Protection Agency: Responsible for monitoring and regulating environmental impacts, including those related to climate change.
  - Danish Meteorological Institute: Provides climate data and projections to inform adaptation planning.
  - Ministry of Climate, and Energy: This ministry plays a leading role in developing and implementing climate policies, including the Plan. It oversees the Danish Energy Agency and (this is the Ministry of Environment) which are responsible for specific aspects of climate action.
  - Danish Energy Agency: Focuses on energy efficiency, renewable energy deployment, and the transition to a sustainable energy system. They provide technical expertise, funding, and regulatory oversight.
  - Other relevant ministries: Climate action is integrated across government, with other ministries contributing to the Plan within their respective areas. This includes the Ministry of Finance (economic and fiscal policies), the Ministry of Transport (sustainable transport), the Ministry of Food, Agriculture and Fisheries (agricultural emissions), and the Ministry of Industry, Business and Financial Affairs (industrial decarbonization), Ministry of foreign affairs. Contribute to adaptation efforts within their respective areas, such as the Ministry of Transport (infrastructure), the Ministry of Food, Agriculture and Fisheries (agriculture), and the Ministry of the Interior and Housing (urban planning).
  - Local authorities: Municipalities play the leading role in planning and the implementation adaptation measures at the local level, such as coastal protection, water management, and urban planning.

The cornerstone of Denmark's governance framework is the legally mandated role of the DCCC as an independent expert advisor and watchdog. This institutional design ensures that the government is continuously and publicly held accountable to the binding climate goals. The Council's detachment from the ministerial structure, combined with its fixed annual cycle of evaluation and reporting, provides an objective source of knowledge that creates pressure for political action and ultimately strengthens the democratic legitimacy of ambitious climate policy.

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- EU: Denmark's adaptation plan aligns with the EU Adaptation Strategy, contributing to broader European efforts to build climate resilience. This is not having a large consequence locally, since the responsibility for adaptation planning is only local.
- International: The plan is also informed by international frameworks, such as the UN Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction, recognizing that climate adaptation is a global challenge requiring international cooperation and knowledge sharing. This is in practice taken care of by the municipalities reporting to the C40 framework.

Other actors involved:

Businesses: The private sector is involved in developing and implementing adaptation solutions, such as climate-resilient infrastructure and technologies. Example includes:

- Industry associations: Representing various sectors, they play a crucial role in disseminating information, promoting best practices, and advocating for policies that support a green transition within their respective industries.
- Individual companies: From large corporations to small and medium-sized enterprises (SMEs), businesses are key drivers of innovation and implementation of green technologies and practices. They are responsible for reducing their own emissions and contributing to a circular economy.
- Investors: Provide the financial capital necessary for the development and deployment of green technologies and infrastructure. Their investment decisions play a crucial role in shaping the transition to a low-carbon economy.

Civil Society: NGOs and environmental organizations raise awareness, advocate for adaptation policies, and participate in local initiatives. They play a vital role in raising awareness, advocating for ambitious climate policies, and holding the government and businesses accountable for their climate commitments.

Research institutions and universities: Conduct research, develop new technologies, and provide scientific expertise to support adaptation planning. Think tanks and policy analysts contribute to the development and evaluation of climate policies, providing independent analysis and recommendations.

Citizens: Individuals and communities play a role in adapting to climate change by taking measures to protect their homes and properties, participating in local initiatives, and making informed choices and make daily choices that contribute to emission reductions, such as using public transport, cycling, adopting energy-efficient appliances, and reducing their carbon footprint. Communities also play a role in promoting sustainable practices, supporting local initiatives, and creating a culture of climate awareness.

The entire climate governance system relies on core procedures: Monitoring, Reporting, Evaluation, and Innovation. The DCCC is deeply involved in three of these processes, which helps mobilize a broad array of actors and reduce potential conflict. This is achieved because the procedures score highly on inclusion, transparency, and routinization – fostering open deliberation and continuous learning across government, business, and civil society.

Finally, the specific governance framework of the "DK2020: A Nationwide Commitment to Climate Action" entails the following features:

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- Multi-level Governance: DK2020 fostered collaboration between municipalities, regions, and the national government. This multi-level governance structure ensured coordination and support for local climate action. The project was a partnership between Realdania, Local Government Denmark (KL), and the five Danish regions, underscoring the collaborative nature of the initiative.
- Capacity Building: The project provided extensive support and training to municipalities, equipping them with the knowledge and tools necessary to develop and implement comprehensive climate action plans. This included workshops, expert consultations, and access to a digital knowledge platform, ensuring municipalities had the resources to navigate the complexities of climate planning.

4. The main dynamic aspects of the strategies

The adaptation plan involves a combination of regulations, incentives, and public awareness campaigns to promote adaptation and foster a sense of shared responsibility among all stakeholders. It outlines the roles and responsibilities of different actors, including government agencies, municipalities, and private sector stakeholders, ensuring coordinated and effective action.

- Governance: The plan's implementation relies on a multi-level governance structure, with clear roles and responsibilities for national government agencies, regional authorities, and municipalities. This collaborative approach ensures coordinated action and effective implementation across all levels of government.
- Financing: A combination of public funding, private investment, and innovative financing mechanisms will be utilized to support the plan's implementation. This diversified approach ensures financial sustainability and leverages the resources and expertise of both public and private sectors.
- Stakeholder Engagement: The plan recognizes the importance of broad stakeholder engagement, emphasizing the participation of businesses, civil society organizations, and citizens in climate adaptation efforts. This inclusive approach fosters a sense of shared responsibility and encourages collective action towards a climate-resilient Denmark.

The plan also highlights the importance of international cooperation and knowledge sharing in addressing climate change adaptation, recognizing that global challenges require collaborative solutions. There is no monitoring and evaluation framework established, which can track progress towards implementing adaptation measures by municipalities or local property owners including households and business. The Municipalities Association KL is engaged in ongoing dialogue and conducts surveys to measure the status and success of planned adaptation projects. However, this is not a systematic review; rather, it is intended to inform the political process and support municipalities in making a strong case for increased government support for adaptation planning. Regular reports on municipal adaptation planning are supplied to the C40 network, which municipalities voluntarily signed up to. This provides some transparency in the progress in adaptation planning and implementation.

The mitigation plan also involves similar dynamic aspects. The plan involves a combination of regulations, incentives, and voluntary agreements to achieve its goals. It clearly outlines the roles and responsibilities of different actors, including

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government agencies, businesses, and civil society, fostering a shared responsibility approach to climate action. The plan also highlights the importance of international cooperation and partnerships in addressing climate change, recognizing that collective action is crucial to achieving global emission reduction targets (exactly as we have seen just above for adaptation).

- Governance: Like the adaptation plan, the mitigation plan's implementation also relies on a robust multi-level governance structure, with clear roles and responsibilities for national government agencies, regional authorities, and municipalities.
- Financing: A combination of public funding, private investment, and innovative financing mechanisms are and will be utilized to support the plan's implementation.
- Stakeholder Engagement: Broad stakeholder engagement is emphasised in climate action. This inclusive approach fosters a sense of shared responsibility and encourages collective action.

However, a comprehensive monitoring and evaluation framework will track progress towards the plan's goals, using key indicators such as emission reductions, renewable energy deployment, and energy efficiency improvements. Regular reports and assessments will be conducted to evaluate the effectiveness of policies and measures, allowing for adjustments and improvements based on evidence and data. This adaptive management approach ensures that the plan remains dynamic and responsive to the evolving challenges of climate change mitigation.

5. Effectiveness of the strategies

The integration of the latest scientific findings into climate plans is one of the important aspects for ensuring their effectiveness and long-term viability. In Denmark, the collaboration of the municipalities (KL) with academic institutions and researchers provides valuable insights into climate change impacts, mitigation strategies, and adaptation options. This evidence-based approach strengthens the foundation of climate action and increases the likelihood of achieving climate goals.

a. Klimaloven (Climate Act)

Denmark's dedication to a structured and legally binding climate strategy has shown significant returns. The DCCC concluded in 2025 that the government has now demonstrated that the country is on track to achieve the national target of a 70% reduction in greenhouse gas emissions by 2030. This success story is seen as crucial globally, not just for the emissions cut (which is a small fraction of the world's total), but because it confirms the country's ability to act as a frontrunner and "Green Superpower".

Denmark has already made progress in reducing emissions and increasing renewable energy use. These achievements demonstrate that a green transition is not only possible but can also drive economic growth and improve quality of life.

Below, we list the achievements from different reports (Danmarks Statistik, 2024; Ministry of Environment of Denmark, 2024; The Danish Government, 2020; Danish Energy Agency, 2024; U.S. Department of Commerce, 2025).

- Emission Reductions: Denmark had already achieved a 39% reduction in greenhouse gas emissions by 2020 compared to 1990 levels, demonstrating

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substantial progress towards the 2030 target of a 70% reduction. This success can be attributed to a combination of policies, including support for renewable energy, energy efficiency improvements, and carbon pricing mechanisms.

- Renewable Energy: Denmark is a global leader in renewable energy, particularly wind power. In 2020, 47% of Denmark's electricity consumption came from wind energy, the highest share in the world. This achievement highlights Denmark's commitment to clean energy and its success in harnessing its natural resources to create a sustainable energy system. In 2023, renewable energy consumption in Denmark reached a record high, meeting 45.2% of the nation's total energy needs (excluding transportation fuel). This represents a doubling of the renewable energy share since 2011, primarily driven by increased use of solar cells and biogas. Despite this shift, total energy consumption remained relatively stable, with decreased use of coal, coke, and waste offsetting the rise in renewables. Approximately 64% of Danish households use district heating, contributing to the country's high energy efficiency. Oil-fired burners are being phased out, with only 200,000 homes still relying on them. The installation of new oil-fired burners is prohibited where district heating or natural gas is available. Natural gas, considered the cleanest fossil fuel, accounts for 15% of household heating. While Denmark is a significant wind energy producer, most renewable energy for buildings comes from solar and biomass. Wood pellets, a CO2-neutral alternative to fossil fuels, are also gaining popularity. Denmark consumes over 1 million tons of wood pellets annually, primarily in private homes and thermal power stations.
- Energy Efficiency: Denmark has also made significant strides in improving energy efficiency across various sectors. Through initiatives such as building codes, appliance standards, and industrial energy efficiency programs, Denmark has successfully decoupled economic growth from energy consumption. Denmark's dedication to green building is evident in its comprehensive approach that considers a building's entire lifecycle, from material selection and construction to daily household operations.
- Coal Phase-Out: Denmark has completely phased out coal-fired power plants, a major milestone in its transition to a cleaner energy system (this has been delayed due to the Ukraine war). This achievement has significantly reduced emissions from the energy sector and improved air quality.
- Sustainable Transport: Denmark has made progress in promoting sustainable transport options, with increasing use of public transport, cycling, and electric vehicles. The country boasts extensive cycling infrastructure and has implemented policies to encourage the adoption of electric vehicles.
- Agriculture and Industry: While more challenging, the agricultural and industrial sectors have also contributed to emission reductions. Initiatives to improve manure management, optimize fertilizer use, and promote sustainable farming practices have reduced emissions from agriculture. In the industrial sector, energy efficiency improvements and circular economy initiatives have led to progress.
- Waste Management/Water: Encouraging water-efficient fixtures and rainwater harvesting. Danish households consume 34 gallons of water per person daily, and initiatives are in place to reduce this through efficient toilets, taps, showers, and water-free urinals. Recycling rainwater for car washing, garden watering, and even indoor use for toilet flushing and laundry is also promoted. Danes generate 13 million tons of waste annually, with household waste accounting

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for one-fourth of the total. Recycling plays a crucial role, with a 66% recycling rate. While not required, some households compost organic waste.

The plan builds on these achievements, aiming to accelerate the transition to a low-carbon economy. Lessons learned from previous efforts will be used to improve the implementation of the current plan.

A major point of debate, however, concerns the country's consumption-based emissions (climate footprint), which has not declined at the same rate as territorial (production-based) emissions due to outsourcing of production. Critics, including the Danish Youth Climate Council, argue this represents an overlooked blind spot and systematic denial of Denmark's full responsibility for its global climate impact. Conversely, some experts contend that focusing on territorial emissions is the most effective way to align with the Paris Agreement and coordinate global action.

b. Climate Adaptation Plan 1

Several adaptation options have already been implemented, such as coastal protection projects and water management initiatives. These efforts could be strengthened further if they were supported by a comprehensive government plan and a supportive legislative framework within the area.

Lessons learned from previous efforts will be used to improve the implementation of adaptation measures ensuring continuous improvement and a need for speeding up the implementation of projects and policies.

Below, we list the achievements from some Government reports (Ministry of Environment of Denmark, 2024; Nordic Council of Ministers, 2023; The Danish Government, 2020).

- The local governments and other actors have implemented various coastal protection measures, such as dikes, seawalls, and beach nourishment, to protect coastal communities and infrastructure from flooding and erosion.
- There have also been investments in flood protection infrastructure, such as pumping stations and drainage systems, to manage increasing precipitation and pluvial flooding.
- There is progress in integrating climate adaptation considerations into spatial planning and urban development, promoting green infrastructure and sustainable urban design.

c. DK2020: A Nationwide Commitment to Climate Action

Impact and Outcomes

- Ambitious Climate Plans: DK2020 resulted in the development of ambitious climate plans across Denmark, covering a wide range of sectors, including energy, transportation, buildings, and waste management. These plans not only addressed mitigation efforts to reduce emissions but also adaptation strategies to enhance resilience to the impacts of climate change.
- Increased Climate Action: The project has spurred significant climate action at the local level, with municipalities implementing various initiatives to reduce emissions and enhance climate resilience. Examples include investments in renewable energy, promotion of sustainable transportation, energy efficiency retrofits in buildings, and initiatives to reduce waste and promote circular economy.
- Knowledge Sharing and Collaboration: DK2020 fostered a culture of knowledge sharing and collaboration among municipalities, enabling them to learn from

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each other and accelerate progress. This was facilitated through peer-to-peer learning, workshops, and conferences, where municipalities could exchange best practices and lessons learned.
- International Recognition: Denmark's DK2020 initiative has received international recognition for its innovative approach to local climate action and its contribution to global climate goals. It has been showcased as a model for other countries seeking to engage local governments in ambitious climate action.

Key Success Factors

- Strong Political Will: The commitment of the local authorities to climate action was crucial for the success of DK2020. This commitment was reflected in the national climate law passed in 2020, which provided a supportive policy framework for local climate action.
- Effective Collaboration: The multi-level governance structure and strong partnerships between different actors were essential for coordinated action. The active involvement of Realdania, KL (association and interest group of the 98 Danish municipalities), and the Danish regions ensured that municipalities had the necessary support and guidance throughout the process.
- Capacity Building and Support: Providing municipalities with the necessary resources and expertise was key to enabling them to develop and implement ambitious climate plans. The comprehensive capacity building program ensured that municipalities had the knowledge and skills to navigate the challenges of climate planning.
- Citizen Engagement: Many municipalities actively involved citizens in the development of their climate plans, ensuring local ownership and support for climate action. This participatory approach fostered a sense of shared responsibility and increased the likelihood of successful implementation.

Key Takeaways

- Local Action is Crucial: DK2020 highlights the critical role of local governments in addressing climate change and achieving national and global climate goals. Municipalities are at the forefront of climate action, as they are responsible for implementing many of the policies and measures that directly impact emissions and climate resilience.
- Collaboration is Key: Effective collaboration between different levels of government and stakeholders is essential for successful climate action. DK2020 showcased the power of partnerships between municipalities, regions, national government, and civil society organizations in driving ambitious climate action.
- Capacity Building is Necessary: Providing local governments with the necessary support and resources is crucial for enabling them to develop and implement ambitious climate plans. The comprehensive capacity building program in DK2020 equipped municipalities with the knowledge, skills, and tools to effectively plan and implement climate action.
- Citizen Engagement is important: Involving citizens in climate planning and action can enhance local ownership and support for climate initiatives. DK2020 demonstrated the value of participatory approaches in fostering a sense of shared responsibility and ensuring that climate plans reflect the needs and priorities of local communities.

DK2020 serves as an inspiration for other countries and regions seeking to accelerate local climate action. Its success demonstrates that ambitious climate

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goals can be achieved through strong political will, effective collaboration, and a commitment to capacity building and citizen engagement. By empowering local governments to take the lead in climate action, DK2020 has paved the way for a more sustainable and resilient future for Denmark.

6. Other important aspects

The success of Denmark's climate transition must be viewed within an increasingly complex environment defined by the "wicked circle of risks," a nexus of interconnected challenges including the climate crisis, the biodiversity crisis, security concerns, and the pervasive problem of misinformation. This dynamic reality requires policymakers to continually make difficult choices between long-term climate targets and immediate challenges, increasing the risk of distraction or policy fragmentation. In this context, the DCCC's commitment to providing objective, evidence-based analysis is paramount to counteract polarization, ensure policy credibility, and secure the political support necessary for accelerated action.

Potential challenges to the successful implementation of the Adaptation Plan include funding constraints, coordination issues among different actors, and uncertainties in climate projections. The plan identifies strategies to address these barriers, such as securing financial resources through public and private investments, establishing clear governance structures to facilitate coordination, and incorporating adaptive management approaches to account for uncertainties in climate projections.

- Funding: Securing adequate funding for adaptation measures can be a challenge, particularly for large-scale infrastructure projects.
- Coordination: Effective coordination among different actors, including government agencies, municipalities, and private stakeholders, is crucial for successful implementation.
- Data and knowledge gaps: Uncertainties in climate projections and the localized impacts of climate change can make it difficult to plan and prioritize adaptation measures.
- Public awareness: Increasing public awareness and understanding of climate risks and adaptation options is essential for building support and encouraging action.

Potential challenges to the successful implementation of the mitigation plan include technological barriers, economic constraints, and public acceptance. Technological barriers can hinder the development and deployment of certain green technologies, particularly in hard-to-abate sectors. Economic constraints can limit the pace of investment in green infrastructure and innovation. Public acceptance of certain climate policies can be a challenge, requiring effective communication and engagement strategies. Uncertainties in future climate projections can make it difficult to plan for long-term adaptation measures. The plan identifies strategies to address these barriers, such as promoting innovation through research and development, providing financial support for green initiatives, and engaging stakeholders to raise awareness and foster collaboration.

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ANNEX B5 – CLIMATE POLICIES IN FRANCE

1. Introduction

a. *France's ambitious climate commitment*

For several decades, France has distinguished itself through its ambitious commitment to combating climate change, combining strategies for reducing greenhouse gas (GHG) emissions with measures to adapt to climate impacts. These policies are anchored in key frameworks such as the National Low-Carbon Strategy *(Stratégie Nationale Bas-Carbone, SNBC)*, the National Climate Change Adaptation Plans *(Plans Nationaux d'Adaptation au Changement Climatique, PNACC)*, and the Multiannual Energy Program *(Programmation Pluriannuelle de l'Énergie, PPE)*, all aligned with European commitments under the National Integrated Energy and Climate Plan *(PNIEC)*.

b. *New climate adaptation commitment in France in 2025*

In March 2025, the French Ministry for Ecological Transition published its third National Climate Change Adaptation Plan (PNACC-3), signalling a clear strengthening of the national adaptation agenda. The plan is based on a Reference Warming Trajectory (TRACC), projecting +4 °C by 2100 for adaptation planning. It is structured around five strategic axes and 52 measures, detailed in Section 2. Dedicated funding streams (e.g., the Barnier Fund with €75 million allocated in 2025 and €300 million overall) are intended to support its implementation. The main goal is to scale up adaptation solutions and embed an "adaptation reflex" across all sectors of society.

However, while the *Haut Conseil pour le Climat* (High Council for Climate) welcomed the publication of PNACC-3 as "an essential document", its members also emphasised early in their assessment that "the financial resources allocated to adaptation in PNACC-3 remain highly insufficient". The Council calls for the plan to be supported by a comprehensive financing strategy (State/local authorities/ private sector), providing increased and sustained funding for adaptation based on both regulatory and incentive-based frameworks, along with transparent monitoring of the credits allocated to each measure.

Figure 1 Extract from the Presentation of the PNACC-3, Preparing France to +4°C Global context and national commitments

In 2015, France played a pivotal role in securing the Paris Agreement, committing to achieving carbon neutrality by 2050. This ambitious target addresses pressing challenges such as the intensification of heatwaves, increasing droughts, and rising

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sea levels, all of which impact ecosystems, infrastructure, and the most vulnerable populations.

To tackle these challenges, France relies on a quinquennial planning system that allows for the revision of priorities and the adjustment of actions. Carbon budgets set by the SNBC, energy targets outlined in the PPE, and monitoring indicators established under the PNACC provide a comprehensive framework that aligns European commitments with local needs.

c. A new political context

Since mid-2024, France has experienced significant political instability, marked by multiple changes of government and shifting parliamentary alliances. This volatility has continued throughout 2025, resulting in a fragmented political landscape and limited clarity on long-term climate and adaptation priorities. The overall policy direction in France remains uncertain and requires continued monitoring.

d. Persistent challenges

Despite these ambitious frameworks, recent evaluations, particularly by the High Council for Climate *(Haut Conseil pour le Climat, HCC)*, continue to highlight significant delays in key sectors such as transportation and buildings. Local actions, critical to achieving national objectives, face challenges due to insufficient coordination and funding. Moreover, the limited implementation of the Citizen's Climate Convention *(Convention Citoyenne pour le Climat, CCC)* proposals, only 10% having been adopted without modification, continues to fuel public scepticism about the political commitment to climate ambition.

e. A multisectoral mobilization to address challenges

To tackle these challenges, France is relying on strengthened collaboration between public, private, and citizen stakeholders. Initiatives such as the Territorial Climate-Air-Energy Plans *(Plans Climat-Air-Énergie Territoriaux, PCAET)*, climate trajectories outlined in the PNACC-3 (published in March 2025), and reforms planned under the Multiannual Energy Program (PPE) demonstrate that the ecological transition increasingly depends on close coordination between national and local levels.

2. Strategies of mitigation and adaptation

France's climate strategies are built on two complementary pillars:

- Mitigation, aimed at reducing greenhouse gas (GHG) emissions to minimize the impact of human activities on the climate and the environment
- Adaptation, focused on limiting the impacts of climate change on human societies and ecosystems, while strengthening their resilience.

2.1. Objectives

The main objectives of France's climate strategies are:

- Achieving carbon neutrality by 2050, with a 40% reduction in GHG emissions by 2030 compared to 1990 levels. This goal is guided by the SNBC and aligned with the European Union's ambitions

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- Strengthening the resilience of territories and populations to climate impacts through the actions outlined in the PNACC[27].

The Climate Action Plan, developed by the Ministry of Ecological Transition, translates these objectives into concrete measures, structured around mitigation and adaptation actions.

2.2. Rationale and timeframe

France is highly exposed to the impacts of climate change, including heatwaves, prolonged droughts, and rising sea levels. These realities demand a structured and coherent response at both national and local levels.

The SNBC, PPE, and PNIEC form an integrated framework based on a shared energy-climate-air scenario:

- The SNBC outlines emissions reduction pathways with the objective to completely decarbonize energy production by 2050
- The PPE plans the development of renewable energy and the evolution of the energy mix
- The PNIEC aligns these efforts with European commitments.

The Climate Action Plan, adopted in response to a recommendation from the High Council for Climate (HCC), aims to enhance the coherence of public policies by mobilizing sectoral ministries and local authorities.

The PNACC seeks to anticipate and reduce the impacts of climate change on populations, ecosystems, and infrastructure by defining concrete, sector-specific, and localized actions to strengthen the country's resilience to current and future climate hazards.

2.3. Mitigation strategy in France (Stratégie d'atténuation en France)

a. The National Low Carbon Strategy (SNBC)

Adopted for the first time in 2015, the National Low Carbon Strategy (Stratégie Nationale Bas-Carbone, SNBC) serves as the primary framework for mitigation, providing guidance for implementing "the transition to a low-carbon, circular, and sustainable economy" across all sectors. It establishes an integrated approach to ensure that all national public policy decisions – plans, programs, draft laws, legislation, public procurement, and public project financing – align with the orientations and objectives set out in the SNBC.

The SNBC pursues four main objectives:

- Completely decarbonizing energy production by 2050, relying solely on biomass resources (e.g., agricultural and wood product waste, energy wood), environmental heat sources (e.g., geothermal energy, heat pumps), and decarbonized electricity
- Halving energy consumption across all sectors (transportation, buildings, etc.) by enhancing energy efficiency, improving equipment performance, fostering more sustainable lifestyles, and promoting a circular economy
- Reducing non-energy-related emissions, such as those from agriculture and industrial processes

[27] Gouvernment français, 'PNACC-3 Document de Présentation'. P12

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- Increasing natural carbon sinks (e.g., forests, wetlands) and developing carbon capture and storage technologies to absorb unavoidable residual emissions.

In the short and medium term, the SNBC establishes **binding sectoral carbon budgets** for five-year cycles. Carbon budgets are defined as "greenhouse gas emission caps that must not be exceeded at the national level over five-year periods".

The updated version of the SNBC and the carbon budgets for the periods 2019–2023, 2024–2028, and 2029–2033 were adopted by decree on April 21, 2020.

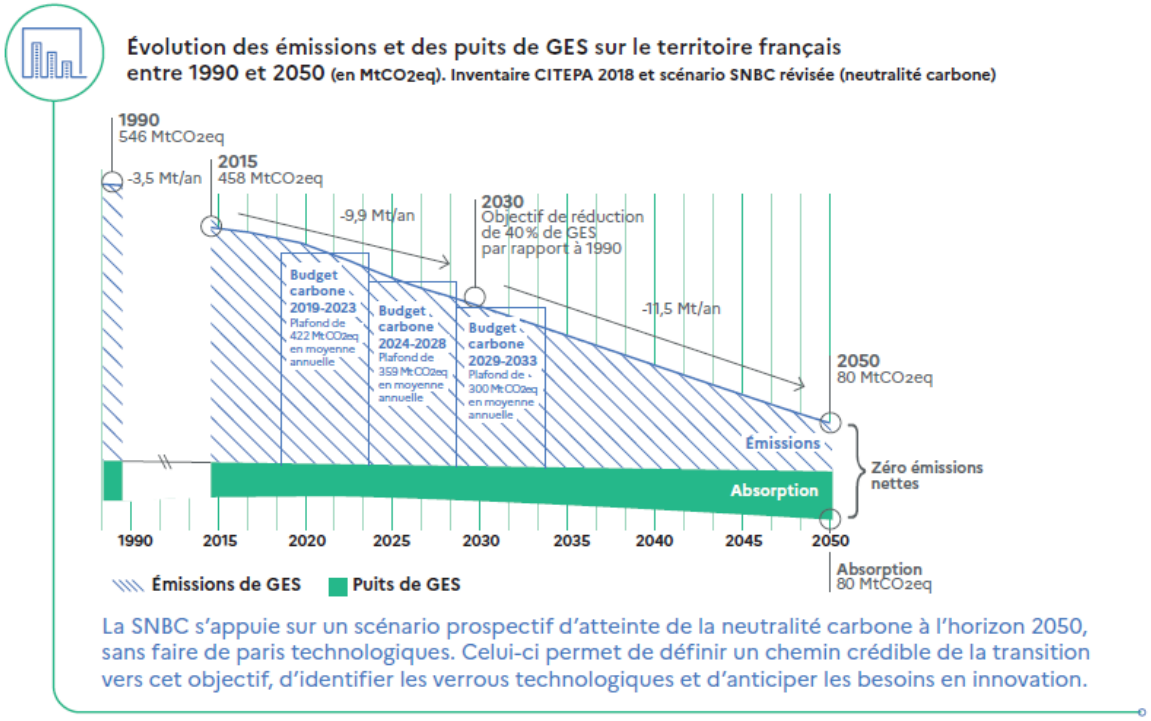

Figure 2 – Evolution of emissions and GHG sinks on the French territory between 1990 and 2050

Cross-cutting orientations of the SNBC

- Carbon footprint: Reduce emissions associated with the consumption of goods and services by French citizens.
- Economic policy: Redirect financial flows to support a green and inclusive transition.
- Research and innovation: Advance technical, social, and organizational innovations that contribute to reducing France's emissions.
- Urban planning and land use: Limit soil artificialization and promote resilient, low-carbon urban development.
- Education, awareness, and citizen engagement: Involve citizens in the transition toward a low-carbon culture.
- Employment, skills, qualifications, and professional training: Leverage the low-carbon transition as an opportunity for the economy and employment, while supporting workforce transitions.

