NEUROCLIMA

Deliverable D2.4

Mapping Climate-Related Policies and EU Missions and Impact Assessment for Long-Term Sustainability

30 Sep 2024

Funded by
the European Union

NEUROCLIMA

Mapping Climate-Related Policies and EU Missions and Impact Assessment for Long-Term Sustainability

Deliverable Number	D2.4
Deliverable Name	Mapping Climate-Related Policies and EU Missions and Impact Assessment for Long-Term Sustainability
Work Package	WP2
Related Task	T2.1, T2.2, T2.3, T2.4
Lead Beneficiary	[STANDO]
Type	R
Dissemination Level	PU
Authors	Christina Deligianni [TRUENIQUE] Artur Bogucki [CEPS] Charalampos Theopemptou [STANDO]
Reviewers	Maximiliano Romero [POLIMI] Spyros Kouvelis [TRUENIQUE] Odysseas Spyroglou [TRUENIQUE]
Version	V0 (*select from the history chart next page*)
Due Date	30/09/2024
Funded by the European Union	Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

REVISION AND HISTORY CHART

Version	Date	Author/Reviewer	Summary of changes
V0	09/07/2024	[TRUENIQUE] Christina Deligianni [STANDO] Charalampos Theopemptou	1st Draft
R1	15/09/2024	[POLIMI] Maximiliano Romero	Revised 1st Draft
V1	20/09/2024	[STANDO] Charalampos Theopemptou	2nd Draft for review
R2	23/09/2024	[TRUENIQUE] Christina Deligianni Spyros Kouvelis	Revised 2nd Draft
V3	27/09/2024	[STANDO] Charalampos Theopemptou [TRUENIQUE] Christina Deligianni	Pre-final for Coordinator review
FINAL	30/09/2024	[TRUENIQUE] Odysseas Spyroglou	Final for submission

TABLE OF CONTENTS

FIGURES AND TABLES

ABBREVIATIONS

Abbreviation	Full name
AFIR	Alternative Fuels Infrastructure Regulation
AI	Artificial Intelligence
BAT	Best Available Technique
CAP	Common Agricultural Policy
CBA	Cost-Benefit Analysis
CBAM	Carbon Border Adjustment Mechanism
CGE	Computable General Equilibrium
CO	Carbon Monoxide
COACCH	Co-designing the Assessment of Climate CHange costs
COP	Conference of the Parties
CPI	Climate Policy Instruments
CSR	Corporate Social Responsibility
CSRD	Corporate Sustainability Reporting Directive
GHG	Greenhouse Gas
GST	Global Stocktake
HC	Hydrocarbons
IED	Industrial Emissions Directive
IPCC	Intergovernmental Panel on Climate Change
NDC	Nationally Determined Contributions
NOx	Nitrogen Oxides
PM	Particulate Matter
EEA	European Environment Agency
EED	Energy Efficiency Directive
EIA	Environmental Impact Assessment
ELV	Emission Limit Value
EPBD	Energy Performance of Buildings Directive
EPR	Extended Producer Responsibility
ERDF	European Regional Development Fund
ERU	Earn Emission Reduction Unit

ESG	Environmental, Social, and Governance
ESR	Effort Sharing Regulation
ETD	Energy Taxation Directive
ETS	Emissions Trading System
EV	Electric Vehicle
FISE	Forest Information System for Europe
IAM	Integrated Assessment Models
LNG	Liquefied Natural Gas
LULUCF	Land Use, Land Use Change, and Forestry
NDC	Nationally Determined Contribution
PPWD	Packaging and Packaging Waste Directive
RED	Renewable Energy Directive
SAF	Sustainable Aviation Fuels
SCF	The Social Climate Fund
SDG	Sustainable Development Goal
SFDR	Sustainable Finance Disclosure Regulation
SO_2	Sulfur Dioxide
SUMP	Sustainable Urban Mobility Plans
SFM	Sustainable Forest Management
TEN-T	Trans-European Transport Network
ToC	Theory of Change
TCFD	Task Force on Climate-related Financial Disclosures
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

This document provides a detailed account of the **climate-related policies and EU Missions** along with **impact assessment methodology for long-term sustainability** in the context of the NEUROCLIMA project. Deliverable D2.4 informs other work packages and the tools and pilot cases that will be created and used during the span of this project. Additionally, it provides a guideline on climate change mitigation and adaptation policies and their context, both at the European and the global level, and can serve as an introduction to this field, from the environmental and social perspective. It also provides an impact assessment methodology for climate-related policies with an overview of stakeholders relevant to this project, the socio-economic tipping points and relevant discussion points, consent forms and guidelines to assist in undertaking impact assessment interviews at a later stage of this project.

This document is structured in two main sections:

A detailed **exploration of the historical evolution of the climate change challenge**. It traces how the global response to climate change has developed over time, with a particular focus on the increasing urgency of policy actions. It highlights the historic evolution of the climate change challenge and then transitions to mapping climate related policies including the EU Green Deal and the Fit for 55 set of initiatives along with many new Directives and policies including CBAM.

The second part includes an **overview of stakeholder theory** that leads to an impact assessment methodology with an indicative list of stakeholders, informed consent/EU AI Act- and GDPR-compliant forms and indicative questions for running stakeholder consultations in the duration of the project.

1 About NEUROCLIMA

NEUROCLIMA is a European project (Jan 2024 – Dec 2026)[1], that aims to raise awareness, provide best practices, and ensure ***sustainable use of climate change adaptation and resilience solutions.*** *NEUROCLIMA leverages both human and artificial intelligence (AI) to support dissemination and communication strategies, it collaborates with other EU-funded initiatives, develops viable business models, standardises outcomes, and invests in frameworks and toolkits addressing citizen and stakeholder needs and climate change challenges. NEUROCLIMA's impact through the use, commercial and other, may span well over 2030.*

The present document (D2.4), forms a detailed account of the **climate-related policies** at the global level and the EU level with a focus on EU Missions along with impact assessment methodology for long-term sustainability in the context of the NEUROCLIMA project along with an introduction to stakeholder analysis. It also offers an impact assessment methodology for climate-related policies, along with an overview of key stakeholders involved in the project. Additionally, it **outlines socio-economic tipping points and key discussion topics**, as well as providing consent forms and guidelines to support the conduct of impact assessment interviews in later stages of the project. D2.4 informs other work packages and the tools and pilot cases that will be created and used during the span of this project.

T2.1: Defining and capitalising upon social tipping and leverage points: setting the landscapes	**T2.2: Setting the theoretical base for the implementation of climate change adaptation**	**T2.3: Evidence mapping on climate-related policies and EU missions and impact assessment for long-term sustainability**	**T2.4 User requirement elicitation and pilots definition**	**T2.5: Technical and operational requirements analysis and architecture blueprint**
The science base behind behavioural change for climate	Knowledge Framework for Climate Adaptation Actions	Lessons learned. Benefits and Opportunities for EU societies	Use-case scenarios. Storyboards and workflow. End user requirements.	Technical Specifications of each system component
D2.1 Ethnographic research review and innovation landscape analysis on social tipping and leverage points		**D2.4 Mapping on climate-related policies and EU missions and impact assessment for long-term sustainability**	**D2.3 Pilots definition and user requirements definition**	**D2.2 Technical, operational and interoperability specifications and reference architecture**

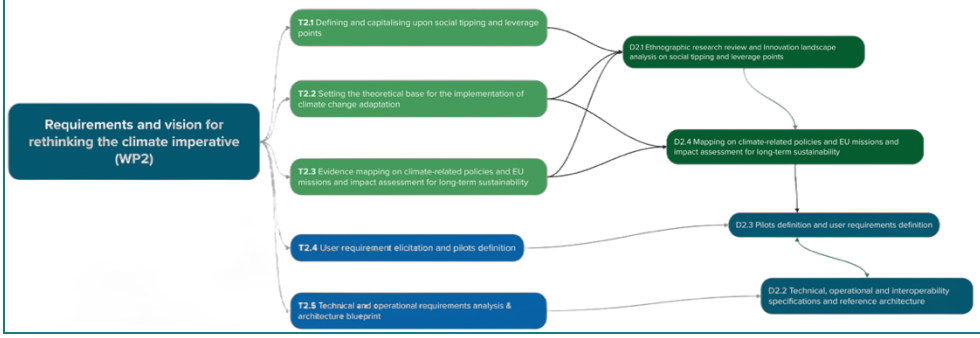


Table 1: WP2 Tasks and Deliverables Interrelations

[1] Research and Innovation Action (RIA) funded by the EU under the Horizon Europe program (HORIZON-CL5-2023-D1-01-09).

2 The Climate Change Challenge

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report states that crossing the 1.5°C threshold risks unleashing far more severe climate change impacts. As seen in the summer of 2024, dubbed the hottest summer on record, climate impacts are already more widespread and severe than expected with a 1.1°C rise in global temperature, and some impacts are now beyond adaptation, leading to an urgent need for systemwide transformations, including the peaking of Greenhouse Gas (GHG) emissions before 2025, a 43% decline in emissions by 2030, and a 60% reduction by 2035 relative to 2019 levels. On top of that, increased carbon removals, both natural and technological, and enhanced climate finance for investments in mitigation and adaptation are critical as a way forward (IPCC Core Writing Team, 2023).

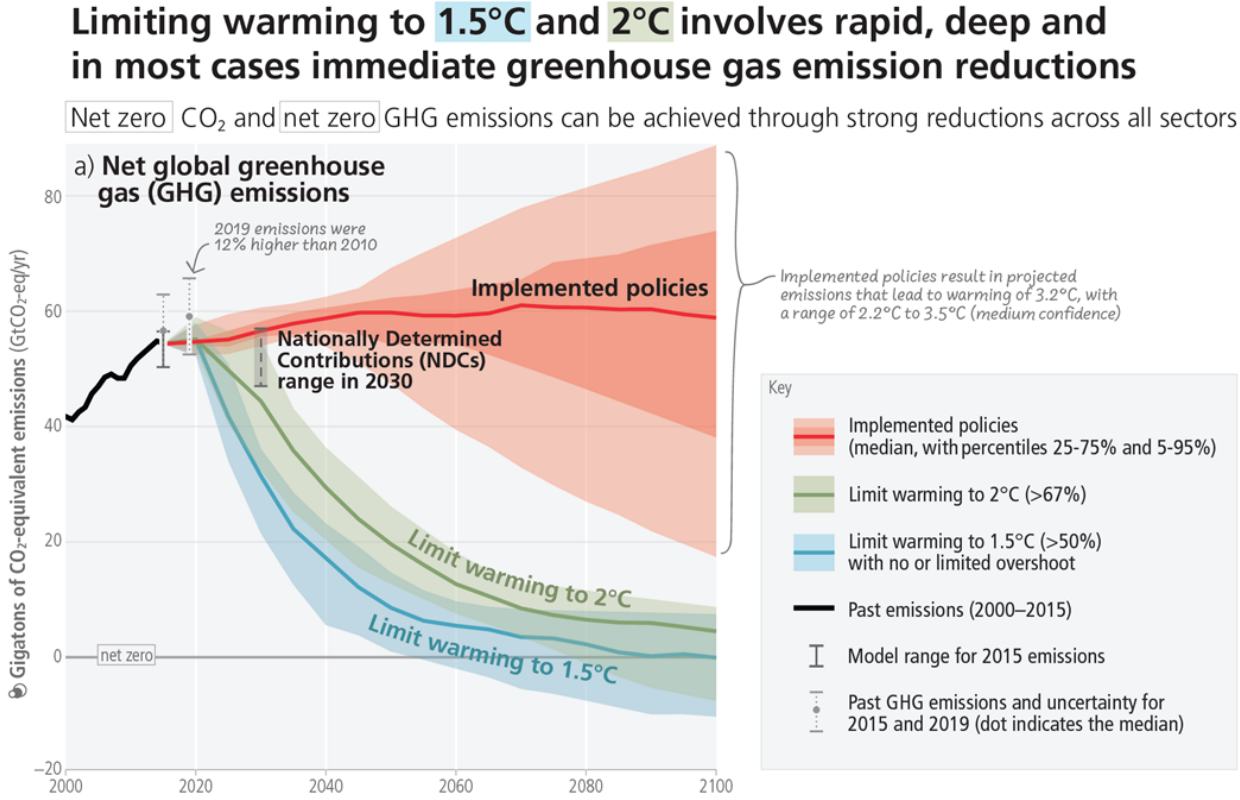


Figure 1: GHG Emissions Reductions Related to Limiting Warming (IPCC, 2023)

At this stage in time if there is no action on climate change, it will lead to a projected 3°C warming by 2100, leading the EU member states to experiencing severe consequences that will be evident in the next 50 years (Feyen et al., 2020). These consequences will include:

- **Heat and Drought**: Heatwaves will claim the lives of 90,000 people each year. Drought will cost the EU and the UK over €9 billion a year in lost revenue.
- **Water Scarcity**: 65 million EU citizens will reside in regions with scarce water supplies. By 2050, more than half of the world's population is predicted to reside in areas with limited access to water.
- **Floods**: The heightened frequency and intensity of floods will result in annual economic losses close to €50 billion.
- **Wildfires**: There will be a 24% increase in the number of people exposed to high-to-extreme fire danger levels, resulting in €2 billion in economic losses per year.
- **Economics**: There will be an annual welfare loss of at least €175 billion.