Sectoral orientations of the SNBC is based on seven areas.

TRANSPORT

- Improve the energy performance of vehicles (light and heavy), with a target of 4 litres per 100 km for thermal passenger vehicles by 2030.

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- Decarbonize energy consumption for vehicles and adapt infrastructure to achieve 35% of new passenger vehicle sales being electric or hydrogen-powered by 2030, and 100% by 2040.
- Manage demand growth for transportation by promoting:
- Teleworking, carpooling, local supply chains, and vehicle usage optimization.
- Encourage modal shifts toward lower-emission passenger and freight transport (public transit, rail) and support active modes (cycling, walking).

BUILDINGS

- Use decarbonized energy sources best suited to building typologies.
- Enhance energy efficiency in buildings (envelopes and equipment) by implementing new environmental regulations for new buildings in 2020 and for renovating tertiary buildings, and targeting 500,000 renovations per year for existing stock, focusing on energy-inefficient homes.
- Encourage behavioural changes for more sustainable usage patterns.
- Promote low-carbon construction and renovation products (circular economy or bio-sourced materials) with high energy and environmental performance across their life cycles.

AGRICULTURE

- Develop agroecology, agroforestry, and precision agriculture, particularly to minimize nitrogen fertilizer surpluses.
- Expand the bioeconomy to supply low-GHG energy and materials to the French economy.
- Adapt food demand to include higher-quality or organic products and reduce food waste, aligning with nutritional recommendations.

FORESTS, WOOD, AND SOIL

- Increase carbon storage in agricultural soils through practice changes.
- Promote active and sustainable forest management to adapt forests to climate change and preserve carbon stocks in forest ecosystems.
- Expand afforestation and reduce deforestation.
- Maximize carbon storage in wood products and promote their use in long-term applications like construction.
- Reduce soil artificialization.

INDUSTRY

- Support companies in transitioning to low-carbon production systems by developing decarbonization roadmaps and financial tools.
- Foster the emergence of key production technologies in France that are essential for the transition.
- Intensify research and development of low-carbon manufacturing processes.
- Significantly improve energy efficiency and transition to decarbonized energy sources.
- Manage material demand through the circular economy.

WASTE

- Prevent waste generation during product design through eco-design and polluter-pays principles.
- Promote the circular economy, reuse, and repair culture among consumers.
- Enhance waste collection and management by developing material and energy recovery processes.

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- Increase the efficiency of treatment systems, particularly for wastewater and organic and non-hazardous waste.

ENERGY PRODUCTION

- Control energy demand through energy efficiency and sobriety.
- Decarbonize and diversify the energy mix, notably by developing renewable energy and phasing out coal for electricity and heat production (by 2022).
- Ensure that the energy mix evolution and efficiency targets are defined within the Multiannual Energy Program (PPE), which is based on the same reference scenario as the SNBC and aligned with its orientations.

b. The Multiannual Energy Program (PPE)

The PPE was established by the law of August 17, 2015, as a key tool for steering France's energy policy. It sets the government's energy priorities for mainland France over a 10-year period, with updates every 5 years. During each update, the second five-year period is revised, and a new subsequent five-year period is added. The PPE aims to achieve five main objectives:

- Reduce energy consumption
- Increase the production of decarbonized energy
- Adapt energy networks
- Ensure energy supply security
- Protect purchasing power and competitiveness.

2.4. Adaptation strategy in France

The National Climate Change Adaptation Plans (PNACC) aims to strengthen the resilience of territories and populations to climate change impacts.

a. PNACC-1 (2011-2015)

The first PNACC implemented 242 measures across the following 20 thematic areas:

1. Cross-cutting actions
2. Health
3. Water resources
4. Biodiversity
5. Natural hazards
6. Agriculture
7. Forests
8. Fisheries and aquaculture
9. Energy and industry
10. Infrastructure and transport systems
11. Urban planning and the built environment
12. Tourism
13. Information
14. Education and training
15. Research
16. Financing and insurance
17. Coastal zones
18. Mountain regions
19. European and international action
20. Governance

These thematic areas helped identify the most vulnerable sectors and structure the initial strategic and operational responses to the impacts of climate change.

Types of priority measures in PNACC-1

Given the uncertainties surrounding the extent of climate change, PNACC-1 prioritized the implementation of specific types of measures.

- No-regret measures – Beneficial even in the absence of climate change, such as:
  - Promoting water conservation across all sectors.

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  - Adapting the French shellfish industry to climate change through health monitoring and genetic potential assessment of oysters and mussels.
- Reversible measures – Adaptable to evolving climatic conditions, such as:
  - Integrating climate change considerations into public service contracts.
- Safety-margin measures – Aimed at reducing long-term risks, such as:
  - Revising maps of areas vulnerable to forest fires to expand vigilance zones.
- Long-term measures – Requiring gradual implementation, such as:
  - Integrating climate change considerations into regional forest management plans.
- Adjustable and revisable measures – Designed to evolve with new knowledge, such as:
  - Strengthening summer comfort requirements in building regulations.

These measures enable a dynamic and adaptable approach to climate change, evolving in response to climatic developments and scientific advancements[28].

Action domains for classifying adaptation measures

Adaptation measures are categorized into four main action domains.

- Information production and dissemination: Enhancing knowledge and awareness about climate impacts.
- Adjustment of standards and regulations: Revising legislative and regulatory frameworks to incorporate climate risks.
- Institutional adaptation: Strengthening institutional structures to better manage and coordinate adaptation efforts.
- Direct investment: Funding concrete projects to reduce vulnerabilities, such as resilient infrastructure or nature-based solutions.

b. PNACC-2 (2018–2022)

The second National Climate Change Adaptation Plan (PNACC-2) refocused actions around six strategic priorities.

- Governance and management:
  - Implementation of enhanced coordination under the National Council for Ecological Transition (Conseil National de la Transition Écologique).
- Climate risk prevention:
  - Strengthening standards to mitigate the impacts of floods and storms.
- Economic resilience:
  - Supporting businesses in integrating climate risks into their strategies.
- Nature-based solutions:
  - Restoring wetlands and promoting sustainable forest management.
- Health and well-being:
  - Preventing emerging diseases and reducing vulnerabilities related to heatwaves.
- Research and innovation:
  - Developing adaptive technologies to address climate impacts.

c. PNACC-3

[28] Ministère de l'Ecologie, du Développement durable, des Transports et du Logement.

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The third National Climate Change Adaptation Plan (PNACC-3), published in March 2025, is structured around five strategic axes and emphasizes enhanced territorialization to address regional specificities.

- Protecting the population:
  - This axis includes measures to reduce health risks, safeguard buildings, and adapt living conditions to climate hazards such as heatwaves, floods, and wildfires.
- Ensuring the resilience of territories, infrastructure, and essential services:
  - Aims to integrate adaptation into planning documents, public infrastructure, and services like energy, water, and transportation.
- Adapting human activities: Ensuring economic resilience and sovereignty in food, energy, and the economy:
  - Focuses on agriculture, industry, and tourism, supporting their transition to more resilient models.
- Protecting natural and cultural heritage:
  - Prioritizes measures to preserve ecosystems, species, and cultural and heritage sites from climate impacts.
- Mobilizing the nation's strengths to succeed in climate adaptation:
  - Calls for national mobilization, involving citizens, youth, public servants, and businesses to disseminate best practices and strengthen adaptation governance.

These axes reflect increased ambition, with a focus on collective mobilization, social justice, and territorial coherence[29].

d. The Climate Action Plan

The Climate Action Plan serves as a cross-cutting framework to integrate these actions into a coherent long-term strategy, while ensuring their annual review by the Ecological Defence Council (Conseil de défense écologique).

3. Governance framework

The governance of France's climate strategies relies on an integrated and multi-level structure that mobilizes national institutions, local authorities, economic stakeholders, and civil society. This framework aims to coordinate mitigation and adaptation efforts to achieve the goals set by the National Low Carbon Strategy (SNBC), the National Climate Change Adaptation Plans (PNACC), and the Multiannual Energy Program (PPE).

a. National institutions

- Ministry of Ecological Transition: The ministry is responsible for developing, implementing, and monitoring climate strategies, including the SNBC and the PNACC. It also coordinates the Climate Action Plan in collaboration with other sectoral ministries, such as those overseeing transportation, agriculture, and the economy.
- High Council for Climate (Haut Conseil pour le Climat, HCC): Established in 2018, the HCC is an independent body tasked with evaluating national climate policies. It publishes an annual report assessing the alignment of implemented

[29] Gouvernement français, 'PNACC-3 Document de Présentation'.

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actions with the carbon budgets outlined in the SNBC and provides recommendations for adjusting strategies.
- National Observatory on the Effects of Climate Change (ONERC): ONERC oversees the monitoring and coordination of adaptation actions. It plays a key role in developing the PNACC and collecting data on climate impacts.
- Ecological Defence Council: Chaired by the Prime Minister, this body conducts an annual review of climate measures, including those in the Climate Action Plan, and coordinates priorities at the highest level of government.

b. Local authorities

Local authorities play a central role in territorializing climate strategies. They are responsible for implementing several regulatory and operational tools.

- Territorial Climate-Air-Energy Plans (PCAET): Mandatory for all inter-communalities with over 20,000 inhabitants, PCAETs translate national objectives into local actions. These plans include measures to reduce GHG emissions, improve energy efficiency, and enhance resilience to climate impacts.
- Regional Climate-Air-Energy Schemes (SRCAE): Managed by regional councils, these schemes provide strategic guidance for PCAETs and other local initiatives.
- Local financing: Regions and departments can mobilize funds, often in partnership with the state and the European Union, to support adaptation and energy transition projects[30].

c. Civil society and economic actors

Civil society and businesses play an increasingly important role in climate governance.

- Citizen participation: Initiatives such as the Citizen's Convention for Climate (Convention Citoyenne pour le Climat, CCC), which brought together 150 citizens to formulate climate proposals, highlight the potential of democratic engagement. While only 10% of the proposals were adopted without modifications, this process strengthened the connection between citizens and public policies.
- Role of businesses: Companies are encouraged to incorporate climate risks into their strategies through regulations such as the European taxonomy and fiscal incentives for decarbonization. The private sector is also involved in public-private partnerships to develop resilient infrastructure and support innovation in renewable energy.
- NGOs and associations: Non-governmental organizations actively contribute to raising awareness, monitoring policies, and providing scientific expertise. They also play a critical role in evaluating the ambition and effectiveness of implemented strategies.

d. European and international interactions

France's climate strategies are part of a broader European and international framework.

- European framework: The National Integrated Energy and Climate Plan (PNIEC), mandated by the European Union, aligns French policies with EU

[30] Gouvernment français, 'PNACC-3 Document de Présentation'.

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objectives, including a 55% reduction in GHG emissions by 2030 and the development of renewable energy. European funds, such as the Just Transition Fund, support local initiatives in France, particularly in coal or industrial regions undergoing reconversion.

- International commitments: France is a key actor in the Paris Agreement and plays an active role in climate negotiations through the COP process. It also supports developing countries in their transitions via the Green Climate Fund and other international mechanisms.

4. The main dynamic aspects of the strategies

French climate strategies evolve within a constantly adapting framework, reflecting scientific advancements, lessons learned, and societal priorities. This section examines key dynamics: their evolution, implementation periods, monitoring systems, and the involvement of civil society.

a. Evolution of strategies

Since the first national strategy in 2006, French climate policies have progressively grown in ambition and complexity:

- 2006: Adoption of the first National Adaptation Strategy, seven years ahead of the European strategy, establishing a general framework for climate actions.
- 2011–2015 (PNACC-1): Introduction of an adaptation plan structured around 20 key thematic areas and 242 measures.
- 2018–2022 (PNACC-2): Streamlining of priorities into six strategic axes covering health, natural hazards, biodiversity, and economic resilience.
- 2025 (PNACC-3): Enhanced territorial focus with 51 measures across five axes, emphasizing local governance and citizen engagement[31].

In parallel, the National Low Carbon Strategy (SNBC), adopted in 2015 and updated in 2020, introduced sectoral carbon budgets to strengthen efforts in reducing greenhouse gas emissions.

b. Implementation periods

French climate policies are designed around planned cycles, allowing for regular evaluation and adjustment:

- PNACC – Developed for 5- to 6-year periods, with mid-term and end-of-cycle evaluations to assess effectiveness.
- SNBC – Based on five-year carbon budgets, with each period accompanied by an ex-post evaluation.
- Climate Action Plan – Monitored annually through the Ecological Defense Council, ensuring governance at the highest level of the state.

c. Monitoring and evaluation systems

- Indicators and dashboards: The SNBC, PNACC, and PPE are supported by indicator systems to track progress. For example, PNACC-3 includes specific indicators for each measure, enabling detailed territorial monitoring.

[31] Gouvernment français, 'PNACC-3 Document de Présentation'.

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- Role of the High Council for Climate (HCC): The HCC publishes an annual report on the state of French climate policies, highlighting gaps between objectives and results.
- Local Monitoring: Territorial Climate-Air-Energy Plans (PCAET) enable decentralized tracking of mitigation and adaptation actions.

d. Challenges and opportunities

- Local and national cooperation: While the territorialization of the PNACC marks progress, disparities persist among regions in terms of resources and capacities.
- European Integration: France must align its policies with the objectives of the European Green Deal while addressing specific local needs.
- Strengthening Local Capacities: PNACC-3 introduces the creation of the "Mission Adaptation," a one-stop support hub to assist local authorities in implementing their actions[32].

5. Effectiveness of the strategies/policies

The implementation of France's climate strategies, through tools such as the National Climate Change Adaptation Plans (PNACC), the National Low Carbon Strategy (SNBC), and the Multiannual Energy Program (PPE), has shown mixed results. This evaluation, based on available reports, highlights successes, challenges, and recommendations to enhance the effectiveness of these policies.

Evaluation of the National Climate Change Adaptation Plans (PNACC).

a. PNACC-1 (2011–2015)

The first PNACC marked France's inaugural structured adaptation initiative, encompassing 20 key thematic areas and 84 actions broken down into 230 measures. Its 2015 evaluation reported a completion rate of 80%, despite notable shortcomings.

Key achievements

- Advances in knowledge:
  - Development of the "DRIAS – Les futurs du climat" portal, providing regionally tailored climate scenarios.
  - Strengthened studies on specific topics such as sea-level rise and drought impacts.
- Awareness and integration:
  - Climate issues were incorporated into Regional Climate-Air-Energy Schemes (SRCAE) and Territorial Climate-Energy Plans (PCET).
- Specific progress:
  - Updated infrastructure standards to address climate risks (e.g., transportation and construction).
  - Enhanced surveillance of vector-borne diseases and forest genetic resources.

[32] Gouvernement français, 'PNACC-3 Document de Présentation'.

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Identified challenges

- Insufficient coordination:
  - Limited synergy between national and local levels, hindering the implementation of measures.
- Limited engagement:
  - Economic actors and certain local authorities demonstrated low integration of adaptation priorities.
- Lack of clear prioritization:
  - Urgent actions were not always prioritized, diminishing their overall impact.

b. PNACC-2 (2018–2022)

The second PNACC introduced a more robust framework, structured around six strategic domains, 29 thematic areas, and 389 sub-actions, supported by 100 monitoring indicators.

Achievements

- Structural improvements:
  - Establishment of a specialized commission within the National Council for Ecological Transition (CNTE) to enhance governance.
  - Development of the +2°C Reference Warming Trajectory to guide policy measures.
- Sectoral progress:
  - Emphasis on nature-based solutions (NbS) for ecosystem and natural resource management.
  - Increased training and awareness-raising efforts for local stakeholders.
- Strengthened monitoring:
  - Utilization of indicators to assess annual actions and measure progress against set objectives.

Challenges encountered

- Uneven results: Overseas departments and regions, although identified as vulnerable, did not receive sufficient support.
- Mobilization of the private sector: Companies, aside from large groups, showed low participation.

c. PNACC-3

The evaluation of the first two PNACC programs led to several recommendations, which are included in PNACC-3:

- Strengthening governance – improving coordination between the state, regions, and local authorities; creation of the "Adaptation Mission," a single point of contact to support territories in their efforts
- Prioritizing critical actions – focusing on the most vulnerable areas and sectors, especially critical infrastructure and essential services
- Increased mobilization of stakeholders – encouraging active participation from businesses, farmers, and citizens.
- Nature-based solutions – intensifying actions focused on the preservation and restoration of ecosystems to address climate hazards.[33]

d. Evaluation of the National Low-Carbon Strategy (SNBC)

[33] Gouvernment français, 'PNACC-3 Document de Présentation'.

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The SNBC is the main framework for mitigation, aiming for carbon neutrality by 2050. Progress made includes:

- The reduction of overall emissions – A 19% reduction in GHG emissions since 1990, but a gap remains compared to intermediate targets
- Development of renewable energy – renewable energies accounted for 20% of France's energy mix in 2022.

Among the challenges, carbon budgets exceeded in several sectors, particularly in transport and building, and progress in the energy renovation of buildings and the electrification of vehicles has been insufficient.

Social Implications and Public Feedback

- Citizen's Climate Convention (CCC): Although the CCC marked a democratic advancement, only 10% of its proposals have been implemented without modifications, leading to a loss of public trust.
- Tensions around climate projects: Opposition to wind energy projects and resistance to coercive measures, such as the ban on energy-inefficient homes, highlight the need for better communication and increased local dialogue.

6. Other aspects

One of the milestones in the French climate policy is represented by the so-called crisis of the "Gilets Jaunes movement". This is a movement, which began in 2018, that was initially triggered by a proposed increase in fuel taxes intended to support France's climate objectives. However, the protests quickly grew into a broader challenge to economic inequality and government policies perceived as unfairly burdening lower-income households.

The movement revealed a critical tension in climate policy: the balance between environmental objectives and social equity. Many protesters, particularly from rural and peri-urban areas, expressed concerns that the fuel tax disproportionately impacted those with limited access to public transportation and relied on personal vehicles.

Research later showed that the Gilets Jaunes were not inherently opposed to environmental action. On the contrary, they often practiced forms of "quiet" sustainability, such as resource conservation and reuse. Their frustration stemmed more from the perceived inequities in how the costs of climate action were distributed, highlighting the need for policies that consider both ecological and social dimensions.

The Gilets Jaunes crisis led to adjustments in government policy, such as freezing the proposed fuel tax and expanding subsidies for energy-efficient renovations. It also spurred the creation of the Citizen's Climate Convention (*Convention Citoyenne pour le Climat*), which sought to involve citizens in shaping climate action.

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Timeline des dates clés des politiques climatiques françaises
Avant 2010 : Début des initiatives climatiques ● 1999 : Lancement du programme de recherche GICC (Gestion et Impacts du Changement Climatique), premier cadre scientifique pour analyser les impacts du climat en France. ● 2006 : Adoption de la première Stratégie Nationale d'Adaptation au Changement Climatique (SNACC), parmi les premières en Europe. 2010-2020 : Structuration des stratégies climatiques ● 2011 : Lancement du 1er Plan National d'Adaptation au Changement Climatique (PNACC-1) (2011-2015), couvrant 20 thématiques et 84 actions. ● 2015 : ✓ Accord de Paris : Engagement de la France à atteindre la neutralité carbone d'ici 2050. ✓ Évaluation du PNACC-1. ✓ Adoption de la Stratégie Nationale Bas-Carbone (SNBC-1), fixant des budgets carbones sectoriels. ● 2018 : Mise en œuvre du 2e PNACC (PNACC-2) (2018-2022), structuré autour de 6 axes et 389 sous-actions. Depuis 2020 : Accélération des engagements climatiques ● 2020 : Mise à jour de la SNBC-2 avec des objectifs révisés : ✓ Réduction de 40 % des émissions de GES d'ici 2030 (base 1990). ✓ Neutralité carbone d'ici 2050. ● 2021 : Adoption de la Loi Climat et Résilience, intégrant plusieurs propositions de la Convention Citoyenne pour le Climat (CCC). ● 2023 : ✓ Adoption du 3e PNACC (PNACC-3) pour la période 2023-2027, avec 51 mesures réparties sur 5 axes. ✓ Révision des objectifs énergétiques dans la Programmation Pluriannuelle de l'Énergie (PPE). ● 2024 : Consultation publique sur le PNACC-3 en cours jusqu'à décembre. ● 2025 : Publication du PNACC-3

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Liste des principales politiques climatiques françaises
Stratégies nationales • SNACC (2006) : Première stratégie nationale d'adaptation. • PNACC-1 (2011-2015) : Première phase opérationnelle des actions d'adaptation. • PNACC-2 (2018-2022) : Approfondissement et intégration sectorielle. • PNACC-3 (2025) : Nouveau cadre national d'adaptation structuré autour de 5 axes et 52 mesures. (La préparation a commencé en 2023 ; la consultation publique a eu lieu fin 2024). • SNBC (2015, mise à jour en 2020) : Cadre central pour la trajectoire de réduction des gaz à effet de serre et les budgets carbone de la France. Lois et plans nationaux • Loi Grenelle II (2010) : Intégration des enjeux climatiques dans les politiques publiques. • Loi Climat et Résilience (2021) : Renforcement des ambitions climatiques nationales, avec des mesures sur la rénovation énergétique, la mobilité durable, et la préservation des sols. • Plan Climat (2017) : Stratégie globale pour l'atténuation et l'adaptation, avec des actions ministérielles spécifiques. • Programmation Pluriannuelle de l'Énergie (PPE) : Planification énergétique alignée avec la SNBC. Initiatives participatives et internationales • Convention Citoyenne pour le Climat (2019-2020) : Démarche participative ayant produit 149 propositions pour renforcer les politiques climatiques. • Engagement européen : Convergence des politiques nationales avec le Green Deal européen et les objectifs climatiques de l'Union.

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ANNEX B6 – CLIMATE POLICIES IN GERMANY

1. Introduction

Since the end of 2024, governmental changes in Germany were foreseen and Germany held a snap federal election on February 23, 2025. In these elections, the conservative Christian Democratic Union (CDU), led by Friedrich Merz, won the largest share of the vote at about 28.5%. The far-right Alternative for Germany (AfD) came in second with about 20.8%, while the Social Democratic Party (SPD), led by incumbent Chancellor Olaf Scholz, dropped to third place with around 16.4%. Other parties like the Free Democrats failed to meet electoral thresholds for seats this time. Like in Austria, following the election, coalition talks resulted in the formation of a new grand coalition government between the CDU/CSU bloc and the SPD, excluding the right-wing AfD from government. This means that like in Austria a backlash in climate mitigation and adaptation policies was prevented. On May 6, 2025, Friedrich Merz was elected. The coalition agreement focuses on economic stability, digital transformation, energy policy, and other major policy arenas including the climate and energy transition.

Germany's strategic approach to adapting to climate change known as the "*Deutsche Anpassungsstrategie an den Klimawandel*" (DAS) is still in force. Initiated by the German government in 2008, the DAS aims to mitigate climate risks and enhance the adaptive capacity of natural, social, and economic systems. The strategy is organized into various clusters, including infrastructure, land, water, health, and economy, each addressing specific areas affected by climate change. The document also details the implementation and continuous development of the DAS through the Action Adaptation Plan (AAP), regular progress reports, and the involvement of federal and state authorities. Additionally, it highlights the role of the German Climate Preparedness Portal and the interministerial working group led by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety, and Consumer Protection (BMUV) in coordinating efforts and providing necessary tools and information for effective climate adaptation. In addition, with the new Climate Adaptation Law KAnG 2024, the federal government wants to provide a binding framework for climate adaptation at the federal level, *Länder* level, and municipal levels. The federal government thereby commits to presenting a proactive climate adaptation strategy with measurable goals, regularly updating it, and continuously implementing it.

2. Strategies of mitigation and adaptation

In 2008, the German government adopted the German Strategy for Adaptation to Climate Change (Deutsche Anpassungsstrategie – DAS) under the lead responsibility of the Federal Environment Ministry with assistance from the German Environment Agency. This strategy laid the foundation for Germany to prepare for the impacts of climate change and reduce climate risks in a continuous process.

Climate risk analyses and adaptation action plans are important elements of the adaptation process. As part of the German Adaptation Strategy, the impacts of

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climate change and adaptation measures undertaken in Germany are regularly monitored. The DAS provides the basis for climate adaptation policy in Germany.

Since 2024, the German focus is on climate adaptation strategies rather than mitigation strategies. The primary emphasis is on developing and implementing a comprehensive climate adaptation strategy to address the impacts of climate change. This includes particularly the items further outlined in the Annex to this report:

Preventive Climate Adaptation Strategy (*Vorsorgende Klimaanpassungs-strategie*) had its most recent update on December 11, 2024, and it was not updated since then, also not under the new German government from 2025. The strategy is intended to be updated every four years and will be based on a climate risk analysis. It includes various clusters such as infrastructure, land use, human health, urban development, water, economy, and overarching fields like vulnerable groups and occupational safety

Climate Adaptation Concepts (*Klimaanpassungskonzepte*): The Länder (states) are responsible for developing climate adaptation concepts for municipalities and districts. These concepts aim to create a systematic approach to climate adaptation, considering existing processes and activities, and include measures for extreme heat, drought, and heavy rainfall.

Federal-State Cooperation (*Bund-Länder-Zusammenarbeit*): The federal and state governments collaborate to achieve the goals set in the preventive climate adaptation strategy. The federal government supports adaptation through strategy development, coordination, data provision, scientific research, and information dissemination.

Climate Risk Analysis (*Klimarisikoanalyse)*: The federal government conducts a climate risk analysis to identify high-risk areas and inform adaptation measures. This analysis is updated every eight years and serves as a basis for planning and implementing adaptation measures.

Monitoring and Evaluation: The federal government monitors the progress of adaptation and mitigation measures and updates the strategy based on scientific findings and observed climate impacts. A monitoring report is published every four years to inform the public and guide future actions.

With a "holistic" approach, the new KAnG (Bundes-Klimaanpassungesgesetz (KAnG, BGBl. 2023 I Nr. 393 vom 22.12.2023) is aiming to protect life, health, infrastructure, and ecosystems the like.

2.1. Objectives

Objectives of the German strategy are to:

- Protect life and health, society, economy, infrastructure, nature, and ecosystems from the negative impacts of climate change
- Avoid or, where unavoidable, minimize the potential damages caused by climate change
- Increase the resilience of ecological systems and society to ongoing and future climatic changes to maintain equivalent living conditions
- Contribute to national and international efforts in climate adaptation
- Prevent the increase of social inequalities due to the negative impacts of climate change

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2.2. Rationale and Timeframe

The time frame for the strategy includes the following key time spans.

- The Federal Government has presented its climate adaptation strategy on December 11, 2024. It has not been updated since. The plan is that the strategy will be updated every four years, taking into account the latest scientific findings.
- The Federal Government will create a climate risk analysis, which will be updated at least every eight years.
- The Länder (states) must submit their own proactive climate adaptation strategies by January 31, 2027, and update them at least every five years.

2.3. Mitigation strategy in Germany

Mitigation policies in Germany, particularly in the context of climate change, refer to strategies and measures aimed at reducing greenhouse gas emissions and enhancing carbon sinks to mitigate the impacts of global warming. A short description of some key mitigation policies in Germany follows. As outlined in the introduction, no severe changes up to today have occurred, as the new government reaffirmed Germany's binding targets of reducing greenhouse gas emissions by 55% by 2030 (compared to 1990) and achieving carbon neutrality by 2045.

Renewable energy expansion: Germany has been a global leader in promoting renewable energy sources such as wind, solar, and biomass. The country aims to increase the share of renewables in its energy mix through the Renewable Energy Sources Act (EEG).

Energy efficiency: Germany has implemented various measures to improve energy efficiency in buildings, industry, and transportation. This includes stringent building codes, incentives for energy-efficient appliances, and support for industrial energy-saving technologies.

Emissions Trading System (ETS): As part of the European Union, Germany participates in the EU Emissions Trading System, which sets a cap on the total amount of greenhouse gases that can be emitted by covered entities and allows for the trading of emission allowances. The new government has indicated recently it may revise some existing policies like the heating provisions of the Building Energy Act, seeking simpler and more publicly acceptable mechanisms, a roadmap for this is still pending.

Coal phase-out: Germany has committed to phasing out coal-fired power plants by 2038. This involves transitioning to cleaner energy sources and providing support for affected regions and workers. The new government commits to continuing the coal phase-out by 2038 and the expansion of renewables across all technologies with an emphasis on grid compatibility and energy storage.

Transportation policies: Germany promotes the use of electric vehicles (EVs) through subsidies, tax incentives, and the development of charging infrastructure. Additionally, there are efforts to enhance public transportation and encourage cycling and walking.

Carbon pricing: Germany has introduced a national carbon pricing system for sectors not covered by the EU ETS, such as transportation and heating. This system sets a price on carbon emissions to incentivize reductions.

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Research and innovation: The German government supports research and development in climate-friendly technologies and practices, fostering innovation in areas such as renewable energy, energy storage, and sustainable agriculture.

International cooperation: Germany actively participates in international climate negotiations and agreements, such as the Paris Agreement, and provides financial and technical support to developing countries for climate mitigation and adaptation efforts through initiatives like the International Climate Initiative (IKI).

Mitigation policies in the sixteen German Länder

In Germany, the Länder (federal states) have their own mitigation policies that complement national efforts to reduce greenhouse gas emissions and address climate change. While the specific policies can vary from one Land to another, some common themes and initiatives include:

Renewable energy promotion: Many Länder have their own targets and programs to increase the share of renewable energy in their energy mix. This includes supporting the development of wind farms, solar parks, and biomass facilities.

Energy efficiency programs: Länder often implement regional programs to improve energy efficiency in residential, commercial, and public buildings. This can include subsidies for energy-efficient renovations, grants for energy audits, and incentives for the adoption of energy-saving technologies.

Sustainable transportation: Regional governments promote sustainable transportation options such as public transit, cycling, and walking. This can involve investments in public transportation infrastructure, the development of bike lanes, and initiatives to reduce car dependency.

Building codes and standards: Some Länder have stricter building codes and standards than the national requirements, aimed at improving the energy performance of new and existing buildings.

Climate action plans: Many Länder have developed their own climate action plans, which outline specific measures and targets for reducing greenhouse gas emissions. These plans often include sector-specific strategies for energy, transportation, industry, and agriculture.

Support for local governments: Länder provide support to municipalities and local governments to implement their own climate mitigation projects. This can include financial assistance, technical support, and capacity-building programs.

Public awareness and education: Regional governments often run public awareness campaigns and educational programs to inform citizens about climate change and encourage sustainable behaviours.

Research and innovation: Some Länder invest in research and development of climate-friendly technologies and practices, often in collaboration with local universities and research institutions.

Green infrastructure: Initiatives to enhance green infrastructure, such as urban green spaces, forests, and wetlands, are also common. These efforts help to sequester carbon and improve resilience to climate impacts.

Industry and business initiatives: Länder may offer incentives and support for businesses to adopt more sustainable practices, such as energy efficiency improvements, waste reduction, and the use of renewable energy.

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2.4. Adaptation strategy in Germany

The 2024 German Adaptation Strategy is the first strategy to establish measurable targets for climate adaptation in Germany. It contains 34 targets and 53 sub-targets. Most of the targets are to be met in 2030, some in 2050. Target-specific indicators will be used to measure success. It is important that the public and businesses are not burdened with additional bureaucracy or reporting obligations. Also with the new German government, the same Adaptation strategy is in force.

The targets are structured in seven clusters that represent the entire range of adaptation and precautionary action:

- Infrastructure
- Land and land use
- Human health and care services
- Urban development, spatial planning and civil protection
- Water
- Businesses
- cross-cluster topics.

Targets under the clusters “water” and “land and land use” that fall within the responsibility of the Federal Environment Ministry include:

- Improving soil resilience to the consequences of climate change
- Strengthening resilience of water infrastructure
- Preserving sufficient, good quality water resources.

One example for the scheme of measurable targets and corresponding indicators of the Adaptation Strategy, in force since July 2024 (Deutsche Anpassungsstrategie, DAS), is that the strategy sets the target of strengthening resilience of the landscape hydrology. This means, first and foremost, to restore nature’s capacity to retain water. This requires as many unsealed areas of land as possible, which can absorb water, and healthy, loose soils, which can store water for longer periods of time. This is a sub-target of the target to maintain available water resources in the long term.

Indicators will help make progress on this target measurable and transparent. One of these indicators is the recovery of natural flooding areas. Recovering natural flooding areas means that bodies of water will have more room and watercourses will be reconnected to alluvial plains. Two other indicators to make progress measurable are currently being drawn up on rewetted bogs and drained farmland and forests.

To summarise, the implementation and coordination of the DAS are managed by the Federal Ministry for the Environment, Climate Action, Nature Conservation, and Nuclear Safety – BMUKN (formerly “Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection – BMUV, in the last government) through the Inter-ministerial Working Group on Adaptation to Climate Change (IMAA). This group involves all federal ministries, which regularly coordinate their activities and set new goals to facilitate climate adaptation in Germany.

Finally, the DAS is supported by the Climate Change and Adaptation Network, led by the Federal Environment Agency, which focuses on the scientific development and coordination of the strategy. The strategy is continuously updated to reflect the expanding knowledge base on climate change and its impacts, with regular

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progress reports and action plans being published to track and guide adaptation efforts

Specific adaptation initiatives by some Länder

The new federal government collaborates with the 16 Lander (states), which are now responsible for developing their own climate adaptation concepts by January 2027, updated every five years. This federal-state coordination aims to ensure regionally tailored adaptation actions. The timeline until January 2027 leaves enough leeway for them. This has not been changed under the new government in 2025 and will still be kept in force.

North Rhine-Westphalia: The state has set ambitious targets for reducing greenhouse gas emissions and increasing the share of renewable energy. It also has a comprehensive climate protection law and a climate protection plan. The purpose of the climate protection law from 2021 is to define climate targets and create the legal basis for the development of a climate adaptation strategy and the implementation, review, reporting and updating of climate adaptation measures.

The aim is to limit the negative effects of climate change, in particular to reduce the threat of damage, increase climate resilience and contribute to national and international efforts to adapt to climate change. Its basis is the obligation under the Paris Agreement based on the United Nations Framework Convention on Climate Change (Federal Law Gazette 2016 II p. 1082, 1083), according to which the contracting parties contribute to sustainable development by improving adaptive capacity, strengthening resilience and reducing vulnerability to climate change.

Monitoring is firmly anchored in the NRW Climate Adaptation Act (2021). The State Agency for Nature, Environment and Consumer Protection NRW (LANUV NRW) is commissioned by the MULNV to carry out the "Climate Impact and Adaptation Monitoring" for the state (KFAM NRW) with the aim of identifying the effects of climate change on nature, the environment and society at an early stage and making the impact of adaptation measures in NRW measurable. KFAM NRW thus provides the necessary basis for tracking trends in the effects of climate change and the progress of adaptation processes and for managing the further development of adaptation policies in a needs-oriented and targeted manner.

Bavaria: Bavaria has its own climate program, which includes measures to promote renewable energy, improve energy efficiency, and support sustainable agriculture. The state government presented the "Bavarian Climate Adaptation Strategy (BayKLAS)" back in 2009. The overarching goal is to motivate all stakeholders to become independently involved in overcoming the challenges of climate change. This is to be achieved through modern and practical instruments such as networking of all stakeholders, dialog and information, targeted research, training and further education as well as financial support. BayKLAS has been updated and further developed in terms of structure and content.

The updated "Bavarian Climate Adaptation Strategy (BayKLAS 2016)" was published in 2022 and provides an overview of the climatic changes already observed and the changes expected in Bavaria in the future. Based on this, the most important consequences for all climate-sensitive fields of action of BayKLAS are highlighted and existing and possible climate adaptation measures in Bavaria are presented, taking into account their effectiveness, implementation, urgency, responsibility, implementation basis and intersectoral networking between the fields of action. BayKLAS also provides information on funding opportunities for the

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implementation of climate adaptation measures for companies, municipalities and private individuals.

In addition, the Bavarian Climate Protection Program is based on the three pillars of climate protection, climate research and climate adaptation. It currently comprises almost 150 individual measures from all three areas in five central fields of action. The program is thus dedicated to all the efforts we need to make to limit further global warming, adapt to the consequences of climate change that has already occurred and continuously expand our knowledge of climate change and its consequences.

The Bavarian climate protection measures are evaluated in the report on climate protection 2050.

Berlin: The Berlin Energy Transition Act (EWG Bln) passed by the House of Representatives in 2016 was amended in 2021 as the Climate Protection and Energy Transition Act. This state law on implementing the energy transition and promoting climate protection in the state of Berlin also established adaptation to the consequences of climate change as a task of politics and administration for the first time.

The concept study "Adaptation to the consequences of climate change in Berlin" (AFOK) was published in 2016. In this study, a vulnerability analysis was carried out on the basis of currently observed changes in weather patterns and weather extremes as well as climate projections. Recommendations for specific adaptation measures were then formulated for the nine fields of action identified. The measures from the adaptation concept that could be implemented in the short and medium term from an administrative perspective were transferred to the Berlin Energy and Climate Protection Program (BEK) 2030 and thus formed the basis for targeted action in the area of climate adaptation in the state of Berlin. In 2018, the BEK 2030 was adopted by the Berlin House of Representatives for the first implementation period until 2021.

In summer 2021, the update process began for the climate adaptation part of the BEK 2030 for the implementation period 2022 to 2026. In a process lasting a good year, the implementation of measures to date was evaluated with the involvement of the responsible departments of the main administrations, their subordinate authorities and the district administrations as well as other representatives from science and urban society. Based on this and in the context of the existing climate risks and vulnerabilities, a total of around 50 measures were formulated for 10 identified fields of action, with which climate adaptation in the state of Berlin is to be further advanced.

Saxony-Anhalt (Sachsen-Anhalt): The country-specific adaptation measures are included in the country's strategy for adapting to the consequences of climate change and can be found at www.klimawandel.sachsen-anhalt.de. The "Third Implementation Report 2021 of the State Strategy" summarizes the implementation status of the measures mentioned in the adaptation strategy. In 2007, the state government of Saxony-Anhalt formed an interdisciplinary and interdepartmental climate working group (AG Klima). The Climate Working Group includes members from the administration, the state's specialist authorities, local authority associations, the state's universities and colleges and national research organizations, e.g., the Leipzig Environmental Research Centre (UFZ) and the German Weather Service. The tasks of the Climate Working Group include climate

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protection and the state's adaptation to the consequences of climate change. Its main tasks include providing policy advice, initiating research projects and drawing up, updating and monitoring the implementation of adaptation strategies in the state. The office of the Climate Working Group is the State Office for Environmental Protection (LAU).

ReKIS: The Regional Climate Information System ReKIS, jointly operated by Saxony, Saxony-Anhalt and Thuringia, is an interactive tool for the provision, documentation, evaluation and interpretation of climate data. In addition to the data service, further information on the topic of climate is provided.

As part of the DAS funding program, the Harz and Magdeburg-Stendal universities carried out the project "Soil erosion reduction in mountainous regions using the example of the Mansfeld-Südharz district (BebeR)" from 2016 to 2019.

These regional efforts are crucial in achieving Germany's overall climate goals and ensuring that mitigation actions are tailored to the specific needs and circumstances of each Land.

3. Governance framework

The governance framework for climate policies in Germany involves multiple levels of government, including the federal government, the Länder (federal states), and local municipalities. This multi-level governance structure ensures that climate policies are coordinated and implemented effectively across the country. Key components of the governance framework include the following.

Federal Government: The federal government plays a central role in setting national climate targets, developing overarching policies, and ensuring compliance with international agreements. Key federal institutions involved in climate governance include:

- Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV): Responsible for environmental policy, including climate change mitigation and adaptation
- Federal Ministry for Economic Affairs and Climate Action (BMWK): Oversees energy policy, including the transition to renewable energy and energy efficiency measures
- Federal Environment Agency (UBA): Provides scientific support and policy advice on environmental issues, including climate change
- Federal Network Agency (BNetzA): Regulates the electricity and gas markets, ensuring the integration of renewable energy sources

Länder (Federal States): The Länder have significant autonomy in implementing climate policies and often develop their own climate action plans and strategies. They are responsible for areas such as regional planning, building codes, and transportation, which are crucial for climate mitigation and adaptation. Coordination between the federal government and the Länder is facilitated through various mechanisms, including:

- Conference of Environment Ministers (UMK): A platform for the 16 environment ministers of the Länder to coordinate their policies and collaborate with the federal government

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- Joint Federal-Länder Working Groups (between Federal State and the *Länder*): These groups address specific climate-related issues and ensure that policies are aligned across different levels of government.

Local governments (Municipalities): Local governments play a critical role in implementing climate policies on the ground. They are responsible for urban planning, local transportation, and public services, and they often develop their own climate action plans. Municipalities can also participate in initiatives such as the Covenant of Mayors for Climate and Energy, which promotes local climate action.

Citizens participation: Germany places a strong emphasis on involving the public and engaging stakeholders in the development and implementation of climate policies. This includes public consultations, stakeholder dialogues, and the involvement of civil society organizations, businesses, and scientific institutions.

Research and innovation: The German government supports research and innovation in climate-friendly technologies and practices through funding programs and partnerships with research institutions and the private sector. This includes initiatives like the Energy Research Program and the National Hydrogen Strategy.

Overall, Germany's governance framework for climate policies is characterized by a collaborative approach that involves multiple levels of government, a strong legal basis for climate action, and active engagement with stakeholders and the international community.

4. The main dynamic aspects of the strategies

Progress reports and their dynamic aspects

The strategies outlined above are connected to regular progress reports and updates to the action plans every 4 to 5 years. Reckien et al. (2018) show that cities are five times more likely to have adaptation plans if there is a national mandate to do so, but there is not yet evidence of national mandates for state CCA plans and their potential impact on lower levels (King, 2022). This leads to the question if, within these dynamics, Germany will continue to incentivize and encourage national adaptation policies, leading to regionalized deficits, or if at some point, the federal government will introduce harder instruments and mandate adaptation policies in the 16 *Länder*. The German Adaptation Strategy (DAS) is designed as a living document, it should be capable of adapting to new information and changing circumstances, but this is also its weakness, as it has no direct legal power. It is continuously developed and updated to incorporate the expanding knowledge base on climate change and its impacts. This ensures that the strategy remains relevant and effective in addressing new challenges and opportunities as they arise.

Regular Monitoring and Reporting

The strategy includes a robust monitoring and reporting mechanism. A monitoring report will be created at least every four years to inform the public about the observed effects of climate change and the progress in achieving the goals. If goals are not met, measures will be adjusted accordingly. The monitoring will provide the

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scientific basis for evaluating progress and updating the strategy. The report provides an overview of observed climate change impacts, and the adaptation measures already initiated in Germany, updated every four years. Additionally, the climate impact and risk analysis (*Klimawirkungs und Risikoanalyse*) identifies specific climate impacts and regions requiring action, updated every six years. Finally, the monitoring provides the scientific basis for evaluating progress and updating the strategy.

Evaluation and Feedback

The strategy includes an evaluation process to analyse the effectiveness of the DAS and its implementation. This external evaluation occurs every four years, providing critical feedback to refine and improve the strategy.

Stakeholder Involvement

The DAS involves various stakeholders, including federal states, municipalities, associations, scientists, and citizens, through the "dialogue for climate adaptation" (*Dialog KlimaAnpassung*). The public, along with associations and other stakeholders, will be involved in setting measurable goals, selecting indicators, and choosing measures. This inclusive approach ensures that diverse perspectives and ideas are integrated into the strategy, enhancing its comprehensiveness and acceptance.

5. Effectiveness of the strategies/policies

Development and Implementation: The Federal Government is required to present a proactive climate adaptation strategy with measurable goals by September 30, 2025, and update it every four years based on current scientific knowledge. As there was a new government installed in May 2025, no new goals have been introduced yet.

The strategy should be further updated based on climate risk analysis and will include various clusters such as infrastructure, land use, health, urban development, water, economy, and overarching fields like vulnerable groups and occupational safety.

The strategy will set ambitious, measurable goals for each cluster, define indicators to measure goal achievement, and specify federal measures to achieve these goals. It will also recommend measures for the states and establish a mechanism to evaluate progress. Sustainable adaptation measures will be prioritized, especially those with synergies in natural climate protection, biodiversity, resilient water management, and sustainable urban development.

The Federal Government and the states will collaborate to achieve the goals set in the strategy. The states will develop their own climate adaptation strategies, which can be based on the federal strategy and must be updated every five years.

The Federal Government will support the states through strategy development, coordination, data provision, scientific research, and networking. The strategy is supported by a legal framework that includes the establishment of climate adaptation concepts for public entities under federal supervision and the adaptation of federal properties to climate change.

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The law on *Klimawandelanpassung* came into effect on July 1, 2024. The new government reaffirms Germany's binding targets of reducing greenhouse gas emissions by 55% by 2030 (compared to 1990) and achieving carbon neutrality by 2045. It also continues to support the EU's climate neutrality goal and aims for a 90% emissions reduction by 2040.

Overall, both the Law and the DAS appear to be a well-structured and continuously evolving strategy with mechanisms in place for regular monitoring, evaluation, and stakeholder involvement, which are crucial for its effectiveness. However, the actual impact and success of the strategy would depend on the implementation of these measures and the tangible outcomes observed over time.

Emissions reduction

When it comes to the progress in emissions reduction in Germany, both the climate adaptation Law (2023) (Klimawandelanpassungsgesetz) and the German Adaptation Strategy (DAS) support emissions reduction. Germany's efforts in emissions reduction are a combination of regulatory measures, technological advancements, and societal shifts towards more sustainable practices. However, challenges remain, particularly in sectors like transportation and industry. Germany has achieved a reduction of approximately 40.8% by 2020 (compared to 1990 level) and has set further targets to reduce emissions by 55% by 2030, 65% by 2040, and to achieve carbon neutrality by 2045. One decisive part of Germany's emissions reduction strategy is the energy transition (*Energiewende*), which focuses on increasing the share of renewable energy in the electricity mix while phasing out nuclear and coal power. For instance, in 2022, renewable energy sources accounted for about 45% of Germany's electricity consumption, up from just 6% in 2000. Finally, it has committed to phasing out coal-fired power plants by 2038. Coal is one of the most carbon-intensive sources of energy and this appears as a crucial step.

The government has provided financial support to coal regions to help them transition to more sustainable economic activities.

Effectiveness of CC policies in the German Länder

The effectiveness of climate change (CC) policies in the German Länder (federal states) is closely tied to the collaborative framework established between the federal and *Länder* governments. The Standing Committee on Adaptation to the Consequences of Climate Change (*Ständige Ausschuss zur Anpassung an die Folgen des Klimawandels,* StA AFK) plays a crucial role in this collaboration, ensuring that the specific strategies and measures of the state administrations are considered in the work related to the (DAS). This committee is part of the broader Bund-Länder-Arbeitsgemeinschaft Klima, Energie, Mobilität und Nachhaltigkeit der Umweltministerkonferenz, which facilitates ongoing dialogue and coordination.

The German Climate Preparedness Portal, launched by the federal government in September 2018, supports municipalities, businesses, and civil society with tailored information and tools to manage the impacts of climate change. This portal is accompanied by a network facilitated by the Umweltbundesamt, where stakeholders can exchange knowledge, receive advice, and learn from each other.

The implementation and continuous development of the DAS are overseen by the Federal Ministry for the Environment, Climate Action, Nature Conservation, and Nuclear Safety (BMUKN) (formerly Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV) in the former government)

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through the Interministerielle Arbeitsgruppe Anpassung an den Klimawandel (IMAA). This interministerial working group ensures that all federal ministries collaborate, regularly align their activities, and set new goals to create the necessary conditions for climate adaptation in Germany. The Behördennetzwerk Klimawandel und Anpassung, led by the Umweltbundesamt, supports the IMAA by focusing on the scientific aspects of the DAS.

In summary, the effectiveness of CC policies in the German Länder is enhanced by a framework of collaboration, continuous development, and rigorous monitoring and evaluation, ensuring that both federal and state-level strategies are aligned in addressing the impacts of climate change.

6. Other aspects considered important

There are challenges at certain phases of the policy cycle in Germany (e.g., agenda setting and passing legislation) and thus gaps were identified as common barriers to CCA (Climate Change Adaptation), such as unclear or non-binding goals (King, 2022). In other words: the process of passing legislation for CCA can be difficult due to the varying levels of commitment and attention to detail among the states. This can result in substantial variation in the strategic planning and implementation of CCA policies These challenges indicate that while there is flexibility in how the sixteen *Länder* can approach CCA, this same flexibility can lead to inconsistencies and gaps in policy implementation and effectiveness. In addition, a lack of financial and human resources slows the implementation of preparation efforts against the impacts of climate change, and a fragmented approach is also considered as a hurdle for Germany. There might be however, a growing awareness that not acting now will result in much greater financial and human costs in the future. Dealing with the effects of extreme weather events caused by climate change has already cost Germany at least 80 billion euros since 2018, according to the last 2022 report commissioned by the economy and climate action ministry (BMWK). On average, extreme heat, drought, and floods have cost the country at least 6.6 billion euros per year in damages over the past two decades. "The numbers sound the alarm for more prevention when it comes to the climate" environment minister Steffi Lemke said in 2022. Steffie Lemke was from the green party, and it appears, that with the new German government, where the green party is absent, despite the promises to continue to aim at pushing renewable energy expansion, energy efficiency, and carbon pricing, there are delays or weakening of some policies (e.g., in building regulations or transport emissions) risk impeding faster reductions. Research groups like Climate Action Tracker project that Germany's 2030 emission levels may fall short by approximately 85 million tons CO2-equivalent compared to the target.

Finally, according to our expert interviews the reaching of the targets remains critical. In other words: while Germany remains legally committed to its 2030 climate mitigation target by the analysed documents, the current coalition's policies and the coalition agreement's content suggest that the target may be missed or only just reached with risk, depending on the effectiveness and speed of policy implementation, innovation in clean technologies, and management of carbon sinks like forests.

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ANNEX B7 – CLIMATE POLICIES IN ITALY

1. Introduction

The policies and measures adopted by Italy to respond to climate change are guided by the international guidelines of the Paris Agreement and the European adaptation strategy. In this direction, the first steps at the national level were taken in 2015, when the National Strategy for Adaptation to Climate Change (SNAC) was proposed and adopted. Subsequently, other strategies and measures have been put in place to manage the energy transition and combat climate change. In a strict chronological sense, these include, among other: the National Integrated Energy and Climate Plan (PNIEC, 2019); the Italian Long-Term Strategy[34] (NLTS, 2021); the Ecological Transition Plan (PTE, 2021); the National Climate Change Adaptation Plan (PNACC, 2023).

All of these are complemented by a range of other sectoral action plans,[35], as well as the National Recovery and Resilience Plan (PNRR) as the main implementation instrument with its Mission 2 'Green Revolution and Ecological Transition' and with the subsequent Mission 7 'REPowerEU', added in 2024[36].

Although complementary and interrelated, and maturing within the more general framework of European indications, these strategies and measures governing Italian national climate change policies operate with their own specific objectives. Taken as a whole, they are aimed at developing a national vision on the common pathways to be taken to tackle climate change by counteracting and mitigating its impacts, achieving 'climate neutrality' by 2050.

2. Strategies of Mitigation and Adaptation

There is no formal and institutional distinction between mitigation and adaptation measures in the policies and programmes implemented in Italy. Although, as mentioned above, a specific adaptation strategy with a related implementation plan has been formulated, many of the plans contain measures of both types (an illustrative picture of the possible interactions between these measures is briefly outlined in section 4). An attempt has therefore been made to reconstruct a general framework, drawing where necessary on the various reference plans.

The Italian policies in this field refer to some general principles which are: 1. Adopt an approach based on knowledge and awareness; 2. Work in partnership and involve stakeholders and citizens; 3. Work in close coordination with the world of research and innovation; 4. Consider the complementarity of adaptation with respect to mitigation; 5. Act according to the precautionary principle in the face of scientific uncertainties; 6. Act according to a flexible approach; 7. Act according to

[34] The full title is: Italian long-term strategy on the reduction of greenhouse gas emissions.
[35] Among these we can mention: Sustainable Energy Transition Plan Suitable Areas (PiTESAI, 2018); National Air Pollution Control Program (PNCIA, 2020); National Plan for the mitigation of hydrogeological risk, restoration and protection of environmental resources (2019); National Hydrogen Strategy (SNI, 2020).
[36] Mission 7 aims to strengthen energy distribution networks, accelerate the production of renewable sources and increase energy efficiency.

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the principle of sustainability and intergenerational equity; 8. Adopt an integrated approach to evaluation; 9. Integrate with existing policies; 10. Carry out regular monitoring and evaluation of progress.

The following figure shows the different measures of the overall framework of initiatives, both adaptation and mitigation, with reference to the three major thematic areas: Climate; Biodiversity; Resources.

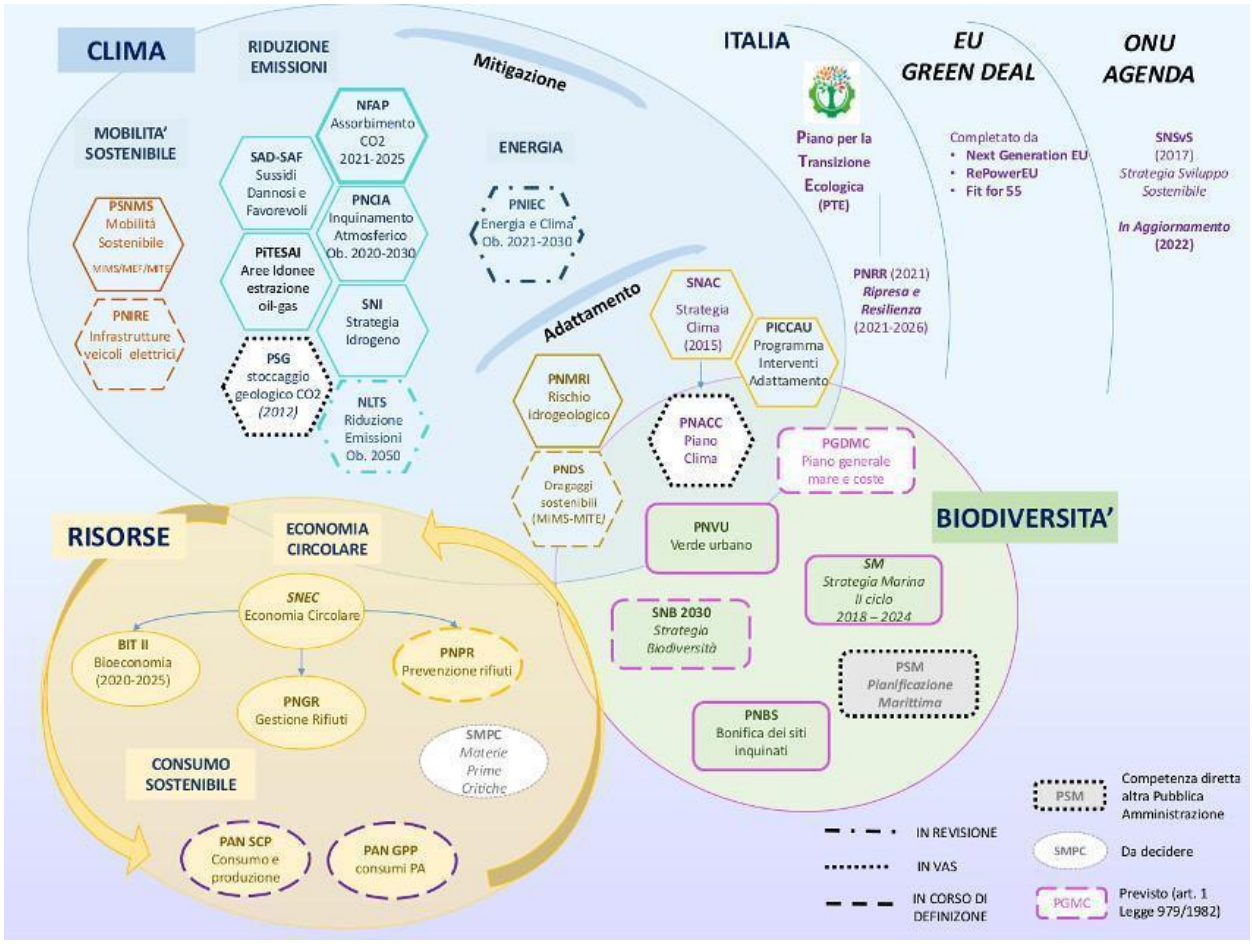

Figure 1 – Adaptation and mitigation measures in Italy, with reference to the three major thematic areas: Climate; Biodiversity; Resources

Moreover, the Social Climate Plan (PSC – *Piano Sociale per il Clima*) implements Regulation (EU) 2023/955 establishing the Social Climate Fund, and is expected to be operational starting from 2026. The Plan aims to support the most vulnerable groups during the energy transition, mitigating the costs arising from new environmental policies such as the extension of the Emission Trading System (ETS) to the residential, building, and road transport sectors. Overall, the PSC represents a necessary complement to the PNIEC, ensuring that climate and energy policies do not exacerbate inequalities, energy poverty, or social vulnerability, and that the transition remains fair and inclusive for all.