- **Security**: Water and food scarcity can lead to climate change migration, instability, and conflicts between or within countries and/or geographies.

Considering the above forecast, the need for immediate and sustained climate action becomes urgent and critical.

2.1 Historical Evolution of Climate Governance

Climate change represents one of the most significant threats to humanity, posing potentially catastrophic impacts on both people and the natural environment. This understanding is becoming increasingly evident as new extreme weather events occur worldwide.

In response, the European Union has prioritized climate action through the **European Green Deal** and the set of initiatives emerging from this flagship initiative. The primary objective is to achieve climate neutrality by 2050 while simultaneously enhancing the continent's resilience to climate change. Before delving into the European Green Deal and other related policies at the EU level, it is useful to review the evolution of climate policy at the global scale.

Over the past three decades, climate policy has evolved into a significant policy domain, gaining substantial political importance, especially at the international level. Since the **United Nations Framework Convention on Climate Change (UNFCCC)** was established following the Rio Earth Summit in 1992, human-induced climate change has been recognized as a complex issue necessitating integrated governance responses worldwide. In addition to institutions specifically designed for climate governance, climate policy has been incorporated into other policy areas due to the pervasive nature of the increasing problem pressure (Guzmán León, 2016).

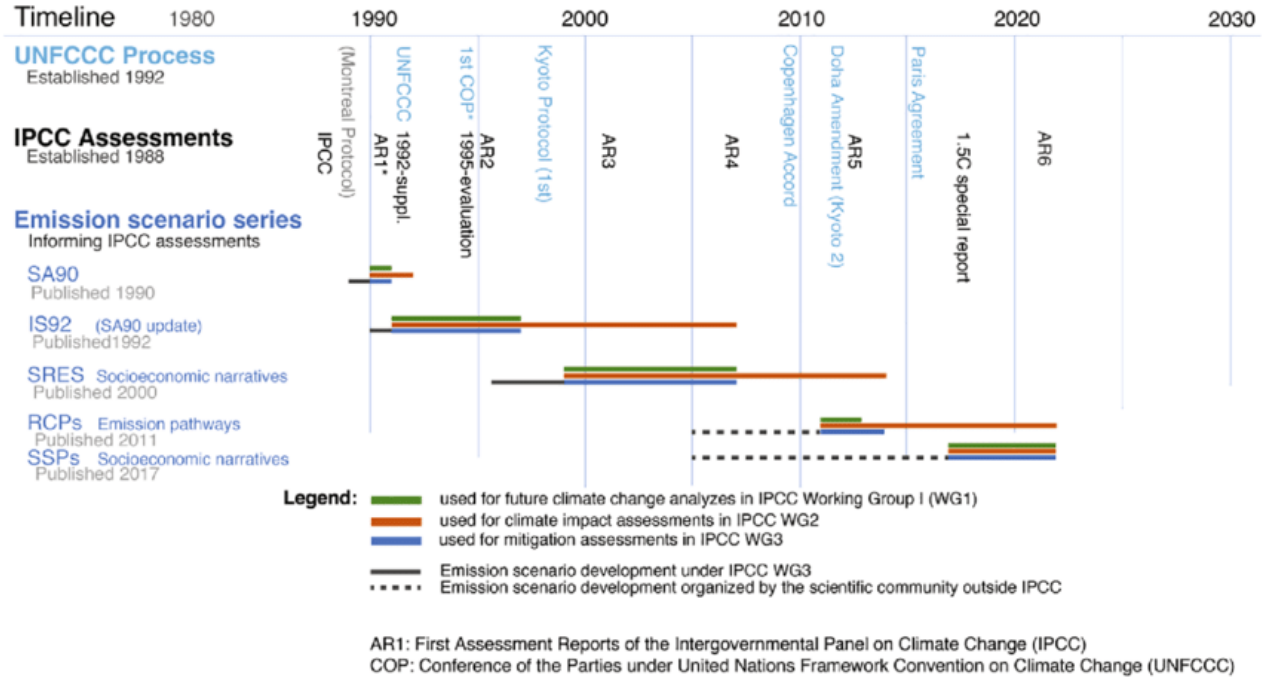


Figure 2: Historical overview of United Nations Framework Convention on Climate Change (UNFCCC), (Pedersen et al., 2022)

This incorporation has led to increasingly complex structures involving a diverse array of actors, interests, institutions, and policy instruments across various governance levels (both state and non-state).

Although fragmentation remains a defining feature of global climate governance, a central framework has emerged over the past decades around which most governance activities revolve. This chapter

aims to understand this central global governance framework and its relationship with the EU. The analysis time frame spans from the pre-Kyoto phase to the Glasgow conference in 2021.

The Kyoto Protocol was a key area where the EU perceives itself as an 'over-achiever' (European Commission, 2013). The EU's involvement in the successor to the Kyoto Protocol, the Paris Climate Agreement (2016), further reinforced this perception. This dedication has been continuously showcased at subsequent Conferences of the Parties (COPs), including COP26 in Glasgow in 2021, COP27 in Sharm El Sheikh in 2022, and once more at COP28 in Dubai in 2023, demonstrating the EU's ongoing commitment to the European Green Deal.

At the same time, the Copenhagen Summit (also known as the 2009 United Nations Climate Change Conference) represents a break in the EU's self-proclaimed leadership image, sparking intense debate regarding contested EU leadership and influence. Thus, these milestones were selected to define the analysis time frame.

2.2 From Kyoto to the COPs

Following the Kyoto conference, the United Nations Framework Convention on Climate Change (UNFCCC) started organising the Conference of the Parties (COP) meetings. These annual conferences bring together the representatives from nearly 200 countries that are signatories to the UNFCCC, to discuss and negotiate global climate policies and actions. The main goal of the UNFCCC COP meetings as they are known is to assess progress in dealing with climate change and to establish legally binding obligations for developed countries to reduce their greenhouse gas emissions.

Each COP has a specific agenda, often building on previous sessions. A notable COP was COP21 in 2015, where the Paris Agreement was adopted, setting out a global framework to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. The agreement also aims to strengthen countries' ability to deal with the impacts of climate change and support them in their efforts.

COP meetings also facilitate discussions on climate finance, adaptation strategies, technology transfer, and capacity-building for developing countries. They serve as a platform for governments, NGOs, scientists, and business leaders to collaborate on innovative solutions and commit to more ambitious climate actions. COP meetings are crucial for advancing international climate policy and ensuring a coordinated global response to climate change.

Table 2: Timeline of significant global and EU developments in climate policy (based on sources: EEA, IPCC, UNFCCC, WMO).

Phase	Year	Development
Pre-Kyoto phase	1990	IPCC First Assessment Report Warming (0.3°C increase per decade, business-as-usual emissions scenario)
	1991	EU Commission proposes European Carbon Tax / Community strategy to limit carbon dioxide (fails 1994)
	1992	Adoption of United Nations Framework Convention on Climate Change (UNFCCC)
		EU signs up to UNFCCC
		Polluter Pays Principle embodied in the Maastricht Treaty
		Polluter Pays Principle becomes key principle of Porto Agreement on the European Economic Area
		UNFCCC opens for signature at Rio Earth Summit

	1995	IPCC Second Assessment Report
		COP1 in Berlin The Berlin Mandate establishes a process to negotiate strengthened commitments for developed countries, thus laying the groundwork for the Kyoto Protocol.
Kyoto and post-Kyoto phase	1997	Kyoto Protocol adopted (The third Conference of the Parties achieves a historical milestone with adoption of the Kyoto Protocol, the world's first greenhouse gas emissions reduction treaty)
	1998	IPCC Task Force on National Greenhouse Gas Inventories is established to oversee the calculation and reporting of national GHG emissions
	2000	Green paper on EU Emission Trading, European Pollutant Emission Register; First European Climate Change Programme (ECCP I, 2000-2004)
	2001	IPCC Third Assessment Report
		COP6 in Bonn achieves breakthrough with governments reaching broad political agreement on the operational rulebook for the 1997 Kyoto Protocol.
		COP7 in Marrakesh (Marrakesh Accords, setting the stage for ratification of the Kyoto Protocol. This would formalise agreement on operational rules for international Emissions Trading, the Clean Development Mechanism and Joint Implementation along with a compliance regime and accounting procedures)
	2002	Ratification of the Kyoto Protocol by EU and MS; EU 'Clean Air for Europe' strategy; Approval of EU Emission Trading System (EU ETS)
	2004	EU develops mechanism to monitor GHG emissions and implement the Kyoto Protocol; promotion of biofuels in transport
		EU ETS Directive
	2005	Kyoto Protocol enters into force (when Russian Federation submitted its instrument of ratification)
		Official start EU ETS (first and largest emissions trading scheme in the world, launches as a major pillar of EU climate policy. Installations regulated by the scheme are collectively responsible for close to half of the EU's emissions of CO2); Integration of JI/CDM into EU ETS; Second European Climate Change Programme (ECCP II, 2005 onwards); EU Thematic strategy on Air Pollution
	2006	Clean Development Mechanism (key mechanism under the Kyoto Protocol) opens for business
		EU action plan on energy efficiency
	2007	EU Treaty of Lisbon: climate change and energy security embedded as two important corner stones
		IPCC Fourth Assessment Report
		EU 20-20-20 targets are decided
	2008	Art. 191 TFEU 2008: climate change an 'explicit objective of EU environmental policy'