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2.1. Objectives

In general, referring to what is stated in Mission 2 of the PNRR[37], the objectives of Italian policies are to achieve the green, ecological and inclusive transition of society and the economy, to make the system as a whole sustainable and competitive, and to favour the circular economy, the development of renewable energy sources, and a more sustainable agriculture. Specifically, they aim at:

- Climate neutrality – bring forward in forced stages the process of zeroing anthropogenic greenhouse gas emissions to net zero in 2050
- Pollution zeroing – bring pollution below the World Health Organisation's warning thresholds, towards substantial zero
- Climate change adaptation – make operational the various climate change adaptation measures that are already having an impact on land, biodiversity and various economic activities
- Restoration of biodiversity and ecosystems – in connection with the mitigation and adaptation goals, the aim is to enhance the national biodiversity stock with conservation measures (increase of protected areas on land and sea), and to implement nature-based solutions in order to restore more naturalness to urban, degraded areas and key areas such as rivers and coastlines
- Transition to the circular economy and the bioeconomy – moving from a linear to a circular economic model, rethought in function of an additive production model.

Additionally, the Social Climate Plan aims to place strong emphasis on citizen engagement, particularly among vulnerable groups in the adoption and implementation of adaptation and mitigation measures. It pursues objectives of promoting social equity, advancing energy sustainability, providing targeted economic support, and strengthening participatory governance to ensure an inclusive and effective transition.

2.2. Rationale and Timeframe

In Italy, the protection of the environment, ecosystem and agricultural resources is the exclusive competence of the central government. The Ministry of the Environment and Energy Security (MASE) is responsible for implementing mitigation and adaptation policies. The Ministry coordinates activities related to adaptation strategies and plans, and thus all institutional and non-institutional actors at national, regional and local levels.

As mentioned above, the general objective is to achieve "climate neutrality" by 2050. In any case, the various plans and measures that have been implemented or are in the process of being defined have specific deadlines and milestones for monitoring and evaluation.

2.3. Mitigation strategy in Italy

The Ecological Transition Plan (PTE) integrates with the National Recovery and Resilience Plan (PNRR) and coordinates the environmental policies that should lead to the transformation of the country system in order to make it capable of achieving the objectives set at international and European level for 2050. The PTE defines

[37] In order not to create confusion, acronyms are given in their original language, while extended titles of strategies, plans and programmes have been translated.

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some macro-objectives for mitigation and adaptation that are shared at European level. For mitigation, these are essentially the following.

- Climate neutrality: aiming for net zero anthropogenic greenhouse gas emissions by 2050, in particular through the progressive phase-out of fossil fuels and the rapid conversion to renewable sources; the transition to healthy, regenerative and circular agriculture and livestock farming according to the European "farm to fork" strategy; the fight against forest fires; the introduction of measures to regulate animal grazing areas.
- Zero pollution: to reduce pollution below the World Health Organisation's alert thresholds, with a view to achieving substantial zero pollution, and to promote sustainable mobility with a view to decarbonising and reducing road congestion and its multiple implications.
- Biodiversity and ecosystem restoration: The aim is to enhance the national biodiversity heritage through conservation measures (increasing protected terrestrial and marine areas) and the implementation of nature-based solutions to restore urban and degraded areas and key areas such as rivers and coasts to a more natural state.

As can be seen in the figure above, there are three macro areas of intervention for climate change mitigation, namely energy, emissions reduction and sustainable mobility. Within this framework, the plan identifies eight specific areas of intervention, some of which are strictly aimed at mitigating the effects of climate change, others more aimed at managing biodiversity and combining adaptation and mitigation measures, and the last, as can be seen in the figure, aimed at resource management. The eight areas are:

1. Decarbonisation
2. Sustainable mobility
3. Air quality improvement
4. Combating land consumption and hydrogeological instability
5. Improvement of water resources and related infrastructure
6. Restoration and enhancement of biodiversity
7. Protection of the sea
8. Promotion of circular economy, bio-economy and sustainable agriculture.

The areas strictly or predominantly aimed at mitigating climate change are presented below.

Decarbonisation

In line with the Paris Agreement, the objective is to achieve net-zero emissions by 2050 and to stabilise global warming at 1.5-2°C. This target implies a 55% reduction in greenhouse gas emissions by EU countries by 2030 (compared to 1990 levels), which at national level means a reduction of 256 million tons of CO^2 (compared to 418 million tons in 2019).

To achieve this objective, the plan calls for further efforts in energy saving policies, especially in the transport and construction sectors, the electrification of the primary energy system with a strong introduction of renewable energy sources (up to 72%) and the complete phase-out of coal. The revolution in the energy system will have to be accompanied by a substantial decarbonisation of the industrial sector, maintaining, in the 'hard to abate' sectors (steel, glass, ceramics, cement, chemistry) the guiding principle of 'energy efficiency first', which finds in efficiency the first lever to be used to obtain economic and environmental benefits in terms

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of reducing emissions. In this framework, the intention is to resort to a combination of several actions, such as: the transition from fossil fuels to renewable fuels such as hydrogen, bioenergy and synthetic fuels, the increased electrification of consumption and the use of residual CO^2 capture and storage (CCS – CCU).

Further emission savings can be achieved through material substitution in the construction sector and more generally through the adoption of circular economy practices and Minimum Environmental Criteria (CAM), which already require the use of a certain proportion of recycled materials. There must also be a boost from agriculture, in line with the Farm to Fork strategy, with the gradual replacement of the most polluting farm vehicles and the transition to more sustainable farming and livestock practices – agro-ecology, precision agriculture – which, in addition to reducing ammonia emissions, will allow greater carbon sequestration in the soil and an increase in bioenergy.

Finally, the aim is to control the ongoing phenomenon of energy poverty, which in Italy affects 13% of families, households that for economic and social reasons are unable to adequately heat or cool their homes.

Sustainable mobility

A second area concerns transport, which is responsible for around 26% of emissions in Italy. In general, the Italian plan is in line with the main objectives of the European mobility strategy (2020), which include 30 million electric cars by 2030 (6 million in Italy), zero-emission ships and planes between 2030 and 2035, a doubling of high-speed rail traffic by 2030 and a tripling by 2050, a 50% increase in rail freight traffic by 2030 and a doubling by 2050.

Actions to achieve this objective have already been identified and launched through various components of the PNRR (Mission 2, Mission 3 and Complementary Fund). These actions are aimed at: strengthening the national railway system and completing certain infrastructures (for over 35 billion); improving regional railway networks for commuters; ecological conversion of local mobility with the creation of 570 km of urban cycle paths and 1200 km of tourist cycle paths; modernising the public transport fleet with the introduction of around 3,000 electric or hybrid buses and the development of a public electric recharging infrastructure network with 7,500 points on motorways and another 13,750 points in cities, in addition to 100 experimental hydrogen recharging stations for cars and trucks.

Other measures concern freight transport. For land transport, a gradual shift from road to rail is planned, as well as the modernisation of rolling stock (locomotives, freight wagons). For maritime transport, the aim is to make hydrogen and alternative fuel engines operational, while work is already underway on a major project to electrify ports (implementation of the national “cold ironing” plan and green ports).

Air quality improvement

The European Commission’s Communication “Towards zero pollution for air, water and soil” proposes, as an intermediate step towards zero pollution by 2050, to reduce in this decade the impact on health (premature deaths) by more than 55%; the impact on EU ecosystems, where air pollution threatens biodiversity, by 25%; and the production of urban waste, the treatment of which contributes to air, water and soil pollution, by 50%.

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In this context, Italy is paying particular attention to the use of woody biomass, which is climate-neutral but potentially harmful to health, and to the progressive reduction of emissions from the agricultural sector (such as ammonia), implementing a "green" conversion process that has been underway in Italy for years, with good results. The agricultural sector will also be able to contribute by implementing the mandatory measures provided for in the National Indicative Code of Good Agricultural Practice and the Common Agricultural Policy programmes.

The National Air Pollution Control Program (PNCIA) has identified and launched (with results even higher than the intermediate objectives of 2020) a set of measures that will allow the reduction targets of the main pollutants to be achieved by 2030. This is in line with the provisions of the European Commission's Thematic Strategy and the National Emission Ceilings (NEC) Directive, which commit Europe to significant reductions in key pollutants (Sulphur Dioxide, Nitrogen oxides, Ammonia, PM2.5, non-methane volatile organic compounds) by 2020 and 2030.

Promotion of circular economy, bio-economy and sustainable agriculture

The circular economy is an epochal challenge that aims to eco-design durable and repairable products to prevent waste. The first step towards the circular economy taken by the PNRR was to optimise waste management throughout the country (increasing separate waste collection, mechanical and chemical recycling facilities, and minimising landfill disposal) to meet the European targets for 2030-40 for packaging, plastics, textiles, paper, aluminium, demolition waste, electrical and electronic waste, and to reduce water and food waste.

The new "National Strategy for the Circular Economy", launched in 2022 and focused on eco-design and eco-efficiency, defines new administrative and fiscal tools to strengthen the market for secondary raw materials, extended producer and consumer responsibility, and the spread of sharing and "product as a service" practices. The goal is to promote an advanced circular economy and, consequently, a strong prevention of waste and refuse (-50%) by 2040.

The plan also aims to strengthen the circular bioeconomy, in particular the valorisation of waste biomass, urban organic waste, non-food crops and second harvest crops for the production of energy, bioproducts and biofuels, with clear production, environmental and climate benefits. Of particular interest in this sense are the "Green Islands" and "Green Communities" projects launched by the PNRR.

2.4. Adaptation strategy in Italy

The National Plan for Adaptation to Climate Change (Piano Nazionale Adattamento ai Cambiamenti Climatici – PNACC) was approved on 21 December 2023 with D.M. n.434, after having been subjected to a Social Impact Assessment procedure concluded on 4 August 2023 with D.M. n.256. The Plan was developed to implement the National Strategy for Adaptation to Climate Change (Strategia Nazionale per l'Adattamento ai Cambiamenti climatici – SNAC), approved with Directorial Decree no. 86 of 16 June 2015 by the Ministry of the Environment and Protection of Land and Sea.

The main objective of the PNACC is to provide a national guiding framework for the implementation of actions aimed at minimising the risks resulting from climate change, improving the adaptive capacity of socio-economic and natural systems,

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and taking advantage of any opportunities that may arise under new climatic conditions.

In this sense, the following can be considered as specific objectives:

- To put in place a structure that enables knowledge of the phenomena characterising the country's natural vulnerability
- Define an optimal organisational framework
- To foster multi-level and multi-sectoral governance.

To this end, the PNACC provides a common base of data, information and analytical methodologies useful for defining sectoral and/or local adaptation pathways to climate change in order to reduce vulnerability to the impacts of climate change, increase resilience to climate change and improve the exploitation of opportunities.

The PNAACC has three outlooks:

- providing a national policy framework for the implementation of actions aimed at minimising the risks resulting from climate change
- improving the adaptive capacity of socio-economic and natural systems, and
- taking advantage of any opportunities that may arise from new climatic conditions, the PNACC provides for two levels of intervention: the first 'systemic measures', the second "steering measures".

Systemic measures and action

At the 'systemic' level, the PNACC aims to build an organisational framework focused on the definition of a governance structure and criteria and on knowledge development. Three 'administrative strengthening' and one 'capacity building' action are identified:

- Establishment of the "National Observatory for Adaptation to Climate Change"
- Identification of methods, tools and competent subjects for the introduction of principles, measures and actions for adaptation to climate change in national, regional and local plans and programs
- Definition of sectoral and cross-sectoral methods and tools for the implementation of PNACC measures at different levels of government
- Development of a research program to improve the knowledge framework on climate change impacts, vulnerabilities and risks in Italy.

For each action, the plan identifies (see table below) some fundamental elements such as, among others, objective, measurement indicator, implementation timeframe and actors involved.

Table 1 – Basic elements of the system of measures and actions

N	Measure	Action	Objective	Progress indicator (measurement method)	Implementation Timeframe	Actors involved
1	Administrative Strengthening for Adaptation at the National Level *(Governance)*	Establishment of the "National Observatory for Adaptation to Climate Change"	Establishment of the National Observatory and constitution of the Technical Secretariat within three months of the ministerial decree approving the PNACC	Issuance of the ministerial decree (Protocol)	Three months from the ministerial decree approving the PNACC	MASE

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N	Measure	Action	Objective	Progress indicator (measurement method)	Implementation Timeframe	Actors involved
2	Administrative Strengthening for Adaptation at the National Level *(Governance)*	Identification of the methods, tools and competent subjects for the introduction of principles, measures and actions for adaptation to climate change in national, regional and local Plans and Programs	Mainstreaming of adaptation in planning at all levels of territorial government	Number of plans and programmes for which methods, tools and competent subjects for mainstreaming have been identified / Number of programmes and/or plans assessed	Six months from the decree approving the PNACC (100%)	Observ.
3	Administrative Strengthening for Adaptation at the National Level *(Governance)*	Definition of sectoral and intersectoral methods and tools for the implementation of the PNACC measures at different levels of government	Approval of the act defining the methods and tools for implementing the PNACC measures within twelve months of the establishment of the Observatory	Approval of the act defining the methods and tools for implementing the PNACC measures (Protocol)	Twelve months from the establishment of the Observ.	Observ.
4	Technical Capacity Building for Adaptation at the National Level *(Information)*	Development of a research program for the improvement of the knowledge framework on the impacts of climate change, vulnerability and risks in Italy	Activation of the Agreement/Convention within twelve months of the decree approving the PNACC	Agreement/ Convention (Protocol)	Twelve months from the decree approving the PNACC	MASE

Steering measures

The second level of intervention of the PNACC intends to exercise a 'steering function' by identifying a framework within which the planning and implementation of regional and local adaptation actions can take place. This framework is based on two Plan sets of instruments consisting of a 'framework of adaptation measures' and 'guidelines for planning at the regional and local scale'. The PNACC provides an organic framework of 'possible adaptation options' (Annex IV – Database of actions) that will be applied in the various planning instruments, at the national, regional and local scales, in the ways that will be identified by the Observatory.

First, the actions have been divided into two main types: Type A (soft) actions and Type B (non-soft – green or grey) actions. The first (type A) are those that do not require direct structural and material interventions but are still preparatory to their implementation. The non-soft actions (type B) are divided into: Grey actions aimed at improving and adapting structures and infrastructures to climate change, and green actions, i.e., nature-based solutions, involving the sustainable use or management of natural "services". Both type b actions have a material and structural intervention component.

They were also grouped into macro categories and specific categories, which are presented below.

Table 2 – Steering measures

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Type	Macro categories	Categories
A. Soft	Information	Research and evaluation; Monitoring, data, models; Dissemination, perception, awareness, and training
	Organisational and participatory processes	Institutions; Organisation and Management; Partnership and Participation
	Governance	Legislative and regulatory adjustments; Plans and strategies; Economic and financial instruments; Orientation
B. Grey & Green	Adaptation and improvement of plants and infrastructures	Plants, materials and technologies; Defense systems, networks, storage, distribution and transmission
	Solutions based on ecosystem services	Integrated solutions; Forest and agro-forestry ecosystems; River, coastal and marine ecosystems; Redevelopment of the built

In total, over 350 specific actions were identified and listed in the action database. Most of these are non-structural (soft): 274 or 76% of the total. This is followed by actions based on an ecosystem approach (green), which amount to 46 or 13%. Finally, infrastructure and technology actions (grey), which are 41 or 11% of the total.

In the database the actions are also organised into 19 sectors (see also SNAC): Transport, Energy, Water Resources, Agriculture, Forestry and Maritime Fisheries, Aquaculture, Geological, hydrological and hydraulic instability, Inland and transition water ecosystems, Marine ecosystems and Terrestrial Ecosystems, Urban Settlements, Cultural Heritage, Health, Tourism and Socioeconomic Impacts.

Finally, the Plan provides guidelines for planning at regional and local scales' represented by two specific documents: the "Methodologies for the definition of regional climate change adaptation strategies and plans" and the "Methodologies for the definition of local climate change adaptation strategies and plans" (Annexes I e II).

As mentioned above, some specific areas included in the Ecological Transition Plan (PTE) are also primarily aimed at adapting to climate change. These areas are briefly presented below.

Restoration and enhancement of biodiversity

Biodiversity is at the heart of the plan and, in line with the European strategy, it provides for a significant increase in protected areas, the adoption of "nature-based solutions" for the restoration of degraded ecosystems, and a strong push for scientific monitoring of habitats and endangered species. Although this area is also relevant to mitigation policies, it appears to be primarily the responsibility of adaptation policies and is therefore presented in this section.

The extension of protected areas in Italy will be increased from the current 10.5% to 30%, and the rigorous protection of endangered habitats will be increased from 3% to 10% by 2030. All data and information on national parks and marine protected areas will be digitalised by 2026 to monitor pressures and the status of species, simplify administrative procedures and improve visitor services.

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Forests cover 40% of the country's surface and make a crucial contribution to decarbonisation and biodiversity. It is therefore essential to promote their active protection through forms of sustainable management, their expansion into remaining and degraded areas and the national valorisation of wood as a long-term carbon store.

Combating land consumption and hydrogeological instability

About 8% of the Italian territory is impermeable and a much larger portion is affected by natural degradation and habitat fragmentation, with considerable economic damage. After a slowdown during the years of economic crisis, land consumption has resumed at a rate of 2 square meters per second.

The goal of the plan is to reach zero net consumption by 2030, both by minimising artificial interventions and by increasing natural restoration in the most vulnerable areas, such as urban areas and coasts.

Landslides, mudflows and floods affect 90% of the municipalities, with almost a fifth of the territory at medium-high risk. The plan aims to secure the territory by strengthening governance and an advanced monitoring system that will give coherence to a national prevention and mitigation program.

Protection of the sea

The seas and 8,000 km of coastline surrounding Italy are an extraordinary source of biodiversity, but also of economic activities and human pressures. The first essential measures of the PNRR invest in research and observation of the seabed and marine habitats, also through the strengthening of a dedicated fleet. The research objective is to map and monitor 90% of marine and coastal systems and to restore 20%.

Conservation targets include increasing the coverage of marine protected areas to 30% by 2030, including 10% with strict forms of protection. Other measures for 2030 include the fight against illegal fishing, coordinated action with other countries to minimise marine litter, and the promotion of sustainable tourism.

Improvement of water resources and related infrastructure

The water system for civil, industrial and agricultural use can be significantly improved, both in terms of quality, security of supply and reduction of network losses, and in terms of wastewater discharge and treatment, in the light of the Water Framework Directive, specific directives and related sectoral plans, first and foremost the River Basin District Management Plan and the Water Protection Plan.

Up to 2026, the measures provided for in the PNRR, amounting to 4.3 billion euros, are intended to strengthen primary water supply infrastructures, distribution networks, sewerage systems and treatment plants, particularly in the south; to digitise and district-align distribution networks; to reduce the dispersion of 15,000 km of water networks by 15% (currently 42%); and to optimise irrigation systems in 15% of agricultural areas.

At the same time, reforms are planned to strengthen the National Plan of Interventions in the Water Sector and to make water management more efficient through the formation of public-private consortia at the supra-municipal level.

The works to strengthen, renew and improve the quality and efficiency of the main water infrastructures are expected to be completed by 2040.

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3. Governance framework

The ecological transition process is implemented by the Ministry of the Environment and Economic Security (MASE) and the Inter-ministerial Committee for Ecological Transition (CITE). In particular, governance is the responsibility of the CITE, which was set up at the Presidency of the Council of Ministers under Article 4 of the so-called 'ministerial reorganisation decree' (Decree-Law No. 22 of 1 March 2021, converted, with amendments, by Law No. 55 of 22 April 2021), which introduced Article 57 bis to Legislative Decree No. 152 of 3 April 2006 on environmental matters.

The Committee was set up in response to the need to "provide an initial definition of the governance of the ecological transition, with the task of coordinating national policies for this transition and the related programming".

CITE is chaired by the President of the Council of Ministers, who may delegate the Minister for the Environment and Energy Security or, in the case of industrial policy issues, the Minister for Enterprise and Made in Italy. The Committee is composed of the Ministers for the Environment and Energy Security, for Enterprise and Made in Italy, for Economy and Finance, for Infrastructure and Transport, for Labour and Social Policy and for Agriculture, Food Sovereignty and Forestry. The other ministers or their deputies responsible for the matters covered by the provisions and topics on the agenda also participate. Furthermore, as mentioned above, working groups have been set up for the implementation of the plan, with the participation of representatives of various ministries, the Presidency of the Council and other institutions. Finally, it should be remembered that CITE collaborates with bodies and research institutes such as National Statistical Institute (ISTAT) and Higher Institute for Environmental Protection and Research (ISPRA).

For technical and operational management, a Technical Support Committee of the CITE has been established, composed of a representative of the Presidency of the Council of Ministers and a representative of each of the Ministries involved in the Ecological Transition. The governance of the Ecological Transition implies, on the one hand, decision-making mechanisms based on common scientific criteria and, on the other hand, close cooperation and continuous coordination between the Ministries and between the latter and the Local Authorities, in some cases with the creation of ad hoc control rooms for the period of the intervention in progress, also through the full involvement of the territorial bodies (Regions, Provinces and Municipalities) for the topics of competence, also through the Department of Regional Affairs and Autonomies and the system of Technical Comparative Tables already operational.

Local authorities, and the Regions in particular, play an important role in the operational definition and implementation of the various measures at local level. They are involved in the definition of the main strategies and participate in numerous programmatic tables on the subject, while maintaining their own autonomy, even within the general framework of the national level.

For example, regarding adaptation measures, the definition of regional strategies and plans is foreseen as the main tool for addressing the impacts of climate change and implementing measures to reduce the vulnerability of territories. In Italy, the

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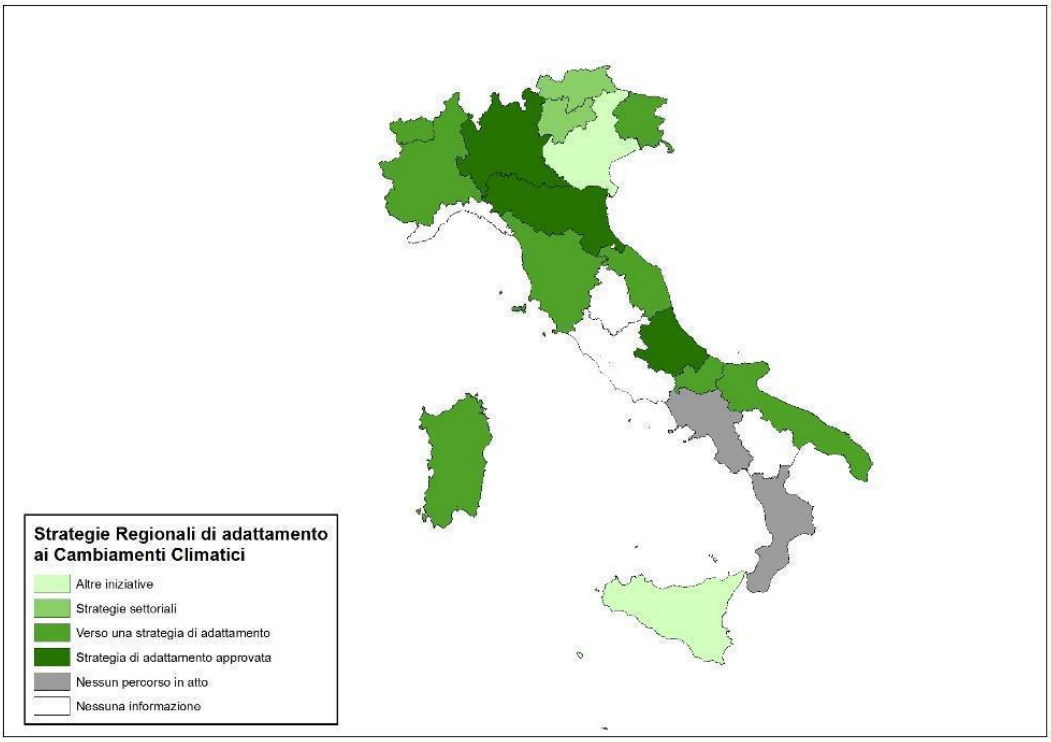
number of adopted regional strategies and plans is still low and, as shown in the figure below, the situation varies considerably between the 20 regions.



Adapt. strategy approved	Towards Adapt strategy	Sectoral strategies	Other initiatives	No path in place	No information

* ISPRA, 2023

Figure 2 – Regional adaptation strategies in Italy

With reference to this, the National Platform on Adaptation to Climate Change was promoted on the initiative of the Ministry for the Environment and Energy Security (MASE) and was realised by the Higher Institute for Environmental Protection and Research (ISPRA).

The platform intends to foster the exchange of information between the central administration, local authorities and all stakeholders, starting with citizens, on the issue of adaptation to climate change, thus representing the main information tool in Italy on this topic. The general aim is therefore to inform, raise awareness and make data, indicators, case studies and operational tools available to all citizens, to promote and support Local Authorities in the decision-making and planning processes on the subject of adaptation to climate change, as well as to facilitate access to the documents of the National Plan for Adaptation to Climate Change (PNACC).

A parallel role in the management of the transition process is played by the Department of Civil Protection (ICPD). The Department is responsible for directing, promoting and coordinating the entire National Civil Protection Service. In close collaboration with the Regions and Autonomous Provinces, it develops and coordinates the National Plans for Risk Scenarios and tests their effectiveness through exercises, coordinates the intervention of the Service in the event of

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emergencies of national importance, promotes activities aimed at predicting and preventing risks, defines the general criteria for identifying seismic zones and develops the general guidelines for training activities in the field of civil protection.

A further specific instrument for the governance of the transition process is the National Observatory for Adaptation to Climate Change. This is a governance structure that is the reference body at national level and involves public administrations, technical bodies and civil society in different capacities and in accordance with their respective roles. Its purpose is to define and ensure the implementation of sectoral and cross-sectoral methods and tools for the implementation of actions at the different levels of government. The Observatory is composed of: a collegial body with direction and coordination functions (Committee); a technical and administrative support structure (Secretariat); a consultative-information body (Forum).

As stated in the Ecological Transition Plan, the governance of the process must be based on the pillars of legality and taxation.

Legality. The need to ensure a fast, as well as fair and equitable, transition process is closely linked to that of having transparent administrative procedures that allow the implementation of plans and programmes by public actors impervious to criminal infiltration. Organised crime has often seen the renewable energy sector as an opportunity to launder the proceeds of illegal activities and to hoard public funds. There is great concern about the results of numerous investigations into illicit waste trafficking, including those with an international dimension and with the presence of affiliates of mafia organisations, which pose a real threat to the virtuous development of the circular economy. Particular attention and awareness must therefore be paid by the institutions to guard the values of legality and ensure the virtuous development of the transition strategy.

Taxation. Indirect taxation can influence consumer behaviour and must, therefore, be designed and applied in order to support the ecological transition in its various declinations. The application of excise duty on energy products, appropriately modulated also in relation to CO2 and other greenhouse gas emissions, can be used to correct negative social externalities, related to environmental and human health effects. Since energy consumption is responsible for 80% of GHG emissions in 2017, an OECD analysis concludes that an increase in excise duty can reduce the consumption of fossil fuels. This would be even more true if the excise duty itself were such as to incentivise a substitution with alternative fuels (OECD, 2018).