		Joint Implementation Mechanism Starts (The Kyoto Protocol mechanism. This allows a country with an emission reduction or limitation commitment under the protocol to Earn Emission Reduction Units (ERUs) from an emission reduction or emission removal project in another country with similar commitments)
Copenhagen	2009	2009: COP15 in Copenhagen produced the Copenhagen Accord (Developed countries pledge up to USD 30 billion in fast-start finance for the period 2010-2012; critical COP for EU actorness failure)
		EU 2020 Climate and Energy legislative package adopted; integration of emissions from aviation into EU ETS; legislation on emissions from passenger cars
	2010	COP16 results in the Cancun Agreements (comprehensive package by governments to assist developing nations in dealing with climate change. The Green Climate Fund, the Technology Mechanism and the Cancun Adaptation Framework are established)
	2011	EU Climate and Energy 2050 Roadmaps published
		EU signs extension of Kyoto Protocol
	2012	COP18 in Doha (governments agree to work toward a universal climate change agreement by 2015 and to find ways to scale up efforts before 2020 beyond existing pledges to curb emissions. They also adopt the Doha Amendment, launching a second commitment period of the Kyoto Protocol)
		EU Energy Efficiency directive
	2013	EU Clean Air Policy package
	2013-2014	IPCC Fifth Assessment Report
	2014	EU 2030 Climate and Energy framework
Paris	2014	Bilateral China–US Climate Agreement
	2015	UNFCCC Paris Agreement adopted (195 nations agreed to combat climate change and unleash actions and investment towards a low-carbon, resilient and sustainable future. The Paris Agreement for the first time brings all nations into a common cause based on their historic, current and future responsibilities)
	2016	EU and MS ratify Paris Agreement; Paris Agreement enters into force
	2017	COP23 in Bonn (first COP to be presided over by a small island developing state: in this case by the Presidency of Fiji) nations agree the next steps towards higher climate action ambition before 2020. Delegates launch the 'Talanoa Dialogue' to help set the stage for the revising upwards of national climate action plans needed to put the world on track to meet pre-2020 ambition and the long-term goals of the Paris Agreement)
	2018	IPCC SPECIAL REPORT Global Warming of 1.5 °C (confirms the need to maintain the strongest commitment to the Paris Agreement's aims of limiting global warming to stave off the worst impacts of climate change, which include more frequent and more severe droughts, floods and storms)
		Upward revision of targets 2030 Climate and Energy framework
Glasgow	2020	Commission proposal for a regulation: European Climate Law

	2021	Glasgow climate summit
	2022	COP27 in Sharm El-Sheikh, Egypt
	2023	IPCC Sixth Assessment Report released
	2023	COP28 in Dubai, United Arab Emirates (UAE)
	2024	COP29 to take place in Baku, Azerbaijan

2.3 The last COP - COP28

The COP28 Conference of the Parties took place in Dubai, United Arab Emirates, from November 30 to December 12, 2023. This conference was significant for its focus on Global Stocktake (GST), a process aimed at assessing collective progress towards achieving the goals of the Paris Agreement, the first formal assessment since the Paris Agreement was adopted in 2015.

Key Highlights of this meeting were:

- Global Stocktake: The first-ever global stocktake was a central feature, providing a comprehensive assessment of national climate actions and identifying gaps in current efforts. This evaluation was crucial for informing future climate policies and enhancing global climate ambition.
- Mitigation Measures: Countries were encouraged to enhance their Nationally Determined Contributions (NDCs) with more ambitious targets. Discussions emphasized the need for rapid decarbonization across key sectors such as energy, transportation, and industry.
- Climate Finance: Financing for climate adaptation and mitigation remained a critical topic. Developed countries were urged to fulfill their commitment to mobilize $100 billion annually for climate finance to support developing nations.
- Loss and Damage Fund: Building on the decision from COP27, the operationalization of the Loss and Damage Fund was a priority. This fund aims to provide financial support to vulnerable countries facing the adverse effects of climate change.
- Technology and Innovation: Technological solutions for climate adaptation and mitigation were showcased, with a focus on renewable energy, carbon capture and storage, and sustainable agriculture practices.
- Youth and Civil Society Engagement: Increased participation from youth and civil society groups highlighted the growing demand for inclusive climate action. Their involvement emphasized the need for intergenerational equity and the representation of diverse voices in climate policymaking.

COP29 Conference of the Parties is set to convene in November 2024 in Baku, Azerbaijan and is set to focus on advancing the goals of the UNFCCC and the Paris Agreement, including efforts to limit global warming, adapt to the impacts of climate change, and mobilize financing for these activities, thus building on the achievements of COP28.

3 Mapping Climate-Related Policies

3.1 EU and Global Climate Change initiatives

Fighting climate change and introducing policies for climate change mitigation and adaptation has been a top priority for the European Union and thus, there has been a plethora of policies, especially in the last five years, that have been put forward and that inform directives and legislation at the European, national and regional levels. These policies include overarching sets of initiatives such as the EU Green Deal and Fit For 55, to the five EU Missions to specific laws, such as the Nature Restoration Law and Directives.

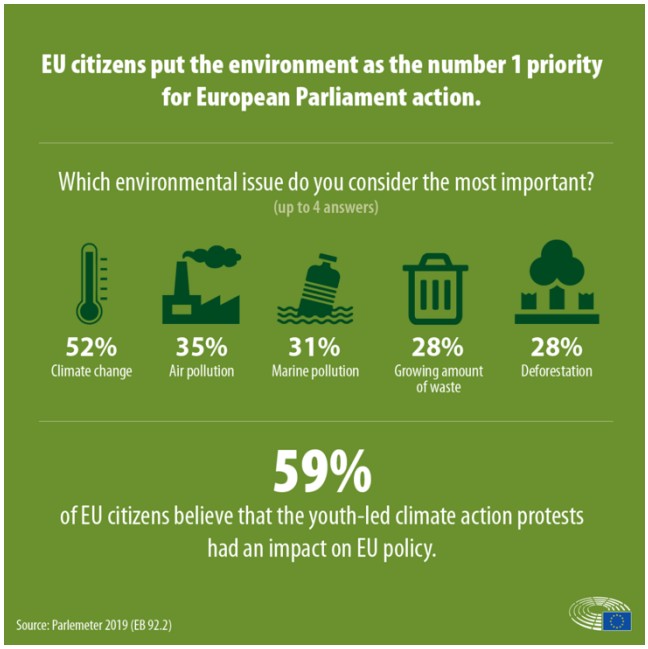


Figure 3: Eurobarometer 2019 on Climate Change

The term "policy" originates from the Greek word “politiki”, which pertains to the activities essential for establishing and sustaining a state and society. Policies and laws differ in that policies are the significant actions taken by governments to address issues or deliver services, while laws are the concrete manifestation of these policies in enforceable regulations.

Policy: A course or principle of action adopted or proposed by a government, party, business, organization, or individual. Public policy is a policy adopted or proposed by governments at all levels (local, state/provincial, regional, national, and international).

Public policy is the constitutions, laws, regulations, court rulings, administrative rules, executive orders, guidelines, recommendations, and other courses of action that a government might take. And it also can include in its definition the funding priorities made by a governmental entity. In summary, it's the rules and planned or defined courses of action made by governments at all levels. Historically these were the significant actions and EU policies that led us to the European Green Deal.

The 2020 Climate and Energy Package

The EU’s 2020 Climate and Energy Package, adopted in 2009, set three key targets to be achieved by 2020

- a 20% reduction in GHG emissions from 1990 levels
- a 20% share of energy from renewable sources, and
- a 20% improvement in energy efficiency.

These targets were legally binding and represented a significant step forward in the EU’s climate policy.

Paris Agreement and the 2030 Climate and Energy Framework

The EU played a crucial role in the 2015 Paris Agreement, which aims to limit global warming to well below 2°C above pre-industrial levels. Following this, the EU adopted the 2030 Climate and Energy Framework, which includes targets of at least a 40% reduction in GHG emissions, a 32% share of renewable energy, and a 32.5% improvement in energy efficiency by 2030.

Horizon Europe and Climate Action

The EU has also invested heavily in research and innovation through programs like Horizon Europe, which allocates significant funding to climate-related research. These efforts support the development of new technologies and solutions to combat climate change.

European Green Deal

In 2019, the European Green Deal was introduced, marking a new phase in EU climate policy. The Green Deal aims for the EU to become the world's first climate-neutral continent by 2050. Key initiatives under the Green Deal include the European Climate Law, which enshrines the 2050 climate neutrality goal into law, and the **Fit for 55 package**, which aims to reduce GHG emissions by at least 55% by 2030.

Below there is a detailed introduction and explanation of existing EU policies and missions related to climate change and sustainability, that will inform the work of other packages within the NEUROCLIMA project and the tools and pilot cases to be created and implemented, in the following months.

3.2 The road to EU Green Deal up to the year 2030

The "**Conference of the Parties**" – COP that took place in Paris in December 2015 ended with a significant legally binding international treaty for climate, which was adopted by 196 parties and came into force in November 2016. The major goals of the Paris Agreement are listed in article 2 of the agreement and are:

> *Article 2*
>
> *This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:*
>
> *(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.*
>
> *(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and*
>
> *(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.*
>
> *2. This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.*

In addition, countries undertook the responsibility to set:

- **Nationally Determined Contributions (NDCs):** Each country must submit NDCs, outlining their emission reduction targets and actions. These targets are to be reviewed and updated every five years. Note that EU has now updated its NDCs to align with its ambitious climate goals, including sectoral targets for energy, transport, agriculture, and industry
- **Global Stocktake:** A process to assess collective progress towards achieving the purpose of the agreement and its long-term goals every five years.
- **Financial and Technological Support:** Developed countries are to provide financial resources to help developing countries with mitigation and adaptation. This includes a continuation of the

$100 billion per year funding goal. The European Union continues to be a major contributor to climate finance, providing a significant portion of the $100 billion annually to support developing countries.

- **Loss and Damage:** The agreement acknowledges the need to address loss and damage associated with the impacts of climate change.

3.3 The Green Deal

To fulfil its obligations, the EU formulated the **European Green Deal** which aims to take measures to reach zero emissions by 2050 and it was introduced in December 2019. The Green Deal is the European Union's comprehensive strategy to transform its economy for a sustainable future. Its primary goal is to make Europe the world's first climate-neutral continent by 2050, ensuring no net emissions of greenhouse gases and fostering a healthy environment.

The Green Deal outlines a roadmap for actions to boost the efficient use of resources by transitioning to a clean, circular economy, restoring biodiversity, and cutting pollution.

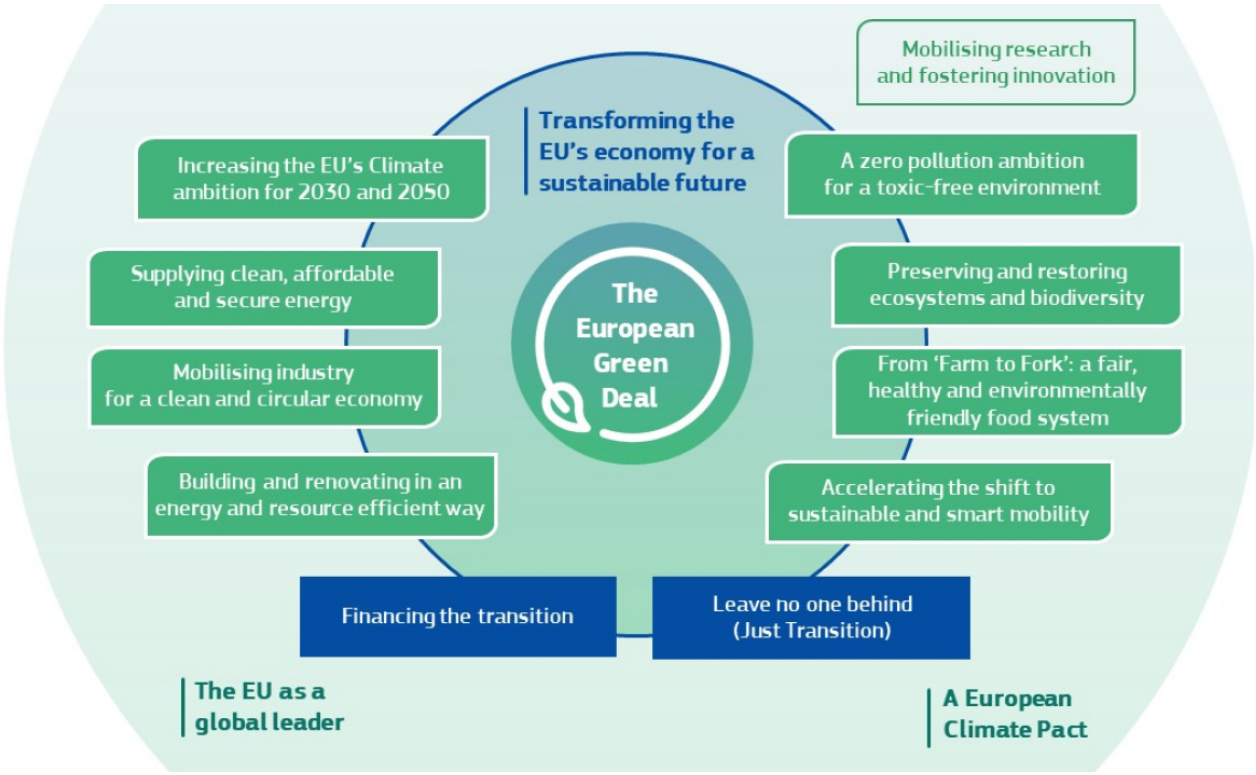


Figure 4: The European Green Deal (The European Green Deal, 2019)

The Green Deal encompasses eight key areas:

1. Increasing the EU's climate ambition for 2030 and 2050;
2. Supplying clean, affordable, secure energy;
3. Mobilising industry for a clean and circular economy;
4. Building and renovating in an energy and resource efficient way;
5. A zero pollution ambition for a toxic-free environment;
6. Preserving and restoring ecosystems and biodiversity;
7. Farm to Fork: a fair, healthy and environmentally friendly food system;

8. Accelerating the shift to sustainable and smart mobility[2].

It aspires to extend Climate Policy Instruments (CPI) to virtually all policy sectors and initiatives, including emission sectors such as maritime transport, agriculture, and additional aspects of buildings and mobility; indirectly emission-relevant policies such as international trade, industrial policy, finance and investment, and research and innovation; and flanking policies to address side-effects of the transition through, e.g., social and foreign policy (The European Green Deal, 2019). Overall, the European Green Deal also entails a significant two-pronged increase in the strength of CPI.

- First, CPI is strengthened because of the aggregate strengthening of the overall policy mix across relevant sectors and the establishment of the guiding 2050 climate-neutrality target as a result, the weight of climate objectives grows substantially.
- Second, the Green Deal establishes a 'principled priority' of climate policy objectives by seeking to ensure that *all other EU initiatives live up to a green commitment to do no harm* (Oberthür & von Homeyer, 2023)

Key elements include

- **Climate Action**: The European Climate Law enshrines the 2050 climate neutrality target into binding legislation.
- **Clean Energy**: It emphasizes increasing the share of renewable energy and improving energy efficiency.
- **Sustainable Industry:** The deal promotes the adoption of green technologies and supports industry to innovate and become global leaders in green products.
- **Building Renovation**: Renovating buildings for higher energy efficiency is crucial.
- **Farm to Fork Strategy**: This aims to make food systems more sustainable.
- **Biodiversity Strategy**: It seeks to protect and restore ecosystems and biodiversity.

The Green Deal also includes the "*Just Transition Mechanism*" ensuring that no person or region is left behind in this transformation. The overarching aim is not only environmental sustainability but also economic growth, social equity, and improved health and well-being for EU citizen. The first major target for achieving the goals of the Green Deal, is the year 2030 where the EU target is to get a reduction of 50% in emissions.

The legislative and other measures to achieve this are known as the "*Fit for 55*" packages since the objective is to take all the necessary measures for EU to achieve 55% reduction in emissions. The main purpose of the 'fit for 55' package is to realize the objectives of the European Climate Law, which include achieving climate neutrality by 2050 and reducing net greenhouse gas (GHG) emissions by 55% by 2030 compared to 1990 levels. The package consists of a set of interlinked proposals and legislative acts aimed at revising existing EU climate and energy laws and introducing new legislation.

Because 2030 is not far, most of these legislative measures have a much shorter period of adaptation to national legislation than the two years that are normally allocated for Directives. That is the main reason why most measures require prior planning to be successfully implemented.

The "Fit for 55" measures cover a wide spectrum of topics and include directives and components that are causing major difficulties and changes to businesses all over Europe and the world. In addition to the legislative measures, the EU has introduced funding programs for each country to assist them to implement their responsibilities. These are the obligation to formulate a national Energy and Climate

[2] Cfr., C. Fetting, «The European Green Deal», ESDN Report (ESDN Office,Vienna), 2020.

program and after Covid-19 the National Recovery and Resilience Fund was also introduced with strong financial support.

4 The "Fit for 55" legislative measures

The list of legislative measures that make up the Fit for 55 package, a set of initiatives under the EU Green Deal, are as follows.

4.1 Emissions Trading System (ETS)

One component of the Fit for 55 package is the revision of the EU's current **Emissions Trading System (ETS)[3].** ETS forms the cornerstone of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is effectively the world's first major carbon market and remains the biggest one.

According to Bailey the EU ETS is the world's largest international market-based emissions control system, covering around 1,600 million tonnes of carbon dioxide emissions in 2007, which accounted for 45% of the EU total. (Bailey, 2010)

The scheme's scale and complexity have made it a significant subject of study, highlighting the EU's transition from opposing to leading the use of market-based emissions control. Internal and external pressures, including the influence of US sulfur dioxide trading experiences, were pivotal in this shift. There was a rapid negotiation and implementation of the EU ETS directives (2003/87/EC and 2004/101/EC), requiring political compromises and resulting in a decentralized emissions allocation system. Initial issues included the over-allocation of allowances and the exclusion of certain sectors and gases.

The EU ETS operates on a cap-and-trade principle, setting a cap on total greenhouse gas emissions and allowing the trading of emission allowances. The scheme experienced challenges such as a price crash

[3] (Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and Amending Council Directive 96/61/EC, 2003)

in 2006 due to overallocation. Phase III reforms (2013-2020) aimed to centralize the scheme, increase the auctioning of allowances, and include more sectors and gases. The scheme's design and political compromises have implications for its effectiveness and equity. Issues such as allowance distribution, impacts on low-income member states, and interactions with other international carbon markets are critical. Further research is needed to ensure the scheme promotes low-carbon investment and fair burden-sharing.

New provisions include:

- the extension to emissions from maritime transport, an industry with significant GHG emissions and very important NOx and SOx pollutants emissions;
- a faster reduction of emissions allowances in the system and gradual phasing-out of free allowances for some sectors;
- the implementation of the global carbon offsetting and reduction scheme for international aviation (CORSIA) through the EU ETS;
- the increase of funding for the modernisation fund and the innovation fund and the revision of the market stability reserve[4].

4.2 Emissions Trading System-ETS II

The Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 established a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC. This formulates a complex set of rules that apply mostly to “upstream” polluters buildings, road transport and additional sectors and follows the success of the previous ETS system.

It extends the EU's carbon market to new sectors, and it would apply mainly for Aviation and Shipping, Road Transport and Large buildings and the Directive is full of implementation dates. ETS II introduces a cap-and-trade system where emission allowances are auctioned, and companies can trade these allowances within a defined cap. The cap reduces over time, ensuring that emissions decrease progressively. Revenues from auctions are intended to fund climate action, innovation, and energy transition projects. A key aspect of ETS II is its focus on addressing social impacts. The directive includes provisions for a Social Climate Fund, which aims to support vulnerable households, micro-enterprises, and transport users affected by the transition. This fund helps mitigate the potential cost burdens of carbon pricing on low-income groups.

[4] https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55/#0

4.3 The Social Climate Fund (SCF)

The Social Climate Fund[5] aims to ensure a fair and inclusive transition to a low-carbon economy under the European Green Deal. Proposed in 2021, the SCF is designed to mitigate the social and economic impacts of the EU's climate policies, particularly on vulnerable households, micro-enterprises, and transport users.

The SCF will support measures and investments that reduce emissions while addressing energy poverty and mobility challenges. It will provide financial aid for energy efficiency improvements in buildings, access to renewable energy, and cleaner transportation options. This includes funding for insulation, heating systems, and renewable energy installations, as well as promoting affordable public transport and electric vehicle infrastructure.

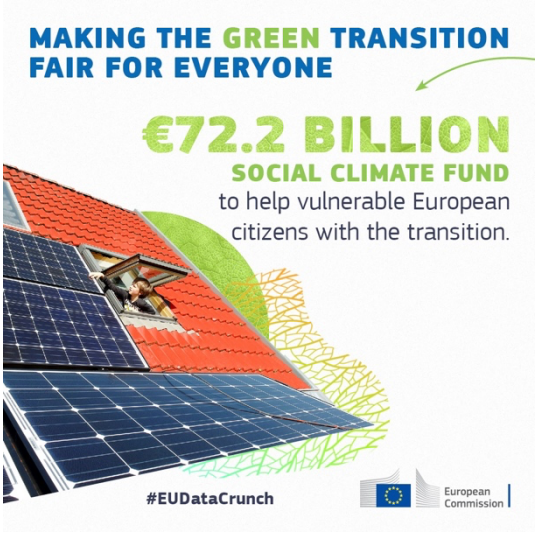


Figure 5: A Social Climate Fund banner

Funded by revenues from the expansion of the EU Emissions Trading System (ETS) to the building and road transport sectors, the SCF aims to ensure that the costs of the green transition do not disproportionately affect those with lower incomes. Member States will develop Social Climate Plans outlining how they intend to use the SCF to support vulnerable groups, ensuring targeted and effective use of resources. The estimated revenue from the EU ETS is about EUR 86.7bn over 2026-2032 period. It will help mitigate the costs for those most exposed to changes, to ensure that the transition is fair and leaves no one behind. The green transition could create around 1 million jobs in the EU by 2030, particularly middle-skilled, middle-paying jobs, in construction and manufacturing.

In effect, the Social Climate Fund will:

- Support vulnerable households, transport users & micro-enterprises from impact of ETS2
- Support investments in energy efficiency & renovation of buildings, clean heating & cooling
- Finance zero- & low-emission mobility & transport, including public transport
- Provide temporary direct income support

4.4 Land Use, Land Use Change, and Forestry (LULUCF) Regulation

The LULUCF regulation[6] aims to ensure that the land use sector contributes to achieving the EU's climate objectives, specifically targeting carbon neutrality by 2050. LULUCF covers greenhouse gas emissions and removals resulting from land use, changes in land use, and forestry activities. This includes activities such as afforestation, reforestation, deforestation, and forest management. The regulation requires EU Member States to account for emissions and removals from these activities accurately and to ensure that the sector achieves a net zero balance of emissions and removals, often referred to as the "no-debit" rule.

Under the LULUCF Regulation, the EU Member States must develop and implement national forestry accounting plans and report their greenhouse gas emissions and removals annually. These plans must include measures to enhance carbon sinks, such as sustainable forest management practices,

[5] https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/social-climate-fund_en
[6] https://climate.ec.europa.eu/eu-action/land-use-sector_en

restoration of degraded lands, and conservation of existing forests and wetlands. By integrating LULUCF into its broader climate strategy, the EU aims to promote sustainable land use practices that contribute to both climate mitigation and biodiversity conservation, supporting the overall goal of transitioning to a sustainable and resilient low-carbon economy.