The recently adopted Integrated Plan of Activities and Organisation (PIAO) 2025–2027 of the Ministry of Environment and Energy Security (MASE) forms part of the broader national and European strategy to address climate change and advance the ecological transition. Closely aligned with the PNIEC, the European Green Deal, and the NRRP, it shares the same strategic priorities of decarbonisation, renewable energy promotion, energy efficiency, circular economy, and environmental sustainability.

The PIAO is a three-year planning document specifically designed to integrate into a single coherent framework several governance tools of the public administration – including performance management, anti-corruption measures, organisational transparency, human capital management, simplification policies, and digital innovation.

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Formally adopted through Ministerial Decree No. 36 of 3 February 2025, it sets out objectives and measures aimed at enhancing ministerial effectiveness and ensuring consistency with the challenges of the green and energy transition. The Plan pursues five main goals: policy alignment with national and EU priorities; regulatory simplification; promotion of sustainability and energy security; internal administrative strengthening; and improved governance centred on the creation of public value.

Looking ahead, the PIAO positions itself as a key instrument linking administrative modernisation with Italy's broader climate and energy objectives. Its strengths lie in the integration of multiple governance dimensions, the emphasis on transparency and simplification, and its alignment with sustainability goals. However, the effectiveness of its implementation will depend on adequate resources, realistic timelines, and efficient coordination among national, regional, and local authorities.

Finally, the role of citizens must be emphasised. Civil society, in its many forms (e.g., local civil protection associations, volunteer firefighters, mountain guides), is heavily involved through communication and awareness-raising campaigns (e.g., I Don't Take Risks), the implementation of local projects, educational initiatives, and so on.

4. The main dynamic aspects of the strategies

The two main strategies of the country's system and the various implementation plans directly or indirectly linked to them can be considered as open instruments. The long-term objectives for 2030 and 2050 propose indicators with specific time targets for each macro area or field of intervention. To this end, all the plans considered here have designed and implemented their own monitoring system in order to assess the progress of the transition process and, if necessary, to adjust intervention measures and re-evaluate objectives and indicators.

In this view, the following elements should be borne in mind.

- The SNAC will be reviewed every five years to take into account the results of the monitoring activities and to achieve the overall objective of resilience.
- The PNACC will be updated every six years, also considering the monitoring timeframe, which provides for a three-year report.
- The PNIEC, presented in a preliminary draft in 2019, was updated and submitted to the EU in July 2025.
- The NLTS aims to extend the objectives of the PNIEC to 2050, which has a target date of 2030.
- The PTE, as stated in the document, is an open plan that will accompany the transition process throughout its duration, with specific targets, monitoring activities and continuous adjustments – also on an annual basis – in relation to the progress of the transformations underway and to scientific and technological progress.

A further dynamic aspect of the strategies considered is the balance between mitigation measures and climate change adaptation measures.

In this respect, of relevance is the analysis that SNAC proposes regarding possible synergies between adaptation, mitigation and sustainable development policies. It

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assumes that they can interact with each other, both positively and negatively, and depending on local conditions (context).

Some of these interrelationships are direct, involving the resources themselves (e.g., land) or stakeholders, while others are indirect (e.g., effects resulting from public budget allocations) or even remote (e.g., changes in global trade flows and exchange rates).

The strongest direct synergy potential between adaptation and mitigation is identified firstly in the areas of agriculture, forestry and land use, and secondly in the areas of energy and water management, infrastructure planning and construction, transport, insurance and waste treatment.

Adaptation and mitigation actions must therefore seek to create synergies, not conflicts, with the other dimensions of sustainable development. In this regard, SNAC presents some examples:

- Energy efficiency and renewable energy policies are often cost-effective while improving energy security and decreasing local pollutant emissions
- Measures to reduce natural habitat loss and deforestation can have a multitude of significant benefits in terms of biodiversity, soil and water conservation, and
- Soil and water conservation, and can be implemented in a socially and economically sustainable manner
- Forestation and plantation measures for bioenergy make a positive contribution to restoring degraded soils, managing water runoff, storing carbon in the soil and benefiting rural economies, but they also risk creating competition in land use with food production and may also be detrimental to biodiversity if not properly designed.

The following table shows a series of examples of measures to be applied which, as stated in SNAC, consider the balance between Mitigation and Adaptation.

Table 3 – Balance between mitigation and adaptation measures

ENERGY	
Mitigation	Adaptation
Reduce emissions by expanding the use of renewable energy	Reduce vulnerability to widespread grid outages by favouring distributed generation from multiple renewable sources (solar, wind, biogas, etc.)
Reduce emissions by improving the efficiency of energy and water distribution systems	Reducing the risk of grid overload and failure due to decreased demand
GREEN' BUILDING	
Mitigation	Adaptation
Reducing emissions by reducing energy consumption through greater efficiency	Lower energy use will create less demand on the grid during extreme events such as heat waves, reducing the risk of blackouts
Adopt or encourage 'green' building standards for commercial, residential, retrofit (modernisation) and municipal projects	Building regulations could include increased resistance to high winds, flooding, etc.

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FOOD PRODUCTION AND CONSUMPTION	
Mitigation	Adaptation
Reduce emissions by favouring local food production through the encouragement of short supply chains and/or farmer's markets, urban gardens etc. in order to reduce the number of kilometres needed to transport food	Reducing dependence on a centralised food system in which commodity production is concentrated in a few locations that may be vulnerable to climatic disruptions, such as damage
FORESTRY AND NATURAL SPACES	
Mitigation	Adaptation
Increasing carbon sequestration from forests by promoting the development of forests (including urban forestry) and natural spaces	Reducing vulnerability to flooding by promoting functional watersheds, including 'healthy' forests and natural spaces
	Increasing the habitat available to species at risk from climate stress by protecting natural spaces
	Counteracting urban heat island impacts by planting trees to provide shade and cooling
WATER RESOURCES	
Mitigation	Adaptation
Reducing emissions by decreasing water use (less energy needed for water treatment and transport)	Conserving water so that it is available during droughts

Finally, it seems useful to mention the measures envisaged to support the most vulnerable segments of the population within the framework of the SCP's mitigation and adaptation policies. These measures are summarised in the box below for ease of reference.

Table 4 – Measure to support vulnerable segments of the population

Area	Key Measures	Main Beneficiaries
Housing / Public Buildings	Energy retrofit of public housing and poorly performing buildings (insulation, windows, solar shading, efficient or renewable systems).	Low-income households, tenants in public housing, local authorities.
Energy Social Bonuses	Expanded subsidies to reduce energy bills (gas, electricity) for vulnerable groups.	Vulnerable families, low-income households.
Mobility	Investments in public transport, local mobility hubs, "My Mobility Account" for affordable travel.	Citizens in transport poverty, commuters, students, rural/peripheral communities.
Microbusiness Support	Financial aid and flexible support for microenterprises facing high energy costs.	Small and micro businesses in vulnerable sectors.
Targeted Subsidies	Full coverage (up to 100%) of eligible energy-efficiency works for households below income thresholds.	Very low-income families, socially and energy-vulnerable groups.

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5. Effectiveness of the strategies/policies

Among the central assessment tools in Italy's mitigation and adaptation policies to climate change are the Environmental Impact Assessment (VIA) and the Strategic Environmental Assessment (VAS). These instruments integrate the evaluation of greenhouse-gas emissions, energy efficiency, and consistency with decarbonisation goals into every project, plan, or programme. They also assess vulnerability to future climate risks such as floods, landslides, heatwaves, and water stress, requiring the design of more resilient infrastructures. Through public consultations, they promote the participation of citizens and civil-society organisations. In this way, they help ensure that territorial decisions are sustainable and aligned with the climate transition.

The different plans aimed at climate change mitigation and/or adaptation and energy transition in Italy are all quite recent and their effectiveness has only been partially assessed so far.

Specifically, however, the first PTE implementation status report was presented in May 2022. This report is the result of the activities of eight specific working groups and is intended to present a mapping of the actions of the plans and funding put in place, as well as to allow a comparison with the objectives set at European level, taken up by the PTE itself. This work also made it possible to carry out an update of the values with respect to the initial ones and, if necessary, a redetermination of the targets to be achieved.

In the table below, the results of the technical work on the implementation of some indicators for each of the eight areas considered are shown.

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Table 4 – First results of technical work on the implementation of some indicators

Area	Indicator	Unit of measure	Value (2019)	Updated value (2020)	Expected value 2030
Decarbonisation	Carbon dioxide emissions	Mt CO2eq	377,7	348,9	-55% over 1990 value (256.000.000)
	Total greenhouse gases according to national air emission accounts	%	18.18% gross final consumption; 35% RES share in electricity generation	20,4% gross final consumption i 38.1% share of renewable energy in electricity generation	30% gross final consumption* 72% RES share in electricity generation
Sustainable mobility	Share of energy from renewable sources	Unit	357,296 (of which 22,728 electric (BEV) and 334,568 hybrid (MHEV, HEV or PHEV); 5.3% market share (0.5% electric + 4.8% hybrid)**	595.807 (of which 53.079 electric (BEV) e 542.728 hybrid (MHEV, HEV o PHEV)) 16.6% market share (2,1% electric + 14,5% hybrid)**	6 million electric cars 25% market share
	Number of electric cars (BEV), hybrid PIHV	Mt CO_2 eq	104,4	78,7	
Air quality improvement	SO2, NOx, NMVOC emissions, NH3, PM2.5 – One indicator for each pollutant	kton /a	Current value: SO2 104,6; NOx 639,3; COVNM 887,7; NH3 349,2; PM2.5 137,8	Current value: SO_2 81,9; NO_x 570.6; COVNM 885.4; NH_3 362.6; PM2.5 133.2	Reduction from 2005 SO_2 71%; NO_x 65%; COVNM 46%; NH_3 16% ; PM2.5 40%
Combating land consumption and hydrogeological instability	% Population exposed to landslide risk	Unit	1,281,970 (2.2% of the population – band P4 and P3)		Target: 250.000
	% Population exposed to flood risk	Unit	6,183,364 (10.4%) – Band TR 100-200 years		Securing 1.5 million people
Improvement of water resources and related infrastructure	Dispersion from municipal water network	%		42%	Reducing fragmentation and waste by 15% by 2026
Restoration and enhancement of biodiversity	Protected areas on land (protected areas, Natura 2000, OECM)	%	10.5% surface area 3% strict protection	22% of the national protected area (as of 2022). ND strict protection	30% surface area, 10% strict protection to 2030
Protection of the sea	Marine protected areas (protected areas, Natura 2000, OECM)	%	7,2%	25% protected areas (as of 2022). ND strict protection	30% national waters
Promotion of circular economy, bio-economy and sustainable agriculture	Circular material use rate	%	19%		30%

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Furthermore, an entire section of the PNACC is dedicated to how actions are and will be evaluated. In a nutshell, the evaluation system, following Flörke's proposal[38], is based on the 5 criteria, namely: effectiveness, economic efficiency, second-order effects (that is, the evaluation of the "unintended" or indirect, positive or negative, effects of the actions implemented), performance under uncertainty (with which it is intended to evaluate the applicability of a specific action in different climatic and socioeconomic conditions), and considerations for policy implementation (which assesses the legal, economic and social framework in which a specific measure is inserted). Each criterion is in turn made up of one or more sub-criteria as follows.

Table 5 – Assessment criteria

Assessment Criteria	Effectiveness	Reduction of the negative impacts of CC
	Economic efficiency	Maximisation of cost-effectiveness indices
	Second-order effects	Win-win
		No-regret
		Negatives
	Performance under uncertainty	Flexibility
		Robustness
	Considerations for policy implementation	Institutional and social viability
		Multidimensionality of measurement
		Urgency

In view of the fact that the Plan was approved at the end of 2023, the first periodic evaluation has not yet been carried out, but only the 'ex-ante' evaluation carried out on the 361 actions identified in the database. When the PNACC was prepared, each individual action was given an ex-ante value by a group of experts on a scale of 5: high, medium-high, medium, medium-low, low. Following the experts' assessment, 59% of the actions received an overall rating of high, 29% medium-high and 12% medium, medium-low and low. Crossing the three dimensions – type, time orientation and evaluation judgement – a group of non-structural (soft) actions (124) emerges, distributed over almost all sectors, with a high judgement and achievable in the short term.

Finally, with regard to the PNIEC, following requests from the European Commission, a process of review and update of the Plan was launched, including two public consultations – the first, in February 2024, through a questionnaire addressed to institutions, businesses and stakeholders on the main areas of the PNIEC, and the second, in December 2024, as part of the Strategic Environmental Assessment procedure, which concluded on 4 March 2025. The updated version

[38] Florke, M. F., Wimmer, F., Laaser, C., Vidaurre, R., Troltzsch, J., Dworak, T., ... & Mysiak, J. (2009). Climate Adaptation–modelling water scenarios and sectoral impacts. CESR–Center for Environmental Systems Research.

of the Plan, incorporating the inputs collected, was submitted to the European Commission on 19 July 2025.

Moreover, since December 2024, the PNIEC Monitoring Platform has been operational, managed by the GSE in support of MASE. The platform provides data and indicators for tracking the objectives of the Plan and compiles information produced by various institutional bodies, including MASE, GSE, ISPRA, ENEA, Terna, ISTAT, and RSE. As stated on the portal, monitoring plays a central role within the PNIEC, serving multiple purposes: tracking progress and supporting policy evaluation; assessing the economic, social, and environmental impacts of the measures; ensuring broad and transparent access to information for citizens; and providing the EU institutions with the data required for periodic monitoring reports.

ANNEX B8 – CLIMATE POLICIES IN ROMANIA

1. Introduction

As a member of the European Union, Romania has undertaken ambitious revisions its national targets and policies on climate change mitigation and adaptation, aligning with EU objectives. These efforts are grounded in commitments under the Paris Agreement and the EGD. The overarching goal is to facilitate a transition to a low-carbon, climate-neutral, and sustainable society by 2050.

The strategic and governance framework for mitigation and adaptation has continuously evolved in the last two decades, with significant changes occurring after 2020. These developments aim to bring new perspectives for the future, specifically 2030 and 2050. However, political divisions, frequent government changes and institutional fragmentation have resulted in policy gaps and limited cross-sectoral coordination. Additionally, the COVID-19 pandemic and the ongoing conflict in Ukraine, with serious implications for the national transport and energy systems, have placed considerable pressure on climate efforts.

This analysis is developed based on a review of current policies and available monitoring data, complemented by information gathered through five interviews with national experts working in NGOs, think tanks, research institutions, and policy-making bodies. Additional insights were drawn from independent monitoring reports and policy analysis studies on climate governance and implementation in Romania.

2. Strategies of Mitigation and Adaptation

2.1. Objectives

The overall national goal, according to Romania's Long-Term Strategy for Reducing Greenhouse Gas Emissions (LTS) – "Romania Neutral by 2050" is to achieve a 99% reduction in net emissions by 2050 compared to 1990 levels. An intermediate target has been set to reduce emissions by 78% by 2030. By 2019, a net reduction of 62% compared to 1990 levels had already been achieved according to the data provided by LTS.

To meet this objective, decarbonisation targets have been established for high-emission sectors, including energy, transport (which saw a 41% increase in emissions from 1990 to 2019), buildings, industry, agriculture, land use, land-use change, and forestry (LULUCF), and waste management.

The updated Integrated National Energy and Climate Plan (NECP), approved in October 2024 and reported to the European Commission, revises Romania's targets and proposes more ambitious medium- and long-term objectives. This plan sets the goals to reduce net greenhouse gas emissions by 85% by 2030 compared to 1990 levels, achieve a 96% reduction by 2040, and attain a 105% reduction (net zero) by 2050. Additionally, it updates sectoral targets and visions in alignment with recommendations from the European Commission.

The national targets are not solely focused on the decarbonisation of net-emitting sectors but also aim to increase absorption levels in the LULUCF sector, which has experienced a decline compared to the 1990 levels. A steady increase is targeted through 2050. This objective aligns with the provisions of the National Forestry Strategy 2030, which emphasises improving forest management and expanding forested areas.

The National Energy Strategy 2025-2035 (NES), adopted in November 2024, is the first programmatic energy strategy adopted in almost two decades. It aims to redefine the energy agenda by aligning national priorities with European decarbonisation objectives. The strategy outlines six strategic pillars: (i) energy security, (ii) low-carbon energy, (iii) energy efficiency, (iv) universal access and competitiveness, (v) efficient energy markets, and (vi) digitalisation.

This new framework updates the goals of previous plans, introducing new measurable and time-bound targets. The GHG emissions reduction target is 87% by 2030 and 94% by 2050, compared to the 1990 level. Renewable energy is expected to represent 44% of final energy consumption by 2035 and 73% by 2050, driven by the rapid expansion of solar, wind, hydro, and geothermal capacities. At the same time, the gradual phase-out of coal by 2032 is a key milestone in the decarbonisation pathway. To support smooth transition and system flexibility, the strategy foresees the deployment of energy storage technologies, such as batteries, hydropower pumping stations, and hydrogen systems.

To support adaptation action, in August 2024, the government adopted the National Climate Change Adaptation Strategy 2030, with a perspective towards 2050 (NSACC). This strategy, accompanied by a detailed action plan, seeks to align with the objectives of the EGD and the EU's New Adaptation Strategy. Its overarching aim is "to enhance the adaptive capacity of socio-economic and ecological systems, as well as society as a whole, to the effects of climate change in Romania, with a focus on the year 2030 and a perspective toward 2050."

The strategy focuses on 13 key national sectors (see Para. 2.4), for which impact analyses have been conducted and sectoral adaptation objectives established. According to the document approved by the government decision, "strengthening the resilience of Romanian society and its adaptation to the effects of climate change is achieved primarily at the local and regional levels, and simultaneously at the national and supranational levels." The government has committed to a consolidated effort to enhance institutional capacity for improving and implementing adaptation policies. To support these efforts, the strategy was launched alongside the National Adaptation Platform – RO-ADAPT, which provides nationally relevant information on climate change, its sectoral impacts, and the current policy framework.

2.2. Rationale and Timeframe

According to the Report on Limiting Climate Change and Its Impacts: An Integrated Approach for Romania, published in 2022 by the Presidential Administration under Klaus Iohannis, "amplifying investments is a necessary condition and a priority for Romania's development within the EU and NATO, as well as in the process of accession to the OECD. However, well-intentioned but misallocated financial resources can create more problems than solutions. As a result, public policies must be based on realities, up-to-date scientific knowledge, competence, and efficient management."

The main strategic documents and policies addressing M&A have been updated since 2020 to ensure the integration of the objectives of the EGD and the new European climate strategies, while also adapting to the post-pandemic period and the current conflict in Ukraine[39]. The initial implementation and evaluation deadlines are often set for 2025, followed by 2030 as a key milestone for achieving more ambitious targets. By 2030, at the latest, numerous mitigation and adaptation policies are expected to be updated.

In the long term, 2040 serves as an intermediate checkpoint, while 2050 is highlighted in most strategic documents as the target year for achieving climate neutrality.

The adoption of new climate-related and sectoral strategies has slowed in recent years, following a wave of plans introduced after the launch of the EGD and the pandemic in 2020. In this context, the implementation of the National Recovery and Resilience Plan (NRRP) provides a dynamic framework connecting public and administrative reforms to specific funding milestones.

2.3. Mitigation strategy

In Romania, the spotlight is on the mitigation of climate change through the decarbonisation of sectors that are net producers of GHG emissions and improving the emissions sequestration capacity. The cornerstone of the current approach of Romania's mitigation policy is set out in three main documents:

- Romania's Long-term Strategy to reduce greenhouse gas emissions – Neutral Romania
- Integrated National Energy and Climate Change Plan
- National Energy Strategy 2025-2035.

LTS outlines efforts to develop a structured approach to climate change mitigation, aiming to reduce, as already stated, net greenhouse gas emissions by 99% and attain climate neutrality by 2050. This strategy "aligns with Romania's commitment to the EU Green Deal and the Paris Agreement, reflecting its dedication to global climate objectives".

The strategy focuses on six key emission-source sectors: (i) energy, (ii) transport, (iii) industry, (iv) buildings, (v) agriculture, and (vi) waste. Its envisioned pathway, known as "Neutral Romania," prioritises the integration of renewable energy, sustainable land use practices, and improved energy efficiency. Furthermore, it includes provisions for advancing carbon capture and storage technologies, promoting afforestation, and transitioning industrial activities to comply with low-carbon standards. Through these measures, the government aims to establish a sustainable and resilient low-carbon economy.

NECP serves as a roadmap and aims to align the energy and climate policies with the new EU objectives and regulations. It focuses on five key dimensions: (i) decarbonisation, (2) energy efficiency, (iii) energy security, (iv) internal energy market development, and (v) research and innovation. The Plan has already been updated, and the revised form was approved and reported to the European Commission in October 2024. It sets ambitious targets to reduce net emissions by

[39] See: Kulovesi, K., Oberthür, S., Van Asselt, H., & Savaresi, A. (2024). The European Climate Law: Strengthening EU Procedural Climate Governance? Journal of Environmental Law, 36(1), 23–42; Schreurs, M. A. (2023). Implications of the Russian War on Ukraine for Climate Policy and the Geopolitics of Energy. Canadian Journal of European and Russian Studies, 16(2), 90–113.

85% by 2030 compared to 1990 levels and to increase the share of renewable energy to 38.3% of final energy consumption. It also emphasises a just transition, aiming to establish a framework for promoting socially equitable policies, an issue insufficiently covered in the previous forms. These include alleviating energy poverty, ensuring affordability for consumers, and creating new jobs. By investing in sustainable energy projects, NECP seeks to enhance the quality of life and foster a more inclusive and sustainable energy future.

The adoption of the National Energy Strategy 2025-2035 is the most significant novelty in the climate and energy policy landscape. This programmatic document is signalling a renewed strategic orientation for this key sector, complementing the NECP and the LTS. The strategy outlines six strategic directions: (i) energy security, (ii) low-carbon energy, (iii) energy efficiency, (iv) universal access and competitiveness, (v) efficient energy markets, (vi) digitalisation, including smart grids and cybersecurity.

This new strategy notably brings several structural shifts and commitments. Firstly, it places climate neutrality by 2050 explicitly as a guiding principle, integrating energy transition with decarbonization goals. Secondly, it sets ambitious renewable energy and storage goals, including a significant increase in wind and solar capacity and the deployment of energy storage capacity. And thirdly, it envisages biomethane integration into the gas grid as part of a diversifying low-carbon gas strategy.

The National Recovery and Resilience Plan (NRRP), which prioritises the green transition and sustainable growth, is a pillar in mitigation action. It mandates a series of reforms aimed at improving the administrative capacity to achieve climate goals (European Court of Auditors, 2022). This alignment underscores Romania's commitment to contributing to the EU's climate objectives while advancing its domestic strategies for a low-carbon and resilient future. The main pillar of NRRP is green transition, integrating energy-climate-environment ambitions. With a budget allocation of €15.9 billion, it targets an accelerated mitigation through sustainable transport, energy efficiency and the REPowerEU component.

Complementing the green transition under the NRRP, the National Hydrogen Strategy aims to support the decarbonisation targets outlined in the NECP. The strategy aims to develop a sustainable hydrogen economy focused primarily on renewable hydrogen, while also acknowledging the role of low-carbon hydrogen during the transition. Aligned with the EU ambitions, the strategy focuses on building the entire hydrogen value chain from production and transport to storage and end-use. It outlines four general objectives and 23 specific targets, accompanied by an action plan for 2030 and longer-term directions for 2035 and 2050, consistent with the "Do No Significant Harm" principle of the EGD.

Complementing the programmatic documents for the energy sector, a set of specific legislative instruments has been adopted to support the transition and strengthen system resilience. Among them, Law no. 226/2021 establishes social protection measures for vulnerable energy consumers, ensuring fairness and inclusiveness during the energy transition. Law no. 184/2018 sets up the system for promoting energy from renewable energy sources, serving as a cornerstone for integrating wind, solar, and other renewables into the national energy mix. In parallel, the Law on Energy Efficiency provides the framework for reducing energy consumption across sectors. Further advancing decarbonisation, Government

Emergency Ordinance no. 108/2022 outlines measures for the decarbonisation of the energy sector, supporting the gradual phase-out of coal and the expansion of low-carbon technologies, components of NRRP.

In addition to this programmatic framework, there are sectoral policies with a strong climate-related component and designed to support climate change mitigation:

- National Strategy for the Sustainable Development of Romania
- National Forestry Strategy 2030
- The Forest Code (fundamental law regulating the management, protection, conservation, and sustainable use of forests and forest land in Romania)
- General Transport Master Plan of Romania
- National policy framework for the market development of alternative fuels in the transport sector and the installation of the relevant infrastructure in Romania
- National Strategy for Circular Economy (SNEC)
- National Long-Term Renovation Strategy
- National Strategy for Agriculture and Rural Development
- Strategy for the medium- and long-term development of the agri-food sector 2020-2030
- National Integrated Urban Development Strategy for Resilient, Green, Inclusive, and Competitive Cities 2022–2035 (Romania's Urban Policy)
- National Strategy for Education on the Environment and Climate Change 2023-2030.

Key policy areas in Romania are linked to mitigation efforts, providing opportunities to reduce GHG emissions while advancing sustainability goals. The circular economy plays a central role in these efforts by promoting resource efficiency and minimising waste-related emissions. The National Circular Economy Strategy aligns with EU directives, encouraging a transition from linear production models to sustainable practices.

The National Strategy for Sustainable Development 2030 emphasises the relevance of safeguarding forest and wetland ecosystems for improving sink capacity, while other sectoral strategies address environmental protection in the context of climate change. Romania's forestry is guided by the National Forestry Strategy 2030 and the Forest Code as the fundamental law managing the sector. The latest National Biodiversity Strategy was approved in 2014, and its update is planned through the new National Strategy on Biodiversity and Nature Conservation, which is currently in the draft stage under the coordination of MEWF.

The green building sector is guided by the National Long-Term Renovation Strategy (adopted in 2020) and Nearly Zero-Energy Building (NZEB) standards. These regulations seek to improve energy efficiency in the construction and building industries, thereby lowering emissions from heating, cooling, and electricity use. Expanding retrofitting programs and encouraging the use of sustainable materials are the main actions promoted to sustain deeper emission reductions.

Sustainable food production policies aim to reduce agricultural emissions, accounting for a significant share of GHG emissions in Romania. The National Strategy for Agriculture and Rural Development, together with the Medium and

Long-Term Development Strategy for the Agri-Food Sector 2020-2030, promotes practices such as agroforestry, organic farming and reduced use of chemicals and pollutants. These practices not only reduce emissions but also improve soil health and resilience. However, aligning agricultural subsidies with sustainable practices remains a challenge as traditional intensive farming methods continue to receive substantial financial support.

2.4. Adaptation strategy

Romania's adaptation framework is outlined in the Climate Change Adaptation Strategy for 2030. The strategy aligns with Article 7 of the Paris Agreement and Article 5 of the EU Climate Law concerning the "*global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change*.

Building on sectoral impact analyses, the strategy established adaptation objectives and defined strategic directions. The adaptation strategy aligns with sectoral national policies across the 13 key sectors. Related to the CROSSEU sectors, the strategy addresses public health, insurance, energy, tourism, transport, biodiversity, forestry, agriculture, and water management. Finance and migration are not included in the strategy, while social justice is only indirectly addressed through references to just transition objectives and the vulnerable populations protection.

The stated political vision focuses on "improving adaptive capacity and enhancing the resilience of socio-economic and natural systems to the impacts of climate variability and change across various regions and timeframes, facilitating Romania's transition to a sustainable, low-carbon economy."

The Action Plan outlines specific actions designed to guide the adaptation process across various sectoral programs. Of the 327 total actions, 182 (56%) are non-structural or "soft" actions, focusing on policy, awareness, and capacity-building. Another 112 actions (34%) adopt an ecosystem-based or "green" approach, leveraging nature-based solutions to enhance resilience. Finally, 33 actions (10%) are classified as "grey," involving infrastructural or engineered solutions. The plan integrates both local or targeted actions aimed at improving adaptive capacity in specific areas, as well as broader actions designed for national implementation, addressing sector-specific and cross-sectoral needs. Moreover, it establishes the clear need for developing local adaptation plans and strengthening local administrative capacity to translate national strategies into concrete, locally tailored actions.