4.5 Renewable Energy Directive (RED II)

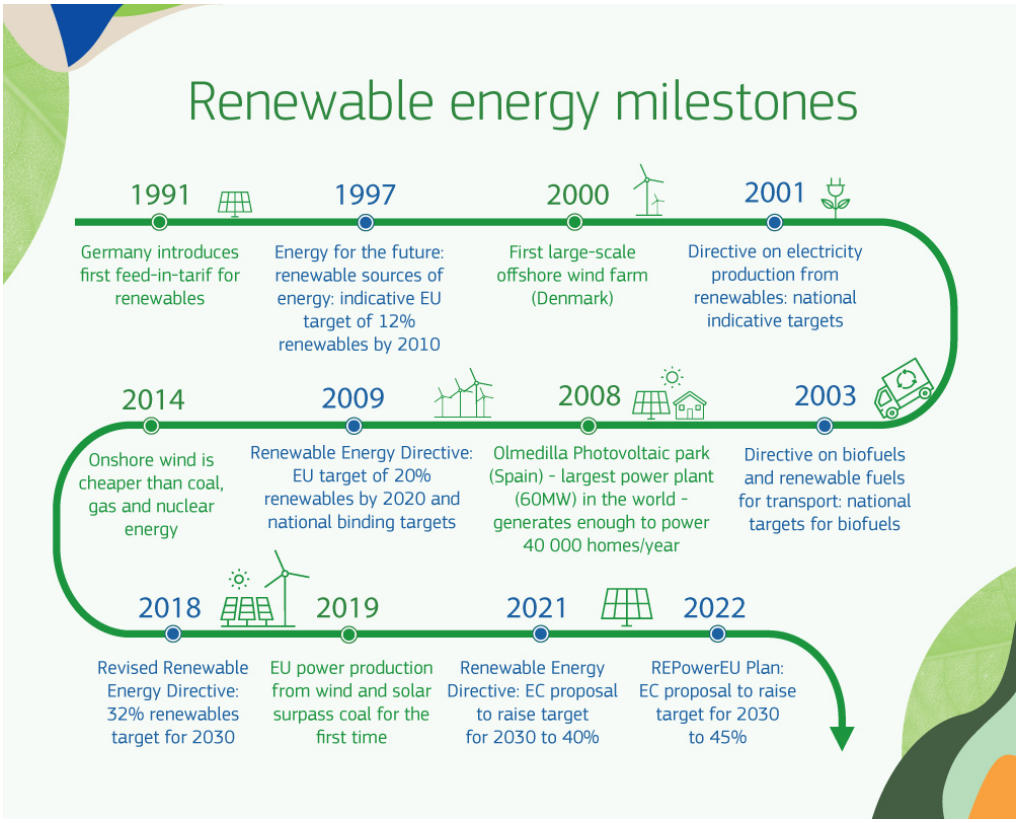


Figure 6: Renewable Energy Milestones. EC Social Media Post (https://x.com/EU_Commission/status/1556600852902813696)

The revision of the Renewable Energy Directive (RED II)[7] was adopted in 2018 and revised in 2021, RED II aims to increase the share of renewable energy in the EU's overall energy mix, setting ambitious targets to promote cleaner energy sources. Under the revised directive, the EU has committed to raising the share of renewables in its energy consumption to at least 32% by 2030, with an upward revision to 40% proposed in 2021. The directive covers all sectors, including electricity, heating and cooling, and transport, ensuring a comprehensive approach to integrating renewable energy across the board.

Key aspects of the revision include stronger sustainability criteria for bioenergy, enhanced support mechanisms for renewable electricity, and the promotion of renewable fuels in the transport sector. It also encourages Member States to develop national renewable energy action plans and to remove administrative barriers to renewable energy projects. It sets a target for a 42.5-45% share of renewable energy sources at the EU level by 2030 and it includes sustainability criteria for biofuels and introduces a credit mechanism to promote electromobility. It also establishes requirements for renewable transport fuels and defines renewable gas and low-carbon gas.

[7]https://joint-research-centre.ec.europa.eu/welcome-jec-website/reference-regulatory-framework/renewable-energy-recast-2030-red-ii_en

It sets targets to member states for the deployment of suitable solar energy installations, if technically suitable and economically and functionally feasible, as follows:

1. by 31 December 2026, on all new public and non-residential buildings with useful floor area larger than 250 m2
2. on all existing public buildings with useful floor area larger than:

a) 2 000 m2, by 31 December 2027

b) 750 m2, by 31 December 2028

c) 250 m2, by 31 December 2030

3. by 31 December 2027, on existing non-residential buildings with useful floor area larger than 500 m2, where the building undergoes a major renovation or an action that requires an administrative permit for building renovations, works on the roof or the installation of a technical building system
4. by 31 December 2029, on all new residential buildings; and by 31 December 2029, on all new roofed car parks physically adjacent to buildings.

The revised directive emphasizes innovation, urging increased investments in renewable technologies and infrastructure. It aims to foster a more decentralized and resilient energy system, encouraging community-led renewable energy projects and ensuring the participation of citizens and local authorities.

4.6 Effort Sharing Regulation (ESR)

Regulation (EU) 2023/8578 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999.

The Effort Sharing Regulation (ESR)[9] is designed to reduce greenhouse gas emissions across various sectors not covered by the EU Emissions Trading System (ETS). Adopted in 2018 and amended as part of the EU's 2030 climate and energy framework, the ESR targets sectors such as transport, buildings, agriculture, and waste management, which collectively account for nearly 60% of the EU's total emissions.

The ESR sets binding annual greenhouse gas emission reduction targets for each EU Member State for the period from 2021 to 2030, based on their relative wealth and capacity to reduce emissions. Each Member State must develop national strategies and implement policies to meet its specific targets. Flexibility mechanisms within the ESR allow Member States to trade emission allowances with each other, bank surplus reductions for future years, or borrow allowances from subsequent years, thus providing a cost-effective way to meet their commitments. The ESR promotes accountability and transparency through regular reporting and compliance checks. One of the key features of ESR is it strives for a fair and balanced distribution of efforts among Member States while fostering sustainable development.

[8] https://eur-lex.europa.eu/eli/reg/2023/857

[9] https://climate.ec.europa.eu/eu-action/effort-sharing-member-states-emission-targets/effort-sharing-2021-2030-targets-and-flexibilities_en

4.7 Carbon Border Adjustment Mechanism (CBAM)

The Carbon Border Adjustment Mechanism (CBAM) is an innovative policy instrument proposed by the European Union to address carbon leakage (see below) and strengthen the EU's climate goals. CBAM aims to equalize the carbon costs between EU-produced goods and imports from countries with less stringent climate policies, thus preventing the relocation of production to countries with laxer environmental regulations (known as carbon leakage).

Figure 7: Source: The European Commission

CBAM currently applies to specific high-emission sectors such as cement, iron and steel, aluminum, fertilizers, and electricity. Importers of these goods to EU countries will be required to purchase carbon certificates corresponding to the carbon price that would have been paid if the goods were produced under the EU's carbon pricing rules. This system ensures that imported products are subject to the same carbon costs as those produced within the EU.

The mechanism is designed to encourage non-EU countries to enhance their climate ambitions and align with international climate goals. It aims to prevent competitive disadvantages for EU industries subjected to strict climate policies. CBAM also includes provisions for a transitional phase, allowing businesses to adapt and providing clarity on implementation procedures. It will be fully implemented in its definitive regime starting in 2026, following a transitional phase from 2023 to 2025. This gradual introduction of the CBAM is aligned with the phase-out of the allocation of free allowances under the EU Emissions Trading System (ETS) to support the decarbonisation of EU industry

4.8 Energy Taxation Directive (ETD)

The Energy Taxation Directive (ETD)[10] was originally established in 2003 by the European Union to harmonize the taxation of energy products and electricity across Member States and it aimed to ensure the proper functioning of the internal market, promote energy efficiency, and support the EU's environmental and climate goals. The directive sets minimum tax rates for various energy products, including motor fuels, heating fuels, and electricity, thereby preventing competitive distortions between Member States.

In the context of the European Green Deal and the EU's commitment to achieving climate neutrality by 2050, the ETD is undergoing a revision. The proposed revisions aim to align energy taxation with the EU's climate and energy objectives, promoting the use of cleaner energy sources and discouraging fossil fuel consumption. Key elements of the revision include adjusting minimum tax rates based on the energy content and environmental performance of fuels, thus incentivizing low-carbon

[10] https://taxation-customs.ec.europa.eu/taxation/excise-duties/review-energy-taxation-directive-proposal_en

alternatives. The revised ETD also seeks to address social and economic impacts by considering the energy needs of vulnerable households and regions.

4.9 The revised Energy Performance of Buildings Directive (EPBD)

New buildings must be zero-emission as of 2030, and new buildings occupied or owned by public authorities must be zero-emission as of 2028, according to the revised Energy Performance of Buildings Directive (EPBD)[11].

For residential buildings, the EU Member States must put in place measures to ensure a reduction in the average level of primary energy used of at least 16% by 2030 and at least 20-22% by 2035.

Figure 8: Energy efficient buildings © European Parliament

1. the common general framework for a methodology for calculating the integrated energy performance of buildings and building units;
2. the application of minimum energy performance requirements to new buildings and new building units;
3. the application of minimum energy performance requirements to:
    a. existing buildings and existing building units that are undergoing major renovation
    b. building elements that form part of the building envelope and that have a significant impact on the energy performance of the building envelope when they are retrofitted or replaced
    c. technical building systems where they are installed, replaced or upgraded
4. the application of minimum energy performance standards to existing buildings and existing building units
5. the calculation and disclosure of the life-cycle Global Warming Potential – GWP of buildings
6. solar energy in buildings
7. renovation passports
8. national building renovation plans
9. sustainable mobility infrastructure in and adjacent to buildings
10. smart buildings
11. energy performance certification of buildings or building units
12. regular inspection of heating systems, ventilation systems and air-conditioning systems in buildings
13. independent control systems for energy performance certificates, renovation passports, smart readiness indicators and inspection reports
14. the indoor environmental quality performance of buildings.

In Article 7 it states that:

1. Member States shall ensure that new buildings are zero-emission buildings in accordance with Article 11:
    a. from 1 January 2028, new buildings owned by public bodies; and
    b. from 1 January 2030, all new buildings;

[11] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

2. Member States shall ensure that the life cycle GWP is calculated in accordance with Annex III and disclosed in the energy performance certificate of the building:
   c. from 1 January 2028, for all new buildings with a useful floor area larger than 1 000 m^2
   d. from 1 January 2030, for all new buildings.

4.10 Energy Efficiency Directive (EED)

Directive (EU) 2023/1791[12] of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast).

The revised Energy Efficiency Directive (EED)[13] increases the binding annual target for reducing energy consumption at the EU level, with specific measures and targets for public and private sectors. It updates and amends Regulation (EU) 2023/955 to align with the EU's climate targets, including a 55% reduction in greenhouse gas emissions by 2030 compared to 1990 levels. The directive emphasizes the energy efficiency first principle, promoting cost-effective measures across all sectors, and aims to reduce energy consumption, enhance energy security, and support sustainable economic growth. It also addresses the need for energy efficiency in buildings, transport, and ICT sectors.

It sets targets for a substantial reduction of primary and final energy consumption, and it includes provisions for efficient district heating and cooling and energy performance contracting in buildings.

4.11 ReFuelEU Aviation and FuelEU Maritime

These ReFuelEU Aviation and FuelEU Maritime initiatives[14] aim to increase the use of sustainable fuels in aviation and maritime transport. Implementation timelines vary, with proposals aiming for gradual implementation starting from the mid-2020s. The ReFuelEU Aviation[15] initiative promotes the use of Sustainable Aviation Fuels (SAF) to reduce CO_2 emissions in aviation. By 2025, a 2% SAF blend is mandated at EU airports, rising to 70% by 2050. SAF includes synthetic fuels, advanced biofuels, and recycled carbon fuels. The initiative seeks to reduce aviation's environmental impact, stimulate innovation and investment in SAF, create jobs, and establish a level playing field in EU air transport. The regulation ensures comprehensive compliance and infrastructure support across the EU.

The FuelEU Maritime initiative was adopted on 25 July 2023 and its aim is to decarbonize the maritime sector. It mandates increased use of renewable and low-carbon fuels to reduce greenhouse gas emissions from ships. Key provisions include gradual reductions in fuel greenhouse gas intensity, incentives for renewable fuels of non-biological origin (also known as RFNBOs) , mandatory onshore power supply for ships in major EU ports by 2030, and a voluntary pooling mechanism for compliance. The regulation takes effect on 1 January 2025[16], with specific articles effective from 31 August 2024.

[12] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L1791
[13] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en
[14] https://www.consilium.europa.eu/en/infographics/fit-for-55-refueleu-and-fueleu/
[15] https://eur-lex.europa.eu/eli/reg/2023/2405/oj
[16] https://data.consilium.europa.eu/doc/document/PE-26-2023-INIT/en/pdf

4.12 Revised Regulation on the Deployment of Alternative Fuels Infrastructure (AFIR)

The EU Revised Regulation on the Deployment of Alternative Fuels Infrastructure (AFIR)[17] aims to accelerate the development and adoption of alternative fuels across the European Union, supporting the transition to a cleaner and more sustainable transport system.

This regulation is a key component of the EU's broader climate goals, including the European Green Deal and the Fit for 55 package.

Aims of the Directive are:

- Decarbonization of Transport: AFIR aims to reduce the carbon footprint of the transport sector, which is one of the largest sources of greenhouse gas emissions in the EU.
- Support for Innovation: By providing a clear regulatory framework, the regulation encourages innovation and investment in alternative fuel technologies and infrastructure.
- Market Development: The regulation seeks to create a harmonized market for alternative fuels across the EU, ensuring interoperability and seamless travel across member states.

And its main features are:

1. Infrastructure Targets: AFIR sets binding targets for member states to ensure the availability of alternative fuels infrastructure. This includes specific targets for electric vehicle (EV) charging stations, hydrogen refueling stations, and liquefied natural gas (LNG) infrastructure for both road and maritime transport.
2. Coverage and Accessibility: The regulation mandates that charging and refueling stations be installed at regular intervals along major transport corridors (TEN-T network) and urban areas. This ensures that EVs and other alternative fuel vehicles can travel long distances without facing fuel shortages.
3. Technical Standards: To ensure interoperability and user convenience, AFIR establishes common technical standards for charging and refueling points. This includes plug types, communication protocols, and payment systems, facilitating a user-friendly experience across different countries and providers.
4. Real-Time Information and Payment Systems: The regulation requires the integration of digital solutions to provide real-time information on the availability and status of charging and refueling stations. Additionally, it mandates the implementation of easy and transparent payment systems, enabling users to access services without subscription-based barriers.
5. Monitoring and Reporting: Member states must regularly report on the progress of infrastructure deployment and usage. This data helps assess compliance with the targets and informs future policy adjustments.
6. Funding and Support: The regulation outlines various financial mechanisms and incentives to support the deployment of alternative fuels infrastructure, including EU funding programs and public-private partnerships.

Overall, the main objective of the EU Revised Regulation on the Deployment of Alternative Fuels Infrastructure is to ensure a comprehensive and cohesive network of alternative fuel options across Europe, to assist the transition to sustainable transport and contribute significantly to the EU's climate and environmental objectives.

[17] https://www.consilium.europa.eu/en/press/press-releases/2023/07/25/alternative-fuels-infrastructure-council-adopts-new-law-for-more-recharging-and-refuelling-stations-across-europe/

4.13 Revised Vehicle Emission Standards

Regulation (EU) 2019/85118 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition.

The Revised Vehicle Emission Standards[19], known as Euro 7, represent the latest update in the European Union's regulatory framework aimed at reducing vehicle emissions and improving air quality. These standards build upon the previous Euro 6 regulations and introduce more stringent limits on pollutants such as nitrogen oxides (NOx), particulate matter (PM), carbon monoxide (CO), and hydrocarbons (HC).

One of the key features of Euro 7 is the uniform application of emission limits across all vehicle types, including cars, vans, trucks, and buses. This is a departure from the previous approach, which had different standards for different categories of vehicles. By setting a common benchmark, the Euro 7 standards aim to simplify compliance for manufacturers and ensure a level playing field.

Additionally, Euro 7 includes more rigorous testing procedures. Vehicles must now demonstrate compliance under a broader range of driving conditions, including urban, rural, and motorway driving, as well as under varying temperatures and altitudes. This is intended to provide a more accurate reflection of real-world emissions compared to laboratory-only tests.

Another significant feature is the introduction of limits on non-exhaust emissions, such as those from brake and tire wear. These sources of particulate matter are becoming increasingly important as the exhaust emissions from engines are reduced. Euro 7 addresses this by setting specific limits and encouraging the development of cleaner technologies and materials.

The standards also emphasize durability and the lifetime performance of emission control systems. Vehicles will be required to maintain compliance with emission limits over a longer period, which means that emission control technologies must be more robust and reliable.

Euro 7 further integrates digital monitoring and on-board diagnostics to ensure continuous compliance. Vehicles will be equipped with advanced sensors and systems that provide real-time data on emissions, allowing for better enforcement and maintenance practices. The revised standards are expected to be implemented from 2025 onwards.

4.14 Right to Repair

Directive (EU) 2024/1799[20] of the European Parliament and of the Council of 13 June 2024 on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394 and Directives (EU) 2019/771 and (EU) 2020/1828

[18] https://eur-lex.europa.eu/eli/reg/2023/851
[19] https://ec.europa.eu/commission/presscorner/detail/en/qanda_24_2527
[20] https://eur-lex.europa.eu/eli/dir/2024/1799

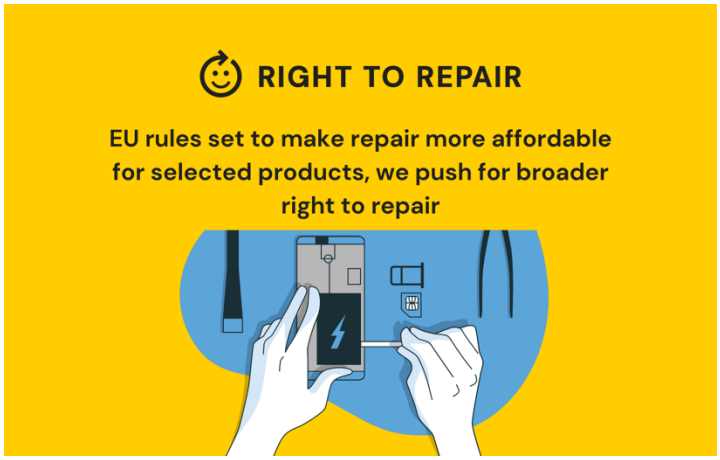


Figure 9: EU Right to Repair Campaign

The Right to Repair Directive significantly shifts EU's traditional approach to product lifecycle management, by emphasizing sustainability and consumer rights. Consumers are granted a new 'right to repair,' which obligates manufacturers to ensure the availability of spare parts and repair information for a minimum period after a product's purchase. This includes providing access to repair manuals and diagnostic tools, which were previously restricted. Online platforms will assist consumers in finding local repair services and shops selling refurbished goods.

The main features include the following:

Availability of Spare Parts: The directive mandates that essential spare parts must be available for a specific duration, varying by product type. For instance, household appliances might require parts to be available for up to ten years, enhancing product longevity.

Repair Information: Manufacturers are required to provide detailed repair information to professional repairers and consumers. This includes instructions on repair procedures and the provision of necessary tools, making repairs more accessible and cost-effective.

1. Standardization of Repair Processes: To facilitate repairs, the directive encourages the standardization of key components and repair procedures. This harmonization aims to simplify the repair process across different brands and products.
2. Consumer Awareness and Support: The directive also includes provisions to raise consumer awareness about the benefits of repairing goods. Public campaigns and educational programs will be launched to inform consumers about their new rights and the environmental impact of repairs.

Impact on Trade

1. Market for Spare Parts and Repair Services: The directive is expected to create a substantial market for spare parts and repair services within the EU. This will benefit small and medium-sized enterprises (SMEs) specializing in repairs and parts manufacturing, fostering local businesses and innovation.
2. Competition and Innovation: By standardizing repair processes and parts, the directive may reduce the dominance of large manufacturers, leveling the playing field for smaller companies. This can stimulate competition and drive innovation in repair technologies and sustainable product design.
3. Cross-Border Trade: The harmonization of repair rules across the EU will simplify cross-border trade in goods and services related to repairs. Consumers and businesses will find it easier to access repairs and parts from other EU countries, enhancing the single market's efficiency.
4. Environmental and Economic Benefits: Promoting repairs over replacements will lead to a reduction in electronic waste and resource consumption. This aligns with the EU's Green Deal objectives and supports the transition to a circular economy. Economically, consumers can save

money by repairing instead of replacing products, potentially increasing disposable income and boosting other sectors.

Products covered by the Directive are:

1. washer-dryers and dishwashers
2. household washing machines
3. refrigerating appliances
4. electronic displays
5. welding equipment
6. vacuum cleaners
7. servers and data storage products
8. mobile phones
9. cordless phones and slate tablets and
10. products containing batteries for light means of transport, such as e-bikes and e-scooter.

4.15 Green Claims Directive

Figure 10: Green Claims Directive (EU)

The Green Claims Directive[21], proposed by the European Commission in March 2023, aims to tackle misleading environmental claims made by companies about their products and services. This initiative seeks to enhance transparency, protect consumers from greenwashing, and promote genuine environmental practices within the EU market.

Key provisions include:

• Standardized Verification: Companies must substantiate their green claims with reliable, verifiable evidence. Independent verification by accredited third parties will be mandatory.
• Clear Communication: Green claims must be presented clearly and accurately, avoiding vague terms like "eco-friendly" or "green" without specific context or proof.
• Harmonization: The directive aims to harmonize rules across the EU, ensuring consistency in how green claims are made and verified, facilitating cross-border trade and protecting consumers in all member states.

- Enforcement and Penalties: Member states will be responsible for enforcing the directive, with the possibility of significant penalties for non-compliance. These penalties aim to deter misleading claims and incentivize adherence to genuine environmental standards.

Impact on Consumers

- Enhanced Trust: Consumers will benefit from more trustworthy information, enabling them to make informed decisions based on accurate environmental claims. This transparency can increase consumer confidence in sustainable products and brands.

[21] https://environment.ec.europa.eu/topics/circular-economy/green-claims_en

- Protection from Greenwashing: The directive protects consumers from deceptive marketing practices, reducing the prevalence of greenwashing. By ensuring that green claims are substantiated, consumers can avoid being misled by false or exaggerated claims about environmental benefits.
- Empowerment: With access to clear and accurate information, consumers are empowered to support genuinely sustainable products, driving demand for environmentally friendly practices and encouraging a shift towards a greener economy.

Impact on Companies

- Increased Accountability: Companies will be held accountable for their environmental claims, requiring them to provide robust evidence and undergo independent verification. This accountability can enhance corporate transparency and credibility.
- Operational Changes: Businesses may need to invest in more sustainable practices and thorough documentation to substantiate their green claims. While this may entail initial costs, it can lead to long-term benefits, including improved reputation and consumer loyalty.
- Competitive Advantage: Companies that genuinely adhere to sustainable practices can leverage the directive to differentiate themselves in the market. Authentic green claims can serve as a competitive advantage, attracting environmentally conscious consumers.
- Regulatory Compliance: Firms must ensure compliance with the directive to avoid penalties and reputational damage. This may require adjustments in marketing strategies, product development, and supply chain management to align with the new standards.