Not covered in the comprehensive adaptation strategy, disaster risk reduction related to climate change has been addressed through a dedicated National Disaster Risk Reduction Strategy for 2023–2035. This strategy outlines Romania's vision to ensure disaster resilience through proactive, multisectoral, multi-hazard actions, and a whole-of-society approach, aligning with the Sendai Framework for Disaster Risk Reduction. Four action priorities are set for implementation: (i) improving the knowledge and awareness, (ii) increasing the capacity of public administration authorities to manage risks, (iii) encouraging investments in structural and non-structural measures, (iv) strengthening the preparedness of response forces and all actors involved.

The National Strategy for Sustainable Development (NSSD) is the main document encompassing transition efforts on the economic, social and environmental

pillars. It defines broad directions for combating the effects of climate change and adapting to its impacts, including ecosystem conservation, wetland restoration, and the rehabilitation of degraded land.

The urban policy is based on the National Strategy for Integrated Urban Development for Resilient, Green, Inclusive, and Competitive Cities 2022–2035, being the first framework dedicated to sustainable and resilient urban growth. It aims to align cities' development vision with European and global objectives, promoting coordinated action between central and local authorities. The strategy addresses major urban challenges such as climate change, urban sprawl, technological shifts, and social inequality and defines five strategic priorities: (i) spatial sustainability, (ii) green and resilient cities, (iii) competitive cities, (iv) social inclusion, and (v) improved administrative capacity and cooperation.

The National Forestry Strategy 2030 emphasises sustainable forest management and reforestation, recognising forests as vital to Romania's adaptation efforts. Expanding riparian forests and integrating forest management with biodiversity and water management policies could significantly improve resilience to climate-related risks such as flash floods and droughts. Biodiversity adaptation is addressed primarily within broader strategies, alongside specific legislation on protected areas and species, aligned with EU directives.

Agriculture faces increasing threats from rising temperatures and extreme weather events. Two pivotal strategies guide national efforts in this area: the National Strategy for Agriculture and Rural Development 2021–2030 and the Strategy for the Development of the Agri-Food Sector 2020–2030. These strategies promote adaptive practices such as agroforestry, drought-resistant crops, and precision irrigation. To support adaptation policies and achieve resilience and sustainability objectives, the National Rural Development Program has been established. This is the main financial instrument to promote sustainable agriculture with a budget of € 3.26 billion for the period 2021 – 2027.

For the water management sector, Romania's National Strategy for Flood Risk Management outlines essential measures to enhance resilience. These include upgrading flood monitoring systems, reinforcing defence infrastructure, and reducing the vulnerability of critical assets. Climate Change Adaptation Strategy recognises the growing challenges posed by drought. The government has developed instruments to mitigate the negative economic effects of drought through direct grants offered to directly affected actors.

Romania's obligations under the UN Convention to Combat Desertification include the development of strategies and priorities focused on sustainable development policies aimed at combating desertification and reducing the impacts of drought. In this context, the government is preparing to adopt the new National Strategy for Preventing and Combating Desertification and Land Degradation. The document has already passed the procedural stages and is currently awaiting formal adoption. The strategy is directly aligned with SDG 15. Life on Land, target 15.3: by 2030, countries combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation-neutral world. To achieve this, the strategy outlines a comprehensive set of measures: (i) related to agricultural ecosystems, (ii) hydrological, (iii) for soil conservation and quality improvement, (iv) addressing other forms of erosion and land degradation, (v) for forest ecosystems, and (vi) social. For each proposed measure, the strategy identifies

monitoring indicators, responsible institutions, estimated costs, and potential funding sources, ensuring the mechanisms for implementation and evaluation.

3. Governance Framework

The main institutional body with a role in climate change policymaking at the national level is the Government, i.e., the relevant ministries, especially the Ministry of Environment, Waters and Forests. The government ensures an overarching perspective on mitigation, adaptation, and sustainable development efforts beyond the sectoral level. In 2017, the Department for Sustainable Development (DSD) was established within the government's working structure and under the authority of the Prime Minister. This department coordinates the implementation of the 17 SDGs, with responsibilities for implementing, monitoring, and reporting. It evaluates and intervenes in relevant policies concerning SDG 13 and other adaptation and mitigation actions.

Significant changes occurred among the central legislative and executive powers following the general and presidential elections. The presidential administration, parliament configuration, and government have all been reshaped. However, no major shifts could be observed in the government's overall priorities or strategic orientation. The new administration faces pressure from a high budgetary deficit, prompting efforts to reduce public spending while increasing the absorption of EU funds. Although fiscal constraints may slow down national investments in M&A actions, the stronger focus on EU funding programmes is expected to stimulate green and resilience-oriented projects, particularly under the NRRP.

The Presidential Administration, with its semi-executive role, changed in May 2025 after a decade under the previous leadership. The former administration strongly prioritised climate action and international engagement, the new one continues along the same policy direction.

Under the authority of the Prime Minister, the General Secretariat of the Government (GSG) is led by the Secretary-General with ministerial rank and holds direct responsibilities for the technical and strategic operations related to governance and national policies. According to the government decision regulating its organisation, operation, and responsibilities, the GSG is tasked with monitoring and evaluating the implementation of measures assigned to national authorities and institutions responsible for climate change. The aim is to ensure coherence with the objective of climate neutrality established at the EU level, under the provisions of Regulation (EU) 1.119/2021, which sets the framework for achieving climate neutrality (the "European Climate Law"). Additionally, as part of its obligations under the National Recovery and Resilience Plan (NRRP), the GSG periodically reports to the European Commission on the progress of implemented measures.

Formally, the Ministry of Environment, Water, and Forests is the responsible body for coordination, monitoring and reporting actions to the European Commission. It underwent extensive restructuring in 2024, resulting in the elimination of 91 positions, including 19 management positions. Among the structures affected was the Directorate-General for Climate Change, which was downgraded to a service level and integrated into a broader directorate-general. This reorganisation significantly diminished the ministry's capacity to effectively coordinate and

implement climate policies at a time when its responsibilities in this area are increasing. In April 2025, under the MEWF, the National Agency for Environment and Protected Areas was established. This new institution has broad responsibilities, covering the mandates of the former Environmental Protection Agency and the Agency for Protected Natural Areas. The agency should play a central role in supporting the development, implementation, and evaluation of environmental and climate policies, covering key areas such as climate change, greenhouse gas emissions and air quality, waste management, soil protection, and biodiversity conservation.

Under the coordination of the MEWF, the Environmental Fund Administration (EFA) manages programmes financed by the national environmental fund. This public fund is part of the state's consolidated budget, with its sources established by law. EFA supports the financing of 26 categories of national projects and programmes aimed at promoting Romania's sustainable development, including climate action initiatives.

EFA administers Romania's most extensive national financing mechanism for climate action projects. Eligible beneficiaries of the fund include economic operators, local and national public institutions, private individuals, development associations, research and development institutes, and other sectoral entities.

To support climate change policies and establish annual priorities in adaptation, mitigation, and energy transition, the government established the Interministerial Committee on Climate Change (ICCC) in April 2022. This consultative body was operationalised as a milestone within the National Recovery and Resilience Plan (NRRP). Chaired by the Prime Minister, the committee brings together representatives of institutions responsible for designing and implementing climate policies at the national level.

Although climate change was included as a topic in the Supreme Council for National Defence in 2023 under the previous presidential administration, signalling its strategic importance, it continues to be treated superficially. Climate change is rarely addressed substantially on the political agenda and is almost completely absent from election campaigns. At the same time, investment decisions continue to favour grey infrastructure and real estate expansion, instead of solutions that can strengthen the climate resilience of communities.

From a multilevel governance perspective, the top-down implementation mechanism is functioning ineffectively. Regional and local authorities (e.g., county councils, municipalities, water basin authorities), which should ensure the coordination and implementation of sectoral strategies, lack the necessary capacities and competencies to translate national strategies into projects with real impact. Most local authorities do not have dedicated climate change departments, and responsibilities for adaptation and mitigation are scattered across various services, such as urban planning or environmental protection. Staff are not sufficiently trained to manage the challenges posed by climate change, and many civil servants do not have specific skills in this area.

NGOs and civil society organisations act as watchdogs, facilitators of dialogue, while citizens participate mainly through public consultations, protests, or local initiatives, but these mechanisms often lack transparency and timeliness. The most important NGOs and non-public actors (e.g., NGO – WWF Romania, think-tank – Energy Policy Group) usually participate in numerous monitoring

committees as observers, without any decision-making role. Their involvement in public consultation processes is often hindered by the short duration of consultations or by the lack of adequate publicity and accessibility. Although the inadequate application of regulations regarding public consultations represents one of the main issues.

Despite the noticeable advances, governance gaps remain substantial. Several strategic documents, such as the NECP and the Long-Term Strategy, do not allocate clear institutional responsibilities, financial tools, or binding implementation timelines. Fragmented mandates, weak coordination among ministries, and limited capacity at local and regional levels undermine the translation of high-level plans into practical measures.

4. The Main Dynamic Aspects of the Strategies

Romania's climate change objectives and actions have followed an upward trajectory, particularly since the country's accession to the European Union. After 2020, an acceleration in establishing strategic and political direction at the national level can be observed. The need to align with new European targets, as outlined in the EGD, the European Climate Law, and the EU Adaptation Strategy, has driven significant changes in national policies.

An analysis of the barriers and challenges to the implementation of mitigation and adaptation strategies, conducted by the think-tank Energy Policy Group, reveals several pressing issues:

- Funding limitations – climate adaptation strategies require substantial funding, yet budget constraints at the national and local levels hinder implementation
- Lack of technical and institutional capacity and expertise gaps
- Public Awareness and Engagement Deficits
- Lack of Cross-Ministerial Accountability
- Complexities and gaps in Policy Coherence
- Lack of political will.

The NRRP channels 56% of investment into the green transition, especially in sustainable transport, building renovation, and waste and water management (Figure 1). These actions contribute to both emissions' reduction and increased resilience to climate risks, ensuring A&M convergence under a shared financing framework.

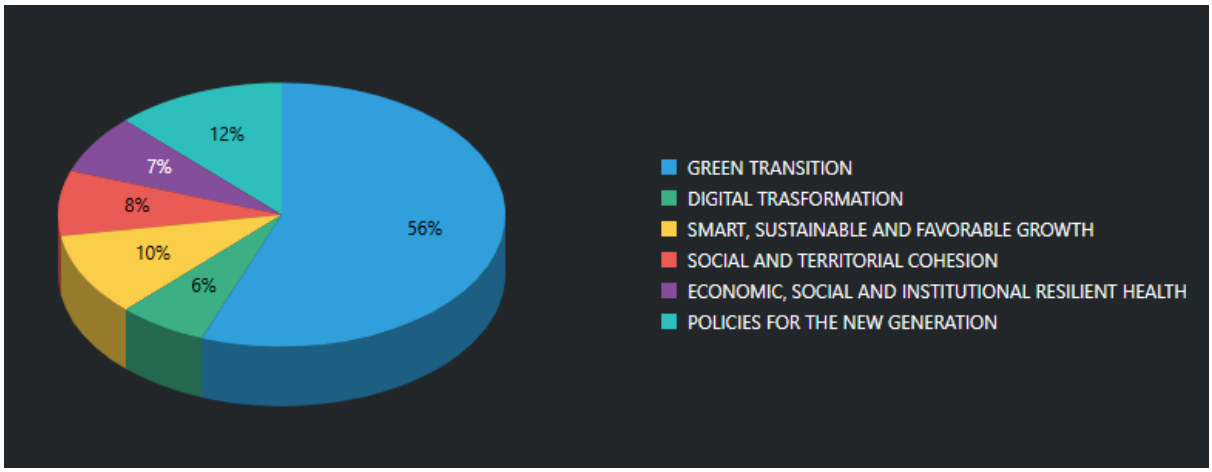

Figure 1. Structure and budgeting of NRRP of Romania (capture from the official website of NRRP)

5. Effectiveness of the strategies/policies

Since 1990, Romania has significantly reduced GHG emissions by 75%, mainly due to industrial shrinking, contextually creating the basis for mitigation action. M&A policies have been progressively integrated into national frameworks in line with international commitments, starting in the early 2000s. Studies exploring environmental policies usually indicate significant gaps in the implementation process and monitoring-evaluation mechanisms.

On 29 November 2023, the Romanian Government approved the Long-Term Strategy for Reducing GHG Emissions, which aims to develop the roadmap for achieving climate neutrality by 2050. The approval of this strategy also enabled Romania to resolve an infringement procedure initiated in 2022 by the European Commission for failing to submit its Long-Term Strategy.

The strategy outlines options for decarbonising key economic sectors, including energy, transport, agriculture, residential heating, waste management, and forestry. Three scenarios were analysed: the Reference Scenario, the Middle Scenario, and the Climate Neutral Romania Scenario, the latter being selected for implementation by 2050. Under this scenario, Romania aims to achieve climate neutrality by 2050, with a net emissions reduction of 99% compared to 1990 levels.

The energy sector has continued to lower GHG emissions in recent years, largely driven by the EU carbon pricing mechanism, the expansion of renewable energy capacity, and the planned phase-out of coal-fired power plants (Energy Policy Group, 2022). These developments mark significant progress in the decarbonisation of the national energy system that is extensively explained in the national report State of Climate 2025. In contrast, energy-intensive industrial sectors have made only limited progress, implementing mainly isolated energy efficiency measures without undertaking the deep structural transformation required to align with a clear pathway toward climate neutrality. While the energy sector is advancing steadily along its decarbonisation trajectory, heavy industry remains insufficiently transformed, representing a key challenge for achieving Romania's long-term mitigation goals (Energy Policy Group, 2022). The coal phase-out law, officialised via Government Emergency Ordinance 108/2022, has institutionalised the gradual removal of coal and lignite from the energy mix, an action part of the NRRP. This is coupled with mandated socio-economic transition

measures for affected workers and local communities. Currently, Romania is negotiating with the European Commission to delay the shutdown of coal plants (consisting of approximately 2.6 GW) since replacement projects are lagging (Energy Policy Group, 2025).

Romania is expected to receive approximately €10 billion between 2026 and 2032 from the Social Climate Fund. The government has not yet managed to meet the main prerequisites for accessing these funds, as the Social Climate Plan has not been adopted and ETS2 system has not been operationalised yet. This social plan should guide investments and projects for enhancing resilience and social equity under the climate change impact and mitigation actions.

Romania has allocated €148 million through the NRRP to develop 100 MW of electrolysis capacity, targeting industries such as chemicals, steel, and refining, economic sectors that are difficult to decarbonise through direct electrification. The Hydrogen Strategy vision for 2030 is structured around four main strategic directions: (i) economic decarbonisation using renewable hydrogen in hard-to-abate sectors, (ii) sustainable technological development and job creation, (iii) long-term energy system modernisation and investment attraction, and (iv) strengthening energy security through the integration of hydrogen and Power-to-X solutions.

In the building sector, progress has been slower. “Renovation rates for energy efficiency remain low, at only 0.5% of the building stock per year” (Ministry of Development, Public Works and Administration, 2020). However, the government plans to scale this up significantly, aiming for a 3.39% annual renovation rate by 2030. Achieving these goals will require an estimated €12.8 billion in investments by 2030, with the funding coming from both public and private sources. To support the energy efficiency of buildings, the “Valul Renovării” (Renovation Wave) component was included in the National Recovery and Resilience Plan, with an allocated budget of €2.2 billion. Green building policies, guided by the National Long-Term Renovation Strategy and NZEB standards, prioritise energy efficiency, often neglecting adaptation measures. Current policies prioritise new construction, leaving older urban infrastructure vulnerable to climate risks. Local programs to retrofit urban buildings are not yet providing resilience improvements on a national scale.

Emissions in the transport sector have risen by “50% since 2005, now accounting for 17% of the country’s total emissions”. Most of these emissions, 96%, come from road transport. Efforts are underway to address this challenge by promoting rail transport, accelerating the adoption of electric vehicles, and improving the overall transport infrastructure, including charging infrastructure. Although there is positive progress towards decarbonising transport and achieving long-term objectives, the World Bank report highlights the likelihood of continued emissions growth and the need for more substantial investments and policies. There is no integrated transport strategy in place, and the comprehensive transport master plan has yet to be updated and aligned with current needs. Despite progress, significant challenges remain in key areas. The energy transition relies on large-scale electrification, particularly in transport and heating, currently based on fossil fuels and biomass. Agriculture and water management face substantial vulnerabilities due to climate variability. The agricultural sector, while economically significant, has shown limited adaptive capacity, and the increasing

risks of water scarcity and flooding require urgent implementation of integrated water resource management.

A report published in 2024 by the think tank Energy Policy Group highlights several gaps in NECP that jeopardise the achievement of its objectives, as follows:

- Lack of detailed implementation plans and mechanisms, and specific sectoral measures
- Inadequate use of renewable energy in industry and buildings
- Insufficient details on the decarbonisation of the transport sector
- Failure to fully comply with the requirements of the Energy Efficiency Directive (EED) and the targets of the Renewable Energy Directive (RED III)
- Lack of ambition in long-term renovation strategies and overall emissions reductions
- Absence of plans to reduce gas consumption and improve energy storage
- Lack of concrete measures to support research and innovation in renewable energy technology and adaptation to climate change.

The NECP fails to address adaptation policies across all relevant dimensions of the Energy Union. It lacks a comprehensive analysis of climate vulnerabilities and associated risks that could impact the achievement of national objectives, targets, and contributions. Furthermore, it does not adequately outline policies and measures within the individual dimensions of the Energy Union. The connection between adaptation policies and specific Energy Union objectives and policies, including the support they should provide, is neither specified nor quantified (EPG, 2024).

According to a World Bank analysis from October 2024, Romania was affected by over 100 catastrophic climate events, which directly impacted over 2 million people, caused nearly 5,000 deaths, and generated economic losses of over $17.2 billion between 1900 and 2021. The Country Report on Climate and Development for Romania indicates losses between 0.3% and 0.6% of its GDP annually due to extreme weather events, amounting to between €800 million and €1.6 billion. The report estimates that Romania should invest up to US$160 billion in climate adaptation to effectively address these risks.

A preliminary analysis assessing the outcomes of the National Climate Change Strategy 2016–2020 was conducted under the national project “Strengthening Institutional Capacity to Improve Climate Change Policies and Adaptation to Climate Change Effects”, which finalised with the adoption of the National Climate Change Adaptation Strategy. The degree of achievement of the strategy’s objectives was found to be unsatisfactory across all key sectors. Only 16 out of 147 measures could be reported as completed. Some measures were partially implemented, while certain objectives were partially met through unspecified actions outside the original plan. Additionally, the analysis highlighted the lack of monitoring mechanisms and the absence of updated data necessary to evaluate the effectiveness of the actions.

Initiatives for disaster risk management and urban climate adaptation are underway, including measures to address UHI effects. Moreover, economic modelling suggests that the transition to a low-carbon economy will have a minimal impact on GDP, with a projected loss of just 2% by 2050 compared to a business-as-usual scenario. Romania’s external competitiveness is expected to remain stable, supported by its alignment with EU policies.

For evaluating the implementation of the SDGs at the national level, the Department for Sustainable Development in collaboration with the National Institute of Statistics, has developed a set of 98 national indicators to monitor progress towards the SDGs. This framework should enable systematic tracking and reporting on the implementation of sustainable development policies. In practice, monitoring of M&A measures is fragmented across institutions, and performance indicators are not integrated into a unified system. Reporting to the EU relies on ad-hoc contributions from ministries, affecting data coherence and comparability. Romania has participated in Voluntary National Reviews (VNRs) in 2018 and 2023, presenting its progress and challenges in achieving the SDGs at the United Nations High-Level Political Forum. According to the 2023 VNR, Romania has made significant advancements in several areas such as poverty reduction, quality education, and economic growth. In line with SDG 7 related to clean energy, the increase of the renewable energy share in the national energy mix, contributing to energy sustainability has already been mentioned. Despite these achievements, ongoing challenges related to SDG 13 Climate Action are faced and the mitigation and adaptation strategies should be strengthened. The government has sought to address this by adopting two key strategies: the long-term emissions reduction strategy and the adaptation strategy.

In March 2024, the Government approved the Romanian Sustainability Code through Decision no. 1.117/2023. This initiative aims to enhance transparency and comparability in sustainability reporting, providing stakeholders with a clearer understanding of sustainability requirements and offering a free-of-charge reporting platform.

Romania has undertaken significant steps to transition from a linear to a circular economic model through the implementation of its National Strategy for the Circular Economy (NSCE). Adopted in September 2022, the NSCE serves as a comprehensive roadmap to accelerate this transition, aligning with the SDGs of the UN 2030 Agenda. Waste management is also embedded as a key component in the EU Green Transition Pillar of NRRP, with a strong emphasis on separate collection, reuse, and recovery. Additionally, after multiple iterations, Romania has transposed EU waste legislation and introduced a deposit-return system for non-reusable packaging to meet packaging and recycling targets.

Significant gaps, weaknesses, and under-support in practice are still faced. There are delays and inconsistencies regarding the recycling and landfill closure obligations; hence, Romania is subject to infringement proceedings. Out of 68 non-compliant landfills, only 20 have been permanently closed. Local authorities, which are directly responsible for waste management activities, frequently lack the capacity to manage integrated waste systems. Responsibilities are fragmented between municipalities, private operators and intercommunity associations, leading to weak coordination. Infrastructure for separate collection, sorting, and recycling is still lagging in many regions.

Despite the measures already implemented at the national level, progress in sectors such as packaging, waste, textiles, or construction is rather unsatisfactory. Municipal waste generation increased by around 5% between 2018 and 2023, while the construction sector recorded the highest growth, with waste generation rising by approximately 25% over the past five years. By the end of 2024, reported recycling rates for municipal waste, packaging, and electrical equipment remained below the EU average. The circular material use rate stands at only 1.3%,

far below the EU average of 11.8%, indicating that a linear economic model continues to prevail in Romania.

Most national documents, including the NSACC and the SDS, refer to principles such as social equity, just transition, and the protection of vulnerable groups, but these concepts remain largely declarative and insufficiently translated into concrete measures.

Mitigation policies have primarily focused on technical and economic objectives, such as emission reduction and energy efficiency, without systematically integrating social impact assessments. Certain actions, including the energy transition or the rising costs associated with environmental policies, risk deepening regional and socio-economic inequalities, particularly affecting communities dependent on high-emission industries or outdated energy infrastructures. Despite growing recognition of vulnerable consumers within the energy transition, most interventions have been reactive, prompted by crises rather than embedded in long-term, preventive strategies.

Concerning adaptation, the social dimension is even rarely addressed. Vulnerable groups, such as elderly people, isolated rural communities, and low-income households, are among the most exposed to climate risks, particularly heatwaves, droughts, and floods. Nevertheless, current policies do not include dedicated support mechanisms, such as social assistance programs or investments in community-level protection infrastructure.

6. Other Aspects

This updated report is based on policies implemented and in force as of November 2025. Regardless of the general orientations of governments in recent years, no significant differences or deviations can be observed in the approach or stance on climate policies. The changes following the parliamentary and presidential elections in December 2024 and May 2025 have not significantly altered the overall direction of the central government regarding EU-aligned objectives.

National M&A policies are heavily concentrated in the energy sector, where most mitigation measures and investments are directed. This sector benefits from clearer regulatory frameworks, quantifiable indicators, and EU-level monitoring and enforcement mechanisms such as the EU Emissions Trading System (EU ETS), including cap-and-trade schemes and EU-funded projects. While the energy sector shows measurable progress in emission reduction and infrastructure modernisation, broader climate resilience objectives remain underdeveloped, reflecting a persistent imbalance between mitigation-driven initiatives and the wider adaptation needs of the economy and society.

Debates remain highly active regarding the decarbonisation of the energy sector, the use of fossil fuels, and the exploitation of coal and of natural gas from the Black Sea. Pressure on decarbonisation efforts continues to increase amid persistent inflation and rising household energy prices. The evolving dynamics of the conflict in Ukraine, which continue to affect the European energy market, together with the new government's capacity to expand production and modernise energy infrastructure, will play a decisive role in shaping decarbonization efforts, at least until 2028, when the next general election is scheduled.

From an adaptation perspective, multiple experts highlight how the current approach remains largely reactive, focusing on responses to the impacts of extreme events. A paradigm shift toward a proactive and anticipatory strategy is urgently needed to address climate risks, especially those related to extreme heat and water hazards. These issues, alongside securing funding sources and improving the local capacity to implement projects with real socio-economic impact, will be critical in the coming years.

ANNEX B9 – CLIMATE POLICIES IN THE U.K.

1. Introduction

The UK approach to tackling and responding to climate change is based on the Climate Change Act of 2008. This act requires that emissions of carbon dioxide and other greenhouse gases are reduced and that climate change risks are adapted to. The Act also establishes the framework to deliver on these requirements (CCC Web-site 2025)[40]. The Act supports the UK's commitment to urgent international action to tackle climate change. The text approved in 2008 has been revised (UK Public General Acts 2025) [41].

It is worth stressing that the UK government recently changed (in July 2024). The new government's practical orientations are very clear, and various meaningful actions have been undertaken. Notwithstanding this, most of the administrative framework has not changed. What follows, therefore, is mainly based on the documents available until the end of October 2024 (the conclusion date of the second documentary analysis) and with those that report the major novelties after the July 2024 elections. Such an approach is well founded since this report is aimed at representing the structural aspects of the UK policies on Climate change, and the most relevant orientations on how these policies will be implemented in the next years.

2. Strategies of Mitigation and Adaptation

2.1. Objectives

According to the current official communication of the UK government, "The Climate Change Act (CCA) commits the UK government by law to reducing greenhouse gas emissions by at least 100% of 1990 levels (net zero) by 2050. This includes reducing emissions from the devolved administrations (Scotland, Wales and Northern Ireland), which currently account for about 20% of the UK's emissions. The 100% target was based on advice from the Committee on Climate Change (CCC) 2019 report, 'Net Zero – The UK's contribution to stopping global warming'"(CCC Web-site 2025).

The legal definition of net zero in the CCA of 2008 implies that it "(...) can be achieved through reducing emissions as well as offsetting greenhouse gases, such as planting trees or using carbon capture and storage technologies. This would mean that total greenhouse gas emissions produced would be equal to greenhouse gas equivalents removed from the environment." (Burnett et al. 2025)[42]

As is often the case, there are two strands of Climate Change policy (CCP). "The Climate Change Act (2008) made the UK the first country to establish a long-term legally binding framework to cut carbon emissions. It contains a target requiring

[40] CCC Web-site (2025), Climate Change Committee, Climate Action, accessed on 15/12/2025.
[41] UK Public General Acts (2025), Climate Change Act 2008, accessed on 15/12/2025.
[42] Burnett N., Stewart I., Hewett T., (2025), "The UK's plans and progress to reach net zero by 2050", Research Briefing 6 November 2025, The House of Commons Library

emissions reductions to Net Zero by 2050. The Act puts in place a rolling cycle of statutory national risk assessments and a resulting Adaptation Programme that must address the risks" (CCC Web-site 2025). The CCA 2008 states two strands of CCP. One is the reduction of emissions of carbon dioxide and other greenhouse gases; particularly, "the 100% target was based on advice from the CCC's 2019 report, 'Net Zero – The UK's contribution to stopping global warming'" (CCC Web-site 2025). The second strand concerns the adaptation to climate change risks.

The two strands of CCP, Mitigation and Adaptation (M&A), have their specific objectives and their related strategies and actions which cover matters not devolved to national authorities and England. Each devolved administration, in turn, has its own M&A strategies and plans.

Generally, Mitigation implies the achievement of the aforementioned objectives in terms of greenhouse gas (GHG) emissions. More in particular, the CCA "requires the government to set legally-binding 'carbon budgets' to act as stepping stones towards the 2050 target. A carbon budget is a cap on the amount of GHG emitted in the UK over five years. Budgets must be set at least 12 years in advance to allow policymakers, businesses and individuals enough time to prepare. (...) Once a carbon budget has been set, the CCA places an obligation on the Government to prepare policies to ensure the budget is met."(CCC Web-site 2025)

Adaptation, on the other hand, is focused on the management of risks generated by Climate Change. "The CCA requires the UK Government to produce a UK Climate Change Risk Assessment (CCRA) every five years. The CCRA assesses current and future risks to and opportunities for the UK from climate change. In response to the CCRA, the CCA also requires the UK government to produce a National Adaptation Programme (NAP). The NAP covers England, while the devolved administrations produce their own programmes and policies. The Act also gives powers to the UK Government to require certain organisations to report on how they are adapting to climate change. This is called the Adaptation Reporting Power" (CCC Web-site 2025). It is worth stressing here that the NAP "covers England and reserved matters, [it] must set out the UK government's objectives, proposals and policies for responding to the risks identified in the CCRA (DEFRA 2022)[43]".