The Green Claims Directive aims to create a more transparent and trustworthy market for green products, benefiting both consumers and companies by fostering genuine environmental practices and reducing the prevalence of greenwashing. By enhancing accountability and encouraging sustainable practices, the directive supports the EU's broader goals of environmental protection and sustainable development.

4.16 The revised Industrial Emissions Directive (IED)

Regulation (EU) 2024/1244 of the European Parliament and of the Council of 24 April 2024 on reporting of environmental data from industrial installations, establishing an Industrial Emissions Portal and repealing Regulation (EC) No 166/2006

The revised Industrial Emissions Directive (IED) aims to further reduce industrial pollution, aligned with the goals of the European Green Deal to achieve climate neutrality by 2050.

The main features and changes compared to the previous directive are:

Before the Revision:

1. Scope: The original IED primarily regulated large industrial installations such as power plants, chemical production facilities, and waste management sites.
2. Emission Limits: Set limits on emissions of key pollutants, including sulfur dioxide (SO_2), nitrogen oxides (NOx), and particulate matter (PM), based on Best Available Techniques (BATs).
3. BAT Reference Documents (BREFs): Provided guidelines on the Best Available Technologies (BAT) for various industries, updated periodically.
4. Permitting and Compliance: Required installations to obtain permits and comply with Emission Limit Values (ELVs) and other conditions specified in those permits.
5. Monitoring and Reporting: Mandated regular monitoring and reporting of emissions to ensure compliance with permit conditions.

6. Public Access to Information: Ensured public access to information on industrial emissions and environmental performance of installations.

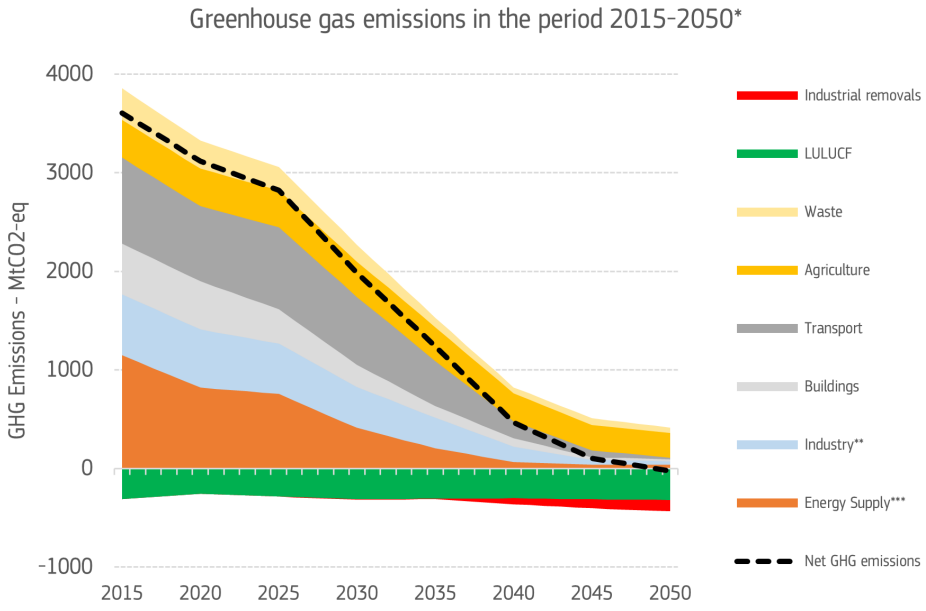
New Features and Changes:

1. Extended Scope: The revised IED includes additional sectors such as large-scale livestock farming, mining, and more food production industries, broadening the range of regulated activities.
2. Stricter Emission Limits: New, more stringent ELVs for pollutants like SO_2, NOx, and PM, reflecting the latest scientific and technological advancements.
3. Updated BATs: Emphasis on adopting the latest and most effective pollution control technologies, with BREFs updated more frequently to incorporate new innovations.
4. Pollution Prevention: Greater focus on preventing pollution at the source, including measures for cleaner production techniques and improved resource efficiency.
5. Enhanced Monitoring and Reporting: Improved and more frequent monitoring requirements, with increased transparency and public access to emissions data.
6. Streamlined Permitting Process: A more efficient permitting process that includes periodic reviews to ensure permits reflect the latest scientific knowledge and technological advancements.
7. Public Participation: Enhanced mechanisms for public involvement in the decision-making process, ensuring communities can voice concerns and contribute to environmental protection efforts.
8. Support for Innovation: Measures to encourage research and development in new pollution control technologies, facilitating a smoother transition to greener industrial practices.

Overall, the revised IED aims to tighten regulations, broaden the scope of industries covered, and enhance transparency and public engagement in efforts to mitigate industrial pollution and protect the environment. *It is important to note that all the data will be publicly available on an EU operated website and that will make all this information available to the public meaning that it will be much easier for NGOs to take legal measures against governments.*

4.17 EU Targets for the Year 2040

The European Commission's communication[22] to the European Parliament, in the document titled "*Pathway to Climate Neutrality by 2050*,"[23] outlined an ambitious and comprehensive strategy to achieve net-zero greenhouse gas emissions by mid-century. This essay delves into the primary targets, policies, and strategic measures proposed by the Commission, emphasizing the importance of coordinated action, sector-specific transformations, and international cooperation to meet these objectives.



*Source: PRIMES, GAINS, GLOBIOM
**Excluding non-BECCS industrial removals
***Including Bioenergy with carbon capture and storage (BECCS)

Figure 11: 2040 climate target (https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2040-climate-target_en)

Climate Vision Beyond 2030: The communication underscores the urgency of immediate and sustained global climate action. It recognizes that to limit global warming to 1.5°C, as stipulated by the Paris Agreement, the world must make significant cuts in greenhouse gas emissions. The European Union (EU) aims to be a frontrunner in this endeavour, setting an example for other nations through its ambitious climate policies.

2040 Climate Target: A central element of the Commission's strategy is the 2040 climate target, which aims for a 90% reduction in net greenhouse gas emissions from 1990 levels. This target is a critical milestone on the path to achieving full climate neutrality by 2050. The Commission's proposal includes detailed impact assessments to ensure that this transition is both economically viable and socially equitable.

Implementation Strategy: Achieving the 2040 and 2050 targets requires a multifaceted approach involving various sectors of the economy. The Commission outlines several key areas where transformation is essential:

Energy System Transformation: The transition to a low-carbon energy system is pivotal. This involves increasing the share of renewable energy sources, improving energy efficiency, and integrating

[22] https://ec.europa.eu/commission/presscorner/detail/en/ip_24_588
[23] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2024:63:FIN

innovative technologies like smart grids and energy storage solutions. The Commission advocates for significant investments in clean energy infrastructure and research to support this transformation.

Industrial Decarbonization: Industries must drastically reduce their carbon footprints. The strategy includes promoting the circular economy, enhancing resource efficiency, and supporting the development of low-carbon technologies. The Commission also highlights the importance of carbon capture, utilization, and storage (CCUS) to mitigate industrial emissions.

Transport and Mobility Improvements: The transport sector, a major source of emissions, requires comprehensive reforms. The Commission proposes measures to promote electric and hydrogen-powered vehicles, enhance public transportation, and develop sustainable urban mobility plans. Infrastructure investments, such as expanding charging networks for electric vehicles, are also critical.

Sustainable Land Use: Agriculture and forestry play a significant role in the EU's climate strategy. The Commission emphasizes sustainable land management practices, promoting carbon sequestration through reforestation, afforestation, and soil management. It also highlights the need for sustainable agricultural practices that reduce emissions and enhance biodiversity.

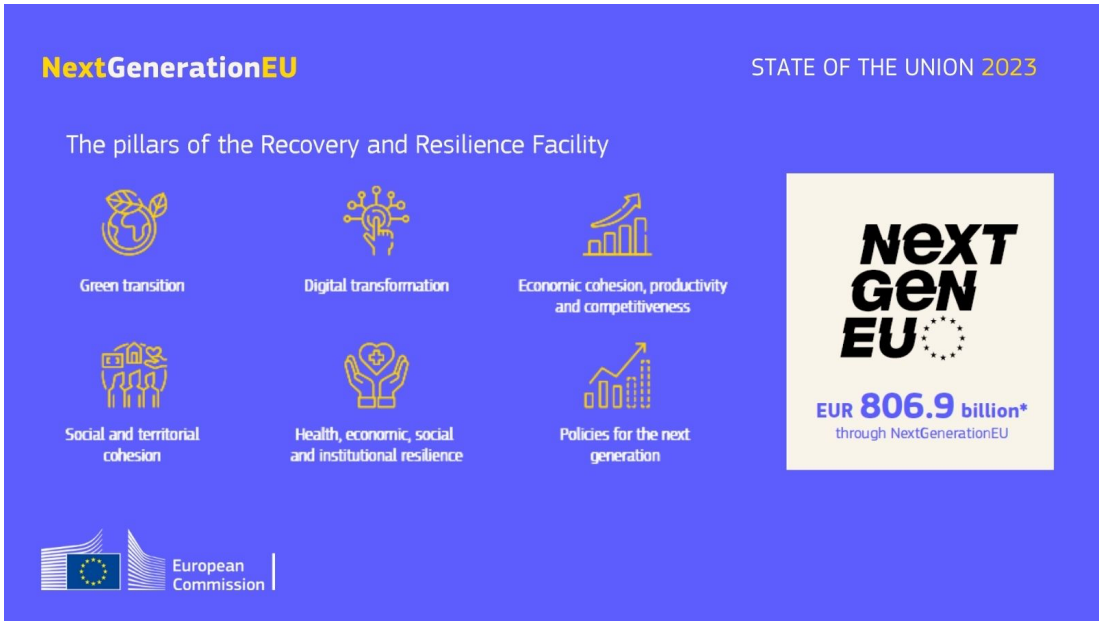


Figure 12: Next Gen EU (from State of the Union 2023)

Significant Investments: Achieving these ambitious targets necessitates substantial financial investments. The Commission calls for leveraging public and private funding, including through the EU's budget and the **NextGenerationEU** recovery plan. Investments in research and innovation are particularly emphasized to develop and deploy new technologies and solutions.

Global Cooperation: Climate change is a global challenge that requires a coordinated international response. The Commission stresses the importance of climate diplomacy and active participation in international forums. Key elements of global cooperation include:

International Climate Diplomacy: The EU aims to strengthen its leadership role in international climate negotiations, advocating for increased ambition and effective implementation of global climate commitments. This includes working closely with other major economies and supporting developing countries in their climate efforts.

Carbon Markets: The Commission supports the development and expansion of carbon markets as a cost-effective mechanism to reduce emissions. It advocates for robust and transparent carbon pricing mechanisms that ensure environmental integrity and drive investments in low-carbon technologies.

Sustainable Trade Practices: The strategy underscores the need for trade policies that support climate objectives. This includes promoting the trade of environmentally friendly goods and services, addressing carbon leakage, and ensuring that trade agreements incorporate strong climate provisions.

Inclusive Transition: A just and inclusive transition is a cornerstone of the Commission's strategy. It recognizes that the shift to a low-carbon economy must support all citizens, particularly those in vulnerable regions and industries. Key aspects include:

1. *Social Equity*: The Commission emphasizes the need to address social impacts and ensure that the benefits of the green transition are shared equitably. This involves measures to support workers in transitioning industries, including retraining and reskilling programs.
2. *Economic Growth and Competitiveness*: The strategy aims to ensure that the transition drives sustainable economic growth and maintains the EU's competitive edge in the global economy. This includes fostering innovation, creating new jobs in green industries, and ensuring that EU businesses can compete in the global market. The European Commission's communication presents a bold and comprehensive roadmap for achieving climate neutrality by 2050.