2.2. Rationale and Timeframe

The UK Government is the actor who has the main responsibility – according to the CCA – of defining and implementing the CCP in the UK. The new government (elected in July 2024) is changing the CCPs in the UK. It is useful to present the main characteristics of the policies currently in force, considering that the new government's initiatives are still at an initial stage (as of November 6, 2025) and that the legislative framework of CCP (the CCA of 2008) has not changed.

According to the Research Briefing of the House of Commons Library, "The UK's Plans and Progress to Reach Net Zero by 2050" issued on 6 November 2025, "the UK is committed to reaching net zero by 2050. This means that the total GHG emissions would equal the emissions removed from the atmosphere, aiming to limit global warming and resultant climate change. The UK Government has adopted a suite of policies in order to reach net zero. Its most recent strategy

[43] DEFRA (2022) UK Climate Change Risk Assessment 2022

document, published under the Labour Government, is the 2025 Carbon Budget and Growth Delivery Plan" (Burnett et al. 2025).

The Boris Johnson government policies, later confirmed by the following cabinets (DESNZ. 2023)[44], were based on the idea that Climate Change is a big menace that is already producing many damages that are going to increase, that the challenge it represents can be addressed, and that doing it represents an economic opportunity (BEIS 2021)[45].

The new Labour Government does not deny this but provides a different angle: Climate action and clean energy are a good answer to the dependence on fossil fuels that is creating economic problems for the UK because of higher prices and unreliability of supply. The rationale of the new Government approach is "taking back control" of energy, also because it represents "the economic and jobs opportunity of the 21st century" (Miliband 2025[46]).

2.3. Mitigation strategy in UK

The first strand of UK policy concerns Mitigation.

The cornerstone of the past UK Government approach of UK CCP, especially for what concerns mitigation, was contained in a document on the Net Zero Strategy ("Build Back Greener", DESNZ 2022)[47] which was published on 19 October 2021 and last updated in April 2022. The approach was focused on "policies and proposals for decarbonising all sectors of the UK economy to meet the government's net zero target by 2050" (Burnett et al. 2024)[48]. Such policies and actions aimed at the Net Zero Strategy were based "on wider government policy, such as the ten-point plan for a green industrial revolution, which was published on 18 November 2020" (Burnett et al. 2024). The Former Governments produced other updates of the strategy (DESNZ 2023 and UK Government 2023[49]) to keep up with the big challenges to the energy supply system due to recent developments (e.g., Russia-Ukraine war).

The various Governments that have succeeded so far seem to share the acknowledgement of the high relevance of climate change and the need to act accordingly. In the document issued by the Government in 2021 it was recognized the relevance of the IPCC report and, particularly, the conclusion that "if we fail to limit global warming to 1.5°C above pre-industrial levels, the floods and fires we have seen around the world this year will get more frequent and more fierce, crops will be more likely to fail, and sea levels will rise driving mass migration as millions are forced from their homes. (...) But the good news is that there is, still, a path to avoid catastrophic climate change. The science could not be clearer (...)"(BEIS 2021). The then Government's market-friendly approach was based on the recognition that contrasting climate change is worth being done "not just because it is the right thing to do, but because we are determined to seize the unprecedented economic opportunity it brings"(BEIS 2021). The idea was that "Removing dirty fossil fuels will require the transformation of every sector of the

[44] DESNZ (2023). Powering up Britain. Energy Security Plan
[45] BEIS, "Net Zero Strategy: Build Back Greener," 2021
[46] Miliband, E. (2025) Ministerial foreword, in UK Government, "Unlocking benefits of the clean energy economy", October 2025
[47] DESNZ (2022), Build Back Greener, 19 October 2021 (Updated 5 April 2022)
[48] Burnett N., Hinson S., Stewart I. (2024), "The UK's plans and progress to reach net zero by 2050", Research Briefing 26 September 2024, The House of Commons Library
[49] UK Government (2023), Carbon budget Delivery plan, March 2023

global economy"(BEIS 2021) and this implies a reduction of costs in the long run. "(...). We have shown the world that green and growth go hand in hand, and as a result, other countries are already following our lead with their own net zero targets."(BEIS 2021). In this framework, it is worth recalling that the very "net-zero" target by 2050 was set in 2019 by a Conservative Party Government that, in this way, tightened the objective that previously was set at 80% of Gas Emissions compared to 1990 levels (UK Government 2025a)[50].

As stressed above, the current Government's approach too is based on the recognition that climate action and clean energy represent "the economic and jobs opportunity of the 21st century" (Miliband 2025). From this point of view, it can be said that the approach of the previous Government has not changed drastically. The idea is that the economic process, if well-managed and functioning properly, could lead to decarbonization. Nevertheless, the differences lie in how to take up these opportunities.

The new Government's strategy is hinged on a strong mission approach according to which "industry and government work in partnership at pace", as the Head of Clean Power 2030 stated in presenting the related plan (DESNZ 2025)[51]. The clear message of the UK Government is the sense of urgency (DESNZ 2025): some important objectives of the Government's action are set in the time horizon of 2030, an important milestone to reach to comply with decarbonization objectives. Cleaning up the UK power system is not just central to decarbonising the whole economy, according to the Government, but has wider benefits, consisting of growing renewable industries, attracting investment, and deploying clean energy technologies on a larger scale (DESNZ 2025a).

The UK Government is promoting "the biggest investment in clean low-cost energy in British history" (UK Government 2025b)[52], including renewable and nuclear. Crucial to this strategy is the idea that benefits should be brought "directly to families and businesses as quickly as possible" (UK Government 2025b 10). According to Ed Miliband, the Secretary of State for Energy, Security and Net Zero, "The age of clean electricity is about harnessing the power of Britain's natural resources [to] protect working people from the ravages of global energy markets" (UK Government 2025b). This orientation to producing tangible results impacting people's lives is clearly expressed in a recently released document (UK Government 2025b). The strategy aims at reducing emissions while enhancing energy security, protecting billpayers, creating economic growth and good jobs, and protecting the environment. This includes "rolling out home and building upgrades, so that working people and businesses feel the benefits of clean power with warmer homes and buildings, and lower bills, with support to install solar, batteries, heat pumps, insulation and other technologies" (UK Government 2025b).

The areas being taken to accelerate the achievement of clean power are the following (DESNZ 2025a):

[50] UK Government (2025a), Carbon Budget and Growth Delivery Plan Presented to Parliament pursuant to details of the Climate Change Act 2008 Section 14 Ordered by the House of Commons to be printed on 29 October 2025, Point 10

[51] DESNZ (2025a), UK Government, Policy paper, Clean Power 2030 Action Plan: A new era of clean electricity – main report, updated 15 April 2025

[52] UK Government (2025)b, "Unlocking benefits of the clean energy economy", October 2025

- Electricity Networks and connections (reform the grid connection process, regulatory reform so to accelerate the expansion and upgrade of the transmission and distribution networks)
- Speed up planning and consenting process (and prioritize 2030-critical projects) by ensuring "that a reformed planning system enhances the restoration of nature"
- Improve renewable and nuclear project delivery through specific interventions (e.g., to improve the competitive process for offshore wind, involve Great British Energy, improve the development of emerging low-carbon technologies and nuclear projects)
- Electricity market reform
- Promote short-duration energy storage and flexibility
- Promote long-duration flexibility
- Strengthen supply chains and workforce. Increasing investment dramatically for renewing the power system implies that the related supply chains are able to provide the needed inputs, and the workforce is available timely. Specific initiatives, including training schemes, are being promoted
- Involve actors from the relevant sectors across industry and academia to advise the administration in implementing the Clean Power 2030 Action Plan.

The difference with the preceding Government's approach lies in the idea of the implementation of a mission through active intervention vs the use and/or production of the right incentives and limitations (via taxes and some regulations) that are supposed to promote the transition. The social dimension of climate change policies is now considered through the objective of lowering bills and producing benefits that could be enjoyed in the short run. Actions are undertaken to speed up the achievement of these goals, including paying attention to the ability of the supply chains to satisfy a growing demand for decarbonized energy. This also includes growing (DESNZ 2025a) a workforce that is able to work in a renewed energy-supply-environment. In the preceding government approach, the benefits would be transmitted through the functioning of the market and, in case of need, through the provision of protection for the most vulnerable people. The urgency now is achieving further results and making them change citizens' daily life, while then it was more about how to fund the "costs to the investments needed to make this transition happen" (BEIS 2021).

Apart from the declaration of principle, it is worth mentioning that the New Government claims that the results reached so far by the UK mitigation policies (led by diverse Cabinets) have been good: "Six carbon budgets have been set to date, covering 2008 to 2037. Carbon Budget 6, the first to be set under the UK's net zero target, was legislated for in June 2021. The UK has already met, and overachieved, its first (2008-2012), second (2013-2017), and third (2018-2022) carbon budgets and is on track to meet the fourth (2023-2027). The UK is the first major economy to halve its emissions – having cut them by 54% between 1990 and 2024, while also growing its economy by 80%."(UK Government 2025a).

The new UK Government, from its establishment, beyond defining its plans for the future, has launched various actions. The Secretary of State for Energy Security and Net Zero lists the following as the main steps already taken for mitigation: "consenting enough wind and solar to power the equivalent of 7.5 million homes,

setting up Great British Energy (DESNZ 2025b[53]) investing in the biggest nuclear building programme in half a century, kickstarting Britain's carbon capture and hydrogen industries, rolling out home upgrades around the country and putting Clean Energy Industries at the centre of our Modern Industrial Strategy" (UK Government 2025b).

2.4. Mitigation for the devolved administrations

Mitigation policies are implemented differently in the devolved administrations. In the rest of the paragraph, some aspects of the process ongoing at the local level are briefly described. In this framework, it should be stressed that "policies are partly process reserved to the UK government and partly devolved. Therefore [the above-described mitigation strategy], presents both England-specific and UK-wide policies and plans, which highlight the government's work to collaborate with devolved administrations to deliver coordinated policy action" (Audit Scotland et al. 2023 [54]).

The Scottish Government, on 6 November 2025, issued a "Scotland's Draft Climate Change Plan: 2026–2040" (Scottish Government 2025a)[55] (it also produced, recently, a new version of the Adaptation plan, see below). It is the result of a process following the release of the CCC's assessment report, and the announcement of an "accelerated package of new climate action measures on 18 April 2024 (Scottish Government 2024a)[56]" that totally or partially accepted the 15 recommendations given by the CCC, which criticized the implementation status of the Scottish plan. In terms of the approach to mitigation policy, it is worth stressing the orientation to guarantee that the "climate change framework (…) reflects the reality of long-term climate policymaking" (basically through annual reporting and the introduction of five-yearly carbon budgets). The new plan is in line with the objectives of the UK strategy, since "the net zero transition can also support significant economic opportunities for Scotland. Our already thriving green jobs sector can continue to grow in regions across Scotland, while collaborative working with the private sector can boost investment in the net zero economy" (Scottish Government 2025a). It is important to stress also that the principle of "Just transition" at the basis of the preceding policies is also confirmed (Scottish Government 2025a) so to address properly the fact the "some people and places in Scotland will be affected by climate change impacts worse than others" (Scottish Government 2024b)[57]. The objectives are: supporting transport services, people, and businesses to reduce their emissions; promoting and develop renewable energy, creating jobs and developing skills within the industry; tackling fuel poverty and protect those on low incomes while decarbonizing heat in buildings; Investing in nature-based solutions helping to reverse nature decline and restore and regenerate biodiversity in Scotland; adapting to climate impacts; and continuing to play our role in delivering global climate justice by securing

[53] Great British Energy is a "publicly-owned and operationally independent company, headquartered in Aberdeen, supporting the delivery of the clean energy superpower mission". UK Government, DESZN (2025b), Policy paper Great British Energy Act 2025: factsheet Updated 3 September 2025

[54] Audit Scotland, Audit Wales, National Audit Office, Northern Ireland Audit Office, (2023) "Approaches to achieving net zero across the UK."

[55] Scottish Government (2025a), Scotland's Draft Climate Change Plan: 2026–2040, 6 November 2025

[56] Scottish Government (2024a), Progress in reducing emissions in Scotland 2023: SG response, 18 April

[57] Scottish Government (2024b), "Scottish national Adaptation Plan. 2024-2029. Actions today, for a climate resilient future"

global change (Scottish Government 2025a). Interestingly, the issue of distribution of responsibility between the UK Government and the devolved administration is raised ("many of the critical levers required to deliver net zero in Scotland are held at the UK level; meanwhile, delivering UK-wide climate targets is also reliant on Scotland achieving our net zero aim" (Scottish Government 2025a).

Relevant policy issues to be considered as for the coordination of action of these different government levels, concern prices in the electricity market; how to approach vehicle and road taxation; financial support for land-based measures, funding distribution for agriculture; and further certainty on critical investment decisions (Scottish Government 2025a).

The CCC published, in June 2023, the "Progress report: reducing emissions in Wales" (Climate Change Committee 2023a)[58]. It was the last document available concerning mitigation policies in general in Wales. The overall comment provided by the CCC is that "While the First Carbon Budget (2016-2020) has been achieved, Wales is not yet on track to meet its targets for the second half of this decade and beyond" (Climate Change Committee 2023a). Interestingly, progress was slow for the aspects of mitigation policies related to "areas where the Welsh Government has policy responsibility". In May 2025 the CCC provided advice to the Welsh Government on the level of Wales' Fourth Carbon Budget (Climate Change Committee 2025a),[59] and then further exchanges followed (see below).

The legislative framework for Northern Ireland climate change policy was set with the Climate Change Act (Northern Ireland) of 2022. In March 2023 the CCC published an "Advice Report: the Path to a Net Zero Northern Ireland (Climate Change Committee 2023b)[60]" consisting of an "advice to Northern Ireland on how the legislated target [on net-zero] might be reached, and on the levels for the 2030 and 2040 interim targets and the First (2023-2027), Second (2028-2032) and Third (2033-2037) Carbon Budgets on the path to it" (Climate Change Committee 2023b 9). The report holds that resolute actions must be taken to achieve the Net-Zero-related objectives: "With emissions having reduced only an average of 9% per decade since 1990, a step change in action is needed now" (Climate Change Committee 2023b). The CCC developed a "'Stretch Ambition' pathway that reaches a 93% reduction in emissions on 1990 levels by 2050" and requires Northern Ireland to take stretching actions to bolster the contribution of GHG removals and therefore balance some of the residual emissions from agriculture" (Climate Change Committee 2023b)". More recently, the CCC has provided its advice on the Fourth Carbon Budget, covering the period 2038 to 2042, and "the Northern Ireland Executive needs to consider this advice and to set the budget by the end of 2026" (Climate Change Committee 2025b)[61].

2.5. Adaptation strategy in the UK

The UK adaptation strategy is presented in the Third National Adaptation Programme (NAP3). In general, the NAPs set out how the government will address the risks identified in the CCRA and "covers England and reserved matters"

[58] Climate Change Committee (2023a), Progress report: reducing emissions in Wales, June 2023
[59] Climate Change Committee (2025a), Wales' Fourth Carbon Budget. Advice for the Welsh Government, 14 May
[60] Climate Change Committee (2023b), Advice report: The path to a Net Zero Northern Ireland, March 2023
[61] Climate Change Committee (2025b), Northern Ireland's Fourth Carbon Budget. Advice for the Northern Ireland Executive, March 2025

(DEFRA 2022). The UK government is currently in its third statutory cycle of national risk assessment and adaptation planning under the CCA 2008 (DEFRA 2023a)[62].

The UK Government published the third National Adaptation Programme – NAP3 (DEFRA 2023a) on 17th July 2023, which sets the actions that Government and others will take to adapt to the impacts of climate change in the UK for the period 2023-2028. The actions in NAP3 seek to address the risks highlighted in the UK's third Climate Change Risk Assessment – CCRA3 (DEFRA 2022), which was informed by an independent assessment of UK climate risk (CCC 2021a[63]) and a supporting technical report and research projects (UK Climate Risk 2021[64])"(Ffoulkes and Oliver 2024)[65].

The former UK government's vision on adaptation that informs the current NAP3 "is for a country that effectively plans for and is fully adapted to the changing climate, with resilience against each of the identified climate risks." (DEFRA 2023a). It acknowledges "the need to take adaptation action". The approach is defined as "comprehensive", since it responds "to every risk and opportunity in the Climate Change Risk Assessment" and its scope has widened to "responding to international risks impacting the UK" [the third Climate Change Risk Assessment (CCRA3)"[66]. The programme is focused on 3 main themes: "action", "information" and "coordination". These – according to the former UK government – combine to ensure a better-informed, more closely coordinated across government]t, and more action-focused delivery over the 5-year NAP period. It is also based on the assumption "the UK's national and local government bodies continue to work closely together to tackle climate change at both national and local levels" DEFRA 2023a). The actions are summarized in the NAP3 presentation document (DEFRA 2023a) and concern the following domains:

- Infrastructure (including water, energy, transport, data, telecoms and 'cascading risks'[67])
- Natural environment (including terrestrial and freshwater habitats and species, coastal and marine habitats and species, forests and peatlands, agriculture and soils)
- Health, communities and the built environment
- Business and industry (including people, physical assets and business operations)
- International impacts (including trade, food human mobility and violent conflict, law and governance, international financial and international health)
- Adaptation Reporting Power
- Supporting evidence.

[62] DEFRA (2023a) The third National Adaptation Programme (NAP3) and the fourth strategy for climate adaptation reporting

[63] Climate Change Committee (2021a) Independent Assessment of UK Climate Risk: Advice to Government for the UK's third Climate Change Risk Assessment (CCRA3)

[64] UK Climate Risk (2021) Technical report (CCRA3-IA).]

[65] Ffoulkes, C., and Oliver, H., (2024) Rapid evaluation of the extent to which NAP3 addressed suggested adaptation actions in CCRA3. ADAS report for the Climate Change Committee.

[66] NAP3 Annex 1 (2023) Climate risks and opportunities, annex to Defra (2023a) The third National Adaptation Programme (NAP3) and the fourth strategy for climate adaptation reporting.

[67] The specifications in bracket are taken from Burnett, N. (2025), "Climate change adaptation and resilience in the UK", Research Briefing, Published 26 June 2025

It is stated in the presentation document that "the NAP3 programme will continue to develop over the 5-year period. It will be underpinned by a programme of capability building and strong governance which will drive effective join-up across government and with our delivery partners, working together to realise our vision" (DEFRA 2023a).

After the establishment of the new Government in July 2024, the CCC, in April 2025, released a report to the Parliament on "Progress in adapting to climate change" (Climate Change Committee 2025c[68]). According to the report, the UK's preparations for climate change are inadequate. Despite some progress, "planning for adaptation continues to be piecemeal and disjointed. (...) Adaptation progress is either too slow, has stalled, or is heading in the wrong direction. Whilst there is some evidence of policies and plans improving, it is clear that NAP3 has been ineffective in driving the critical shift towards effective delivery of adaptation, highlighted in our previous progress report in 2023. The Government has yet to change the UK's inadequate approach to tackling climate risks and must act without further delay" (Climate Change Committee 2025c). In this framework, the CCC's assessment suggests improving objectives and targets as well as coordination across government, integrating adaptation into all relevant policies and implementing monitoring evaluation and learning across all sectors (Climate Change Committee 2025c).

An exchange occurred between the CCC and Minister Emma Hardy based on the acknowledgement of the Government about "the need to strengthen the approach to climate adaptation" (Hardy 2025)[69]. On 13 October 2025, a reply from the CCC came to the questions posed by the Minister, specifying that "adaptation objectives should be set to be achieved by 2050 at the latest. They should, at a minimum, prepare the country for the weather extremes that will be experienced if global warming levels reach 2°C above preindustrial levels by 2050 (Brown 2025)[70]". It was also specified that "Planning for global warming levels reaching 2°C above preindustrial levels by 2050 should be a minimum level. Faster rates of warming between now and 2050 remain possible, and additional warming beyond 2050 is currently expected (Brown 2025)". The issue of the long timescales of major adaptation policies was also raised by the CCC, which stressed that adverse events such as heatwaves, drought, flooding, fire weather, and storms will get worse (Brown 2025). It is also stressed that "adaptation objectives should be regularly reviewed (as part of the five-yearly process in the Climate Change Act) to ensure they keep pace with our increasing understanding of the expected effects of climate change" (Brown 2025). Meanwhile, the Government had already launched its plan titled "UK Infrastructure: A 10 Year Strategy" (HM Treasury 2025)[71] in which the infrastructural aspects of climate change policies are also taken into account. It's worth stressing that the long timescale is considered by its promoters a salient characteristic of the plan. On 29th October 2025, the Government issued a policy paper on "Government response to the Climate Change committee 2025

[68] Climate Change Committee (2025c), Progress in adapting to climate change -2025 report to Parliament, April 2025
[69] Hardy, E. (2025), Letter from Emma Hardy MP to Baroness Brown, Chair of the Adaptation Committee for the Committee on Climate Change, Published 5 September 2025
[70] Brown 2025, Letter to Emma Harding from Baroness Brown of Cambridge Chair, Adaptation Committee of the Committee on Climate Change
[71] HM Treasury (2025), UK Infrastructure: A 10 Year Strategy, June 2025

adaptation progress report" (DEFRA 2025a)[72]. The Government highlighted the measures already taken and those that will be taken to respond to the CCC's comments. The areas of action – the same suggested by the CCC in the monitoring framework, see below – are the following:

- Nature
- Working land and seas
- Food security
- Water supply
- Energy
- Telecommunications and ICT
- Transport
- Towns and cities
- Buildings
- Community preparedness and response
- Health
- Business
- Finance
- International collaboration.

Among the many responses to CCCs recommendations, there is also one concerning cross-government coordination and the method to "work with devolved governments, local partners and others to increase the resilience of the UK" (DEFRA 2025a).

2.6. Adaptation policies in devolved administrations

Scotland

In order to comply with its legal obligations and the substantive responsibility connected to adaptation, the Government of Scotland has recently released a "Scottish National Adaptation Plan" (SNAP3) (Scottish Government 2024a)[73], after consultation with stakeholders according to a participatory approach (the public engagement principle). The plan foresees the implementation of a set of actions in order to reach 5 general outcomes, each having its own objectives (Scottish Government 2024a). Another important principle inspiring the plan is "Just transition" (see above)(Scottish Government 2024a). The plan foresees the implementation of a set of actions in order to reach 5 general outcomes, each having its own objectives. The actions and policies foreseen in the next five years are, among others (as listed in the presentation of the Scottish Adaptation Plan) (Scottish Government 2024a):

- Ensuring all parts of Scotland are building climate resilience through regional partnerships, local action and climate-resilient economies
- Improving flood warnings for businesses and communities across Scotland, and building rainwater networks in urban areas to manage flash flooding
- Encouraging behaviour change to help households and communities cope with both too much and too little water
- Strengthening our new national network of Climate Action Hubs and ensuring that the Hubs are supporting vulnerable communities to adapt

[72] DEFRA (2025a), Government response to the Climate Change committee 2025 adaptation progress report, 29 October 2025

[73] Scottish Government (2024a), "Scottish national Adaptation Plan. 2024-2029. Actions today, for a climate resilient future"

- Shifting half of all agricultural funding to be conditional on delivering for climate and nature, including climate adaptation
- Increasing Scotland's railway resilience through investing approximately £400 million over the next five years, with multiple benefits for passengers
- Developing an investment plan that connects nature finance and adaptation outcomes, including a suite of actions to mobilise public, and responsible private and philanthropic finance supported by an expert taskforce
- Strengthening the skills and capacity of businesses, communities and organisations to adapt though the Adaptation Scotland programme
- Establishing the adaptation.scot online hub to help people access tools, resources and advice on adaptation action
- Delivering a suite of new tools and advice tailored for businesses, including a guide for Small and Medium-sized Enterprises (SMEs) and sector-specific tools to support entities most exposed to climate change impacts
- Leading the way in climate adaptation monitoring, publishing an adaptation monitoring and evaluation framework, supporting annual reporting to the Scottish Parliament and best practice both nationally and internationally in this emerging work
- Supporting connectivity and resilience of our island populations through fleet renewal of ferry services, with reducing weather-related disruption as a priority
- Delivering for international communities disproportionately affected by climate impacts through our £36 million Climate Justice Fund
- Delivering comprehensive climate resilience actions across NHS Scotland, including greening the NHS estate
- Working to improve long-term health outcomes for people, including Public Health Scotland delivering the Adverse Weather and Health Plan
- Protecting our cultural and historic heritage through improved adaptation actions for historic buildings
- Building the Public Sector Climate Adaptation Network, led by Adaptation Scotland, which provides opportunities for learning and best practice.

Together with the SNAP3, "the Scottish Government also, for the first time, published an adaptation monitoring and evaluation framework to assess progress toward the Plan's objectives and how we are building greater climate resilience in Scotland" (Scottish Government 2025a)[74]. In June 2025, the Scottish government published the "First annual progress report for the Scottish National Adaptation Plan (SNAP3) published in September 2024" (Scottish Government 2025a).

Wales

The last CCC document presenting the adaptation situation in Wales was issued in September 2023 and is titled "Adapting to climate change. Progress in Wales". It holds that "there is a clear need for a more effective response to climate change in Wales" (Climate Change Committee 2023b)[75] because of the recent and repeated damages produced by flooding, heat waves, etc. 61 risks and opportunities have been identified for Wales concerning climate change that

[74] Scottish Government (2025), Publication -Progress report, Climate change – Scottish National Adaptation Plan: annual progress report 2024-2025 19 June 2025
[75] Climate Change Committee (2023b), Adapting to climate change. Progress in Wales, September 2023

require urgent action. In October 2024, a new adaptation strategy was released, which included 15 plans on specific adaptation areas (Nature, Agriculture, Water, etc.; Welsh Government 2024[76]). The four principles informing the strategy for adaptation are:

- A focus on delivery of climate adaptation outcomes
- A systems-based approach, addressing interdependencies between different sectors and stakeholders
- A wider perspective of collective action across Wales, recognising the needs and roles of different stakeholders in delivering climate adaptation
- Integration with other societal goals, such as decarbonisation, social justice, and nature recovery.

The areas covered by the plans are: Nature; Agriculture; Forestry and woodland; Fisheries and Aquaculture; Food Security; Water Quality and Supply; Health and Well-being; Business; Transport; Buildings; Towns, Cities and Rural Communities; Culture and the Historic Environment; Energy Supply; Telecoms and ICT, and Finance.

As stressed above, attention is paid to the governance approach that foresees the cooperation among the various relevant stakeholders. In this framework – also with the objective of managing the many interdependencies among various aspects of mitigation and adaptation policies – the Welsh Government established a Climate Change Portfolio Board (Welsh Government 2024).

Northern Ireland

In 2024, the Northern Ireland Executive was expected to publish the new Northern Ireland Climate Change Adaptation Programme (NICCAP3). At the moment (end of November 2025) we are writing, NICCAP3 has not been published yet. A consultation process on Adaptation is ongoing, and the first consultation phase about the draft version of NICCAP3 was concluded on 4th August 2025. "The consultation received 59 responses. DAERA [the Northern Ireland Government's Department responsible for Adaptation] engaged with external stakeholders during the development of the draft NICCAP3 through "Climate NI" and their network of representatives from local councils, academia, NGOS and the private sector. The Department also worked with stakeholder groups during the consultation period" (Northern Ireland Government DAERA 2025a[77]).

The draft version of "NICCAP3 has been structured around these 13 thematic areas to align with the CCC's monitoring framework" (see above) (Northern Ireland Government DAERA 2025b)[78], then grouped "into 5 key areas which will be impacted by our changing climate" (Northern Ireland Government DAERA 2025b):

- Natural Capital (including the CCC themes Nature, Working Land & Seas)
- Food Security (including the same CCC theme)
- Infrastructure Services (including the CCC themes Water; Energy; Telecoms & ICT; Transport)

[76] Welsh Government (2024), Climate Adaptation Strategy for Wales, October 2024
[77] Northern Ireland Government DAERA (2025a), Summary of the responses to the Consultation on the draft third Northern Ireland Climate Change Adaptation Plan (NICCAP3)
[78] Northern Ireland Government DAERA (2025b), Third Northern Ireland Climate Change Adaptation Programme (NICCAP3) Consultation Annex I: Draft NICCAP3

- People and the Built Environment (including the CCC themes Towns & Cities; Buildings; Health; Community)
- Disruption to Business and Supply Chains (including the CCC themes Business; Finance).

3. Governance framework

The governance framework of CCP in the UK can be presented through the description of the actors that are entitled to intervene in the policy making process, and with the related tools established by the CCA of 2008 (see above).

The main body that has a role in Climate Change policy making is the Government that acts through its departments. At the UK and national levels, it is important to note the role of the CCC. There are also the devolved administrations. Among the challenges that this governance framework addresses, there is the overarching and not sectoral character of the CCP. In this regard, it is stated, as reported in official communications, that:

"Tackling the causes of climate change, and adapting to its impacts, touches on all aspects of the economy. It is for all government departments to include climate change within their thinking when making policy decisions" (CCC Web-site 2025).

Within the administration, the two main UK government departments responsible for climate change are (CCC Web-site 2025):

- Department for Energy Security and Net Zero (DESNZ) – leading on policy for reducing emissions (mitigation). DESNZ is responsible for ensuring secure energy and promoting action on climate change in the UK and internationally
- Department for Environment and Rural Affairs (Defra) – leading on domestic adaptation policy (adaptation). Defra is responsible for developing the National Adaptation Programme to address the risks set out in the most recent UK Climate Change Risk Assessment.

As stated in some official communication documents (CCC Web-site 2025), "the governments and assemblies of the devolved administrations (Scotland, Wales and Northern Ireland) set out to create climate change policy for their devolved area and help to implement UK-wide policies. As well as being covered by the Climate Change Act, Scotland, Wales and Northern Ireland have separate climate change policies."

Climate change policies, therefore, need strong cooperation. It was, stressed, in relation to the achievement of the Net-zero strategy, that "The powers needed (...) sit with the UK government (reserved powers) and the governments of Northern Ireland, Scotland and Wales (devolved powers)" (Audit Scotland et al. 2023). An example of territorialized governance of Climate Change policy can be done with regard to reduction of emissions, one of the two strands of CCPs. The diverse actors involved in implementing these policies interact in a complex way. As for what concerns emissions, such complexity is also due to the fact that "the four nations [England, Scotland, Wales, and Northern Ireland] have different emissions profiles". "This has led to different approaches in each nation, which will likely continue as the UK makes progress towards its net zero target. This means that each nation will contribute in different ways to reducing UK-wide emissions. It is important to ensure that the choices made by each nation, when considered collectively, provide an efficient path to achieving the UK net zero target, while at

the same time achieving relevant targets for Northern Ireland, Scotland and Wales" (Audit Scotland et al. 2023).

Indeed "UK nations have set different targets for tackling climate change; the UK, Northern Ireland and Wales have set a target to achieve 'net zero' GHG emissions by 2050, whereas Scotland has a target to achieve this by 2045. Each nation has established a slightly different approach, including differing combinations of budgets, targets and policies. In addition, each nation has different sector-specific arrangements underpinning its overall climate change goals" (Audit Scotland et al. 2023).

In this framework, it is stressed that "Achieving net zero in any one nation depends on UK-level action, and vice versa: The balance of reserved and devolved powers varies across the different sectors covered in the emission reduction targets. For example, UK-wide policy decisions will be critical in defining pathways towards decarbonising heating in buildings, such as on whether to pursue hydrogen or electrification (or both) as a fuel source, but this will need to be supplemented by action at a devolved level on issues such as planning and improving energy efficiency. Interdependencies also arise through financial decisions by the UK government affecting budgets of the devolved governments" (Audit Scotland et al. 2023). Consequently, it is stressed that "Effective working relationships and close engagement between the UK and devolved governments will be vital to achieving the overall aim of net zero" (Audit Scotland et al. 2023).

The Governance structure of UK Climate policy and implementation is hinged on the Committee on Climate Change (CCC). CCC is an independent expert body with an annual average budget whose members do not represent particular interest groups but are chosen for their technical expertise (Averchenkova et al. 2018)[79].

The CCC is an example of how it is possible to pursue long-term policy objectives by strengthening evidence-based policymaking. The CCC applies the provisions of the CCA through counselling the UK government and devolved authorities. Averchenkova et al. (2018) list the roles and responsibilities of the CCC (including also statutory duties):

- "Recommend to Parliament appropriate emissions reduction targets (…) [recommended by the CCC and set by Parliament]
- Advise the Government on the risks and opportunities from climate change and evaluate its National Adaptation Programme
- Monitor and assess progress on reducing emissions and on climate resilience. The CCC produces an annual progress report to Parliament, to which the Government has a statutory obligation to respond.
- Provide on-demand advice to the UK Government and the devolved administrations of Northern Ireland, Scotland and Wales on specific questions of climate policy. (…).

The mechanism of CCC effectiveness as an actor in the policy-making process is described by Averchenkova et al. (2018):

"*The CCC does not have any formal powers to change the Government's approach to climate policy. Instead, it relies on the political embarrassment that*

[79] Averchenkova, A., Fankhauser, S., & Finnegan, J. (2018). The role and influence of the UK's Committee on Climate Change. *Grantham Research Institute on Climate Change and the Environment & Centre for Climate Change and Policy. Policy brief*

its assessments may cause and the threat of a judicial review brought about by environmental pressure groups if it fails to meet its statutory obligations under the CCA."

Averchenkova et al. (2018) say that CCC's achievements are the following.

- The CCC's statutory advice on carbon targets has generally been followed, albeit not always to the letter
- The CCC has had more difficulty getting its broader policy recommendations accepted (many recommendations have not been taken up, but the CCC has had the possibility to stress the variances, creating a debate over policies' implementation)
- CCC analysis is used in Parliament to push for greater ambition
- The CCC's advice reaches beyond carbon targets.

Another important actor of the governance structure of the CCP in the UK is the judiciary. The documents "*Powering Up Britain – the Net Zero Growth Plan* March 2023" (DESNZ 2023), and "*Carbon budget Delivery plan, March 2023* (UK Government 2023)" have been released after a High Court judgment on the Net Zero Strategy on 18 July 2022 that determined that "the 2021 Net Zero Strategy to be 'unlawful' and 'inadequate' in meeting the 2050 net zero target and that it breached the requirements set out by the CCA 2008" (Burnett et al. 2025). The English High Court followed a claim brought by some British environmentalist associations like Friends of the Earth, Client Earth and the Good Law Project (Burnett et al. 2025).

A similar initiative for what concerns Adaptation policies was also taken by the group "Friends of the Earth". DEFRA was challenged based on the "CCC's assessment that the adaptation plans proposed 'fall far short of what's needed'" (Burnett 2025[80]). The claim was that the UK National Adaptation Programme 3 (NAP3) was unlawful related to the Climate Change Act 2008 "for failing to set out lawful 'adaptation objectives' and for failing to consider and publish an assessment of the risks to delivery. It was also claimed that "NAP3 failed to 'protect human rights'" (Burnett 2025). The High Court rejected the claims and ruled, in October 2024, that the NAP3 was lawful.

The Judiciary's role, in these cases, has been connected to that of civil society. Civil society actors, anyhow, are diverse and not only environmentalists. They are consulted for the definition of policies. It happened, for example, in the case of the Scottish adaptation plan, which was released after a participatory process (see below). Also, the UK plan for the Net Zero strategy foresaw various forms of consultation of stakeholders (BEIS 2021). It is worth mentioning that DESNZ carries out a "nationally representative annual survey of adults (aged 16+) in the UK that tracks public awareness, attitudes and behaviours relating to the policies of the Department for Energy Security and Net Zero (DESNZ), such as energy and climate change" (DESNZ Public Attitudes Tracker 2025[81]). Other similar initiatives were taken, for example, DEFRA's "Public Dialogue on Climate Adaptation" in 2023

[80] Burnett N. (2025), "Climate change adaptation and resilience in the UK", Research Briefing 26 June 2025, The House of Commons Library

[81] DESNZ Public Attitudes Tracker: Headline findings, Summer 2025, Official Statistics. UK, Published 28 October 2025

(Brisley et al. 2023[82], Harcourt and Dessai 2023[83]). Devolved administrations pay attention to the issue of public communication by producing specific information materials for the public, as in the case of the Welsh Government (Welsh Government 2025)[84].

4. The Main Dynamic Aspects of the Strategies

The policies implemented at the UK and the devolved administration levels have changed in the last years based on the interaction among the various actors composing the Governance Framework briefly described above.

There are at least three fundamental sources of this dynamic. The first is civil society, whose impact was evident in the case of the claims brought before the Court, which participates in various consultation activities conducted by the government. It is worth mentioning that from DEFRA's "Public Dialogue" on adaptation to climate change within England emerged, interestingly, that "participants' initial awareness of climate change adaptation was low, although people agreed that England's weather had already changed in many ways during their lifetimes. Once the concept of adaptation was better understood, there was strong support for urgent action as England was seen as unprepared for a changing climate. Participants felt that the government should have done more sooner, and the time to act is now. This message remained constant as the dialogue progressed" (Brisley et al. 2023 5). The consensus on CCPs seems to be there, but it comes with certain conditions, such as the provision of adequate information. Similarly, in the DESNZ survey of 2025, it emerged that people's support for the use of renewable energy is high (80% even if declining compared to the first survey on the matter). Visibility of CCPs impacts is, nevertheless, important: "when asked what benefits would make people more likely to support new renewable energy infrastructure in their local area, the most common response was energy bill discounts (62%) (...)" (DESNZ Public Attitudes Tracker 2025). CC policies tend to be sensitive to these issues of communication and the actual perception of impacts (see, for example, the focus on lowering the energy bills for UK consumers).

A second relevant source of policy dynamics is due to the role of the scientific sector. Not only does the CCC provide crucial counselling for policies based on its scientific background but, recently, a further relevant development occurred, when the "Climate Adaptation Research and Innovation Framework" was released by DEFRA. It "outlines the research and innovation (R&I) needed to support adaptation plans across UK governments and sectors. [It was] produced under the guidance of the government's Climate Adaptation Research and Innovation Board, [which] identifies the main climate adaptation research and innovation challenges that can help us address climate risks and opportunities identified in the third UK Climate Change Risk Assessment (CCRA3). The framework supports

[82] Brisley,R., Fotiadis, I., Juliette, C., Mackie, M., Mesher, K, Pizzol, S., Dessai, S., Harcourt R., and Taylor A. (2023), Public Dialogue on Climate Adaptation Final Report for Defra/Sciencewise, UKRI, University of Leeds, IPSOS

[83] Harcourt, R., & Dessai, S. (2023). Public Dialogue on Climate Adaptation: What does a well-adapted England look like?. *Climate adaptation Dialogue Final Report: Annex C. Ipsos*

[84] Welsh Government (2025), Reaching net zero, Ideas and advice to help us talk about our next steps, October 2025

an evidence-based programme of public sector research and innovation and provides information for businesses and academics working on climate adaptation-related research" (DEFRA 2025b[85]). **Furthermore, when highlighting the importance of the scientific sector in Climate Change Policies, the role of the CCC in policy evaluation must be stressed.** In this framework, it is worth mentioning the monitoring system framework that has been set up by the CCC for M&A policies. They were released, respectively, in June 2022 (Climate Change Committee 2022)[86] and March 2023 (CCC Web-site 2023)[87]. The approach to monitoring adaptation is presented in this way: "(...) adaptation action in the UK needs to extend beyond risk assessment and planning to include a stronger focus on delivery and implementation of adaptation actions. This requires an approach which centres on the desired adaptation outcomes, and a theory of change for how to achieve those outcomes through the policy levers available to Government". "Theory of Change" is defined as "How we expect change to happen through a causal chain of actions and results. This maps out the expected outcomes of the intervention" (CCC Web-site 2023). A theory of change is also used for monitoring Mitigation. In this case it is stated that:

"*For the major sectors [of Mitigation policy], we have mapped the relationships and interdependencies between the policies, enablers and outcomes required to meet the UK's climate targets. These monitoring maps demonstrate our theory of change for each sector, following the structure below.*

- *Contextual factors. This row captures aspects that are largely (but often not entirely) independent of Government climate policy, but important for the transition. This includes global and societal shifts, and geopolitical circumstances.*
- *Policies. Building on the contextual factors, this row lays out what good policy should look like. This will include existing Government strategy where this is sufficient, but also shows other policy interventions that the CCC considers necessary – regardless of whether the Government has committed to them. While we focus on policy given our statutory remit, this should not be taken to imply that other actors are not important – all parts of society and the economy have a role in delivering Net Zero.*
- *Enablers. Good policy will only succeed if the enablers are in place and the barriers removed. Enablers vary for each sector, but include themes such as private finance, business action, innovation, governance, public engagement, and a fair distribution of costs and benefits.*
- *Required Outcomes. The Government's overall sectoral ambitions depend on delivery of numerous specific measures. These are captured here*." (CCC Web-site 2022)[88]

The "monitoring framework focuses on thirteen critical thematic areas or sectors of the adaptation challenge. These thirteen thematic areas cover the range of relevant identified risks from CCRA3 [the ultimate Climate Change Risk assessment carried out by the CCC](CCC Web-site 2023). The thematic areas for adaptation action – which have been already taken as a reference point for various

[85] DEFRA 2025b, Web page of DEFRA, Government Office for Science and Emma Hardy MP, Published, 7 April 2025.
[86] Climate Change Committee (2022), Progress in reducing emissions 2022 Report to Parliament, June 2022.
[87] CCC Web-site (2023), Monitoring system framework, 29 March 2023.
[88] CCC Web-site (2022). CCC Mitigation Monitoring Framework (2022–2024).

adaptation programmes both at the UK and Nations' levels (see above) – are listed below.

- Nature: Terrestrial (including on farmland), freshwater and marine habitats.
- Working lands and seas: Agriculture, forestry and fisheries.
- Food security: Domestic and imported food supply chains, as well as vulnerability of society to climate-related food disruption.
- Water supply: Public water system which supplies households and businesses.
- Energy: Key energy systems, the electricity system (transmission, distribution, and generation), gas networks and novel sources of energy supply (such as hydrogen) as they develop.
- Telecoms & ICT: Communications and ICT infrastructure, including data centres, networks and other critical national infrastructure.
- Transport: Road networks (both the national strategic road network and local roads), railways, ports and airports.
- Towns and cities: The built environment at a settlement scale, covering flooding, coastal erosion and overheating risks.
- Buildings: Individual buildings and their occupants, covering overheating and flooding.
- Health: Public health, including mortality and morbidity, as well climate-sensitive vector-borne diseases and health care delivery.
- Community preparedness and response: Preparedness of communities for climate impacts, including the ability to protect cultural heritage, and their ability to effectively respond when climate and weather-related disruptions occur.
- Business: Businesses and their function as a commercial entity, including risks to supply chains (both domestic and international), sites and assets, access to capital and productivity impacts.
- Finance: Financial system, so that systemic risks from climate change are minimised and it can effectively support the economy in investing in necessary adaptation actions.

Politics is the third relevant source of the dynamics of change. The most important and obvious example is the change of government because of the political rotation connected to the electoral process. In this framework, it is worth mentioning that what changed was not just the orientation of the policies of the new Government, largely expected and based on its mission of "Making Britain a Clean Energy Superpower" (Prime Minister's Office web-site 2024)[89]. The Conservative Party that launched the Net Zero 2050 objective is changing orientation, and its new leader Badenoch, pledged to scrap the UK's landmark climate change legislation and replace it with a strategy for "cheap and reliable" energy" (Morton 2025[90]). This position creates frictions even among the Conservative party ranks, as "Conservative ex-prime minister Baroness Theresa May criticised the decision as a 'retrograde step which upends 17 years of consensus between our main political parties and the scientific community'" (Morton 2025). Mass media report that also the right party "Reform UK has also

[89] Prime Minister's Office website (2024), Make Britain a Clean Energy Superpower.
[90] Morton B. (2025), Tories pledge to scrap landmark climate legislation, BBC 2 October 2025.

said it would scrap net zero targets if it wins the next election, blaming the policy for higher energy bills and deindustrialisation in the UK" (Morton 2025).

Debate between political parties is not the only way in which politics impacts CC policies. Various levers are available to the Government to respond to the solicitations coming from society and the scientific sector. As for Adaptation, it is worth mentioning the DEFRA reporting power, through which it asks different government or regulated bodies (e.g., water supply companies), to report on the risks they produce on adaptation and what they plan to do on the matter. Reporting power is, in a certain sense, a way to distribute responsibility for adaptation among the various government branches and levers. Recently, there were some pilot initiatives to involve through this reporting power also some local authorities. The issue is complex because this power applies to England and reserved functions, and not to all the Nations' bodies. An analogous tool is represented by the so-called "Green Book". It is a tool of the Treasury that "sets out that all policies, programmes, and projects must be developed and assessed against how well they deliver on the government's climate and environmental objectives, as well as other policy priorities. In April 2025, Defra updated the supplementary Green Book guidance on Accounting for the Effects of Climate Change. The guidance supports the value for money assessment of spending decisions across government, enabling analysts across departments to use a consistent methodology for incorporating the impacts of climate change into the appraisal of policies" (DEFRA 2025a). Following the observations of the CCC in its report of 2025, "in June 2025, the government published a consultation on draft UK Sustainability Reporting Standards, which aim to include reporting on climate-related risks, and adaptation efforts and investments" (DEFRA 2025a). This is another way the Government is trying to involve the private sector in pursuing CC policy-related issues so to promote a "regulatory framework to support sustainable growth and enable the private sector to realise the opportunities of the transition" (Department for Business & Trade 2025)[91].

5. Effectiveness of the strategies/policies

As it was said above, CC policies changed. Part of the dynamic is due to the specific assessment of results being obtained. In general, they were not satisfactory at both the UK and the devolved administrations levels.

Just after the new government took office, the CCC, on 18 July 2024, published the result of its statutory assessment of UK energy policy that set out 10 priority actions (Climate Change Committee 2024a)[92] for the remainder of 2024. After that, further assessments have been produced (see above). Also the NAP3, the National Adaptation Programme 3 (see above) was assessed by the CCC in March 2024 and, after the new government took office, other assessments and exchanges on Adaptation policies followed (see above). At the time, according to the CCC, there were "three key priorities that would help address the major issues and ensure

[91] Department for Business & Trade (2025) Closed consultation, Exposure draft of UK Sustainability Reporting Standards: UK SRS S1 and UK SRS S2, Updated 25 June 2025.
[92] Climate Change Committee (2024a), Progress Report to Parliament, 18 July 2024.

that NAP3 can drive action across government, and beyond, more effectively" (Climate Change Committee 2024b[93]):

- Reforming governance to put adaptation at the centre of government
- Aligning further developments of NAP3 with the next spending review
- Creating accountability with targets and monitoring.

These issues were restated in the contexts of the new policies launched by the new Government and a response has been provided by the new Government at the end of October 2025 (see above).

Effectiveness of CC policies in the Devolved administrations

As for the CC policies of the Devolved administrations, it is worth focusing on the assessment carried out by the CCC.

The CCC published, in March 2024, a report on the "Progress in reducing emissions in Scotland. 2023 Report to the Parliament"[94] in which it was stated that "The Scottish Government is failing to achieve Scotland's ambitious climate goals. Annual emissions targets have repeatedly been missed, and the publication of Scotland's draft Climate Change Plan has been delayed" (Climate Change Committee 2024c).

The Scottish government accepted the 15 recommendations of the CCC and announced (in September 2024) an "accelerated package of new climate action measures" whose main commitments are the following:

- "Deliver approximately 24,000 additional electric vehicle charging points by 2030
- Develop a new integrated ticketing system that people can use across all public transport
- Continue implementation of the Agricultural Reform Programme, increasing conditions on payments over the next two years to better balance our commitments on food security, climate mitigation and biodiversity support
    - Publish our route map for 20% car km reduction by Autumn 2024, with a timeline for implementing demand management (this will include consideration of how local government action can further incentivise the switch to EVs in addition to reducing overall car km)
    - Consult on proposals to introduce a carbon land tax as part of considering fiscal and regulatory measures to incentivise peatland restoration, afforestation and renewable energy generation." (Scottish Government 2024b, Introduction[95])

As reported above, the policy process has continued with the recent publication of the "Scotland's Draft Climate Change Plan: 2026–2040" (Scottish Government 2025b)[96].

As for the Adaptation policy in Scotland, the Scottish Government has released, in September 2024 a "Scottish National Adaptation Plan 2024-2029" (see above;

[93]Climate Change Committee (2024b), "Independent Assessment of the Third National Adaptation Programme (NAP3) March 2024".
[94] Climate Change Committee (2024c), Progress in reducing emissions in Scotland. 2023 Report to Parliament, March 2024.
[95] Scottish Government (2024b), Progress in reducing emissions in Scotland 2023: SG response, Publication – Progress report, 5 September 2024.
[96] Scottish Government (2025b), Scotland's Draft Climate Change Plan: 2026–2040, 6 November 2025.

(Scottish Government 2024a). Apart from a first progress report, no relevant independent assessments have been issued (such as CCC ones) so far.

For what concerns Welsh Mitigation policy, the CCC stated in 2023 that "Wales is not yet on track to meet its targets for the second half of this decade and beyond"(Climate Change Committee 2023c)[97] and progress is slow as for the aspects of mitigation policies related to "areas where the Welsh Government has policy responsibility". In this regard, the further key messages provided by the CCC were listed below.

- Many areas that are dependent on Welsh Government policy powers recorded insufficient progress (tree-planting, peatland restoration, development of the charging infrastructure. More progress has been seen in the waste sector and recycling but improvements have stalled in recent years" (Climate Change Committee 2023c).
- Welsh Government is not using its policy powers to full effect (Climate Change Committee 2023c)".
- Policy action in all sectors across the economy is now needed, including:
  - Addressing the funding gap in 2024 for agri-environment financial support and overcoming non-financial barriers related to woodland creation, through capacity building and skills development.
  - Delivering a widespread, reliable, and high-quality electric vehicle charging network and developing a full delivery plan for achieving Wales's target of a 10% reduction in car-km per person compared to 2019 levels by 2030.
  - Improving recycling policies to increase the currently stalled rates in Wales to ensure future recycling targets are met.
  - Developing a detailed plan for delivering energy efficiency measures and low-carbon heat". (Climate Change Committee 2023c).

In May 2025 the CCC provided advice to the Welsh Government on the level of Wales' Fourth Carbon Budget (Climate Change Committee 2025d)[98]. The "recommended level for the budget is a 73% reduction in average annual emissions compared to the 1990 baseline, over the five-year period from 2031 to 2035, including Wales' contribution to international aviation and shipping" (Climate Change Committee 2025d). Following the issuance of this document, an exchange took place with the Welsh government, in which CCC provided more specific suggestions. In general, it was stressed that "Achieving Wales' emissions targets will require a focus on key near-term actions, particularly in buildings, surface transport, and agriculture and land use. These sectors have significant policy powers devolved to the Welsh Government" (Topping 2025)[99]. The Welsh Government was also advised to promote a public engagement activity "to provide clear, trusted information about the most effective actions for households and businesses in Wales" and "(...) "publish a Net Zero skills action plan to identify and address barriers to enable growth of the workforces needed to deliver the Net Zero transition" (Topping 2025). Plans should also be developed by the Welsh

[97] Climate Change Committee (2023c), Progress report: reducing emissions in Wales, June 2023.
[98] Climate Change Committee (2025d), Wales' Fourth Carbon Budget. Advice for the Welsh Government, 14 May.
[99] Topping N., (2025), Nigel Topping, Chair of Climate Change Committee, Official letter of 24 July to Huw Irranca-Davies, Deputy First minister and Cabinet Secretary for Climate Change and Rural Affairs, Welsh Government.

Government and relevant stakeholders to enable access to secure employment and business opportunities (Topping 2025).

As for Welsh Adaptation policies, the CCC assessment provided the following key messages[100].

- The last national Adaptation Plan for Wales, Prosperity for All: A Climate Conscious Wales – PfACCW provides good coverage of required research and potential actions across priority climate risk areas.
- There is insufficient progress in delivery and implementation of adaptation and monitoring is limited.
- There are some positive examples of good plans in place, although this is not consistent across sectors. The variability "reflects a lack of clarity in responsibilities for responding to climate risks across the public sector".
- The next national adaptation plan for Wales must go further to drive delivery across the public sector and more widely. To support clear decision-making and urgent action, there is a need for greater clarity on risk owners and where responsibility for delivering adaptation action sits. The plan should also be accompanied by a strengthened monitoring and evaluation framework to enable assessment of progress against managing climate risks and delivering adaptation outcomes.
- Welsh Government should embed adaptation into its plans for Net Zero, future well-being and increasing biodiversity. Without consideration of climate risks, these other societal goals will not be achieved. The next adaptation plan, as well as plans for other government objectives should recognise the overlaps, maximising co-benefits and minimising negative impacts where possible.

As reported above, the Welsh Government reacted with the definition of a new adaptation strategy for Wales.

In relation to Northern Ireland's Mitigation policies, the CCC assessment of March 2023 states that resolute actions must be taken to achieve the Net-Zero-related objectives: "With emissions having reduced only an average of 9% per decade since 1990, a step change in action is needed now" (Climate Change Committee 2023c)[101]. The CCC provides some suggestions about the action to be undertaken, concerning the following domain:

- Agriculture
- Transport
- Buildings
- Business and industry
- Energy
- Land use
- Engineered removals of CO2
- Plan for closing the gap to Net Zero (Climate Change Committee 2023c).

In 2025, the CCC provided advice to the Northern Ireland Government for the 4th Carbon Budget. Agriculture is indicated by the CCC as the most important emitter. In this framework, initiatives to decarbonize the sector are considered urgent

[100] The description of these points is largely taken directly from the text of the CCC Report titled "Adapting to climate change. Progress in Wales", September 2023.
[101] Climate Change Committee (2023c), Advice report: The path to a Net Zero Northern Ireland Climate Change Committee March 2023.

(Burnett et al. 2025). In this regard, it is stressed that "Long-term certainty is needed on public funding for farming practices and technologies to reduce emissions from managing crops and livestock, and incentives and markets should be provided for farmers and land managers to diversify their incomes for actions including woodland creation, peatland restoration, bioenergy crops, and renewable energy" (Climate Change Committee 2025e)[102]". Other priorities suggested by the CCC concern: Decarbonisation of electricity supply, by promoting renewable generation, managing supply conditions with neighbouring nations, addressing barriers to expansion of transmission and distribution infrastructure, and ensuring that grid connections are easily available to renewables, industry, EV charging, and other low-carbon loads; supporting households to install low-carbon heating and to lower energy bills for consumers expanding electric vehicle charging infrastructure; promote carbon capture and storage and removals (Climate Change Committee 2025e).

As for the adaptation policy of Northern Ireland, it is worth mentioning the overall comments provided in April 2023 by the CCC for the NICCAP3, that at the time was being prepared and now is in its consultation phase. Here below the key messages of the report (Climate Change Committee 2023d)[103].

- "NICCAP2 [i.e., the previous programme] has some of the elements required for a vision of a well-adapted Northern Ireland. Further development of the programme structure is needed to make this vision operational and to drive policy creation and delivery.
- Planning for climate change in Northern Ireland remains at an early stage.
- Despite the critical importance of adapting to climate change, there is only limited evidence of delivery, and data gaps in key areas are unacceptably large.
- The next NICCAP must go much further than its predecessor and it must increase its scope to include the full range of sectors and policy areas.

As reported above, the draft version of NICCAP3 adopted the suggestions of CCC and is structured in a way that facilitates the monitoring of the foreseen actions.

[102] Climate Change Committee (2025e), Northern Ireland's Fourth Carbon Budget. Advice for the Northern Ireland Executive, March 2025.
[103] Climate Change Committee (2023d), Adapting to climate change. Progress in Northern Ireland, April 2023.

CROSSEU Partners

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