Through setting ambitious targets, promoting sector-specific transformations, and fostering international cooperation, the EU aims to lead the global fight against climate change. Additionally, the effort is to ensure an inclusive transition that supports economic growth and social equity which are central to this strategy, demonstrating the EU's commitment to a sustainable and prosperous future for all its citizens.

5 Additional climate-related EU legislation

5.1 The European Climate Law

Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')

Over the years, the EU has developed a vast set of legislative acts dealing with the topics of energy and climate change. Until 2021, the EU's overarching objective of a 40% Greenhouse gas (GHG) reduction in 2030 compared with 1990 was only determined by an endorsement of the European Council in 2014. This changed with the EU Climate Law of 2021[24]. The European Climate Law represents a significant advancement in procedural governance. In addition to enshrining the 2030 and 2050 emission targets into law, it establishes a framework for determining the emission trajectory towards 2050 and the necessary accompanying measures. This includes guidance for the Commission to propose a 2040 emission target and an indicative emission budget for the 2030-2050 period. The law mandates the Commission to ensure public participation and engage relevant stakeholders in developing indicative sectoral decarbonization roadmaps.

Furthermore, it establishes the European Scientific Advisory Board on Climate Change[25] to provide advice on EU climate targets and implementation, and it encourages member states to create national scientific advisory bodies. The 2050 climate-neutrality target of the Climate Law also strengthens existing procedural instruments, particularly the Governance Regulation, by providing clearer guidance for planning, review, and follow-up processes.

The 2021 European Climate Law obliges the Commission to 'assess the consistency of any draft measure or legislative proposal with the climate-neutrality objective'[26] and the interim targets for 2030 and 2040.

The European Climate Law will set up a framework to achieve climate neutrality in 2050 thanks to:

- Legally binding target of net zero greenhouse gas emissions by 2050
- New 2030 EU greenhouse gas emission reductions target of 55% compared to levels in 1990
- 2030-2050 EU-wide trajectory for greenhouse gas emission reductions
- Implementation of adaptation strategies to improve resilience to climate change effects
- Tracking progress made by member states and adjusting the measures (based on National energy and climate plans, reports from the European Environment Agency and other tools)
- Reviewing progress made by September 2023, and every 5 years thereafter

[24] EU Climate Law was formally adopted by the EU Council, 28 June 2021, ending the adoption procedure and setting into legislation the objective of a climate-neutral EU by 2050.

[25] https://climate-advisory-board.europa.eu

[26] European Commission, «The European green deal», 2019. COM/2019/640.

- Empowering the Commission to issue recommendations to Member States, whose actions are inconsistent with the climate neutrality target[27].

Following the European Climate Law more than half of the EU member states have adopted national climate laws with many variations in approach. For instance, Greece adopted the National Climate Law in 2022 (Law 4936/2022/17.5.2022) that stipulates, inter alia, a reduction in greenhouse gas emissions by 55% by 2030 and by 80% by 2040, compared to 1990, with the goal of climate neutrality by 2050.

However, Greece's national climate law is not considered the most ambitious within the EU. Other member states have enacted more comprehensive and stringent climate legislation. For instance, Germany's Federal Climate Change Act aims for a 65% reduction in greenhouse gas emissions by 2030 compared to 1990 levels and sets a goal of achieving climate neutrality by 2045—five years earlier than the EU target. Denmark's Climate Act is even more ambitious, targeting a 70% reduction by 2030 and mandating annual evaluations to ensure progress. Sweden's Climate Act establishes a legally binding net-zero emissions goal by 2045 and includes the creation of an independent Climate Policy Council to monitor implementation. These examples highlight that while Greece has made significant strides with its climate law, other EU member states have set higher benchmarks for climate action.

5.2 Revision of the Packaging and Packaging Waste Directive (PPWD)

The revision of the Packaging and Packaging Waste Directive[28] could bring major disruptions in the manufacturing sector outside and inside the EU. The major terms of the Directive are:

Figure 13: the EU's waste Priority order (https://www.consilium.europa.eu/en/policies/packaging/)

- By January 2030, all packaging sold in the EU will have to be recyclable. Packaging recyclability will be expressed in the performance grades A, B or C.
- By January 2038, only packaging within grades A or B will be allowed. The provisions on recyclability will not apply to packaging made from lightweight wood, cork, textiles, rubber, ceramics, porcelain or wax
- By January 2030, minimum recycled content targets for the plastic part in packaging (calculated as an average per manufacturing plant and year) The percentages will increase by January 2040.
- Within three years of the new regulation entering into force, tea and coffee bags, and soft after-use system single-serve units that contain tea or coffee will have to be compatible with the standard for composting.
- Packaging minimisation: by January 2030, manufacturers will have to ensure that packaging is designed so that its weight and volume are reduced to the minimum necessary for its functionality.
- It lays out nine conditions for packaging to be considered reusable – for instance, it can be reused multiple times, it can be emptied or unloaded without causing damage to the packaging or it fulfils the requirements regarding consumer health, safety and hygiene.

[27] https://climate.ec.europa.eu/eu-action/european-climate-law_en

[28]https://www.europarl.europa.eu/news/en/press-room/20240419IPR20589/new-eu-rules-to-reduce-reuse-and-recycle-packaging

- From 3.5 years after the new regulation enters into force, packaging will have to be marked with a label containing information on its material composition, to facilitate consumer sorting.
- Reusable packaging sold from four years after the new regulation enters into force will have to bear a label informing users that it is reusable.
- To eliminate excessive packaging, by January 2030 economic operators filling the packaging in grouped packaging, transport packaging or e-commerce packaging will have to ensure that the empty space ratio is a maximum of 50%.
- Within three years of the new regulation entering into force, the economic operator who fills the sales packaging will have to ensure that empty space is reduced to the minimum necessary for ensuring the packaging's functionality, including product protection.
- Within 24 months of the new regulation entering into force, companies in the HORECA sector that sell, in take-away packaging, cold or hot beverages filled into a container at the point of sale or ready-prepared food intended for immediate consumption will have to provide a system for consumers to bring their own container to be filled. The goods filled in the container brought by the consumer should be sold at no higher cost and in no less favourable conditions.
- Within 36 months of the new regulation entering into force, companies in the HORECA sector that sell, in take-away packaging, cold or hot beverages or ready-prepared food intended for immediate consumption, will have to provide consumers with the option of packaging within a system for reuse.

To achieve these targets, Member States will have to take measures to ensure that deposit return systems are set up for these packaging formats, and to ensure that a deposit must be charged at the point of sale. This obligation does not apply to packaging for wine, spirits, and milk and milk products.

Member States may exempt economic operators from charging a deposit if a product is consumed within the premises in the HORECA sector, provided that the deposit-bearing packaging is opened, the product is consumed, and the empty deposit-bearing packaging is returned within the premises.

The EU Member States may be exempted from the obligation to set up deposit return systems if:

- the rate of separate collection for the packaging formats concerned is above 80 % by weight in the calendar year 2026,
- by 12 months before 1 January 2029 at the latest, the Member State notifies the Commission of its request for exemption and submits an implementation plan with a strategy and concrete actions, including a timeline, that will ensure achievement of the 90 % separate collection rate for the relevant packaging format.

5.3 Recast Gas and Hydrogen Regulation and Directive

The main goal of the Recast EU Regulation on Gas and Hydrogen Markets Directive[29] is to transform the legislative framework for EU gas markets by incorporating renewable gases and hydrogen as key components, boost the production and storage of hydrogen and renewable gases, facilitate their integration into existing or new gas networks, support the European Green Deal, fulfil the EU's climate ambitions, and eventually lead to the thorough decarbonization of the entire energy sector.

This regulation also aims to decarbonize the gas market, promote the use of renewable and low-carbon gases, enhance energy security by reducing dependency on Russian fossil fuels, and facilitate the transition to a climate-neutral economy by promoting the production and integration of hydrogen into the energy system.

[29] https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)729302

5.4 Ecodesign for Sustainable Products Regulation (ESPR)

Regulation (EU) 2024/1781[30] of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC

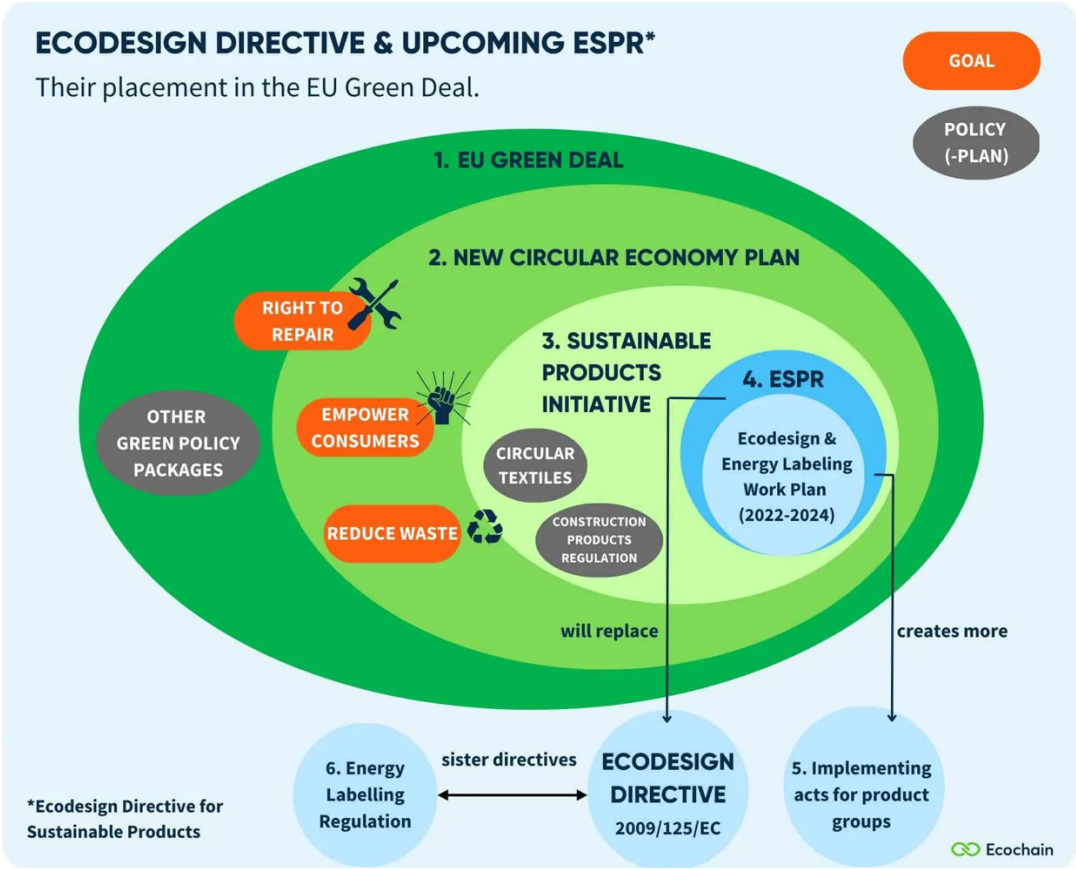


Figure 14: Green Deal policy framework around ESPR (green) and the ESPR's relationship to the Ecodesign directive (blue). @Ecochain: https://ecochain.com/blog/espr-2024-overview/

The Ecodesign for Sustainable Products Regulation[31] (ESPR), set to take effect on 18 July 2024, forms the cornerstone of the European Commission's strategy for fostering more environmentally sustainable and circular products. The ESPR is part of a suite of measures critical to realizing the 2020 Circular Economy Action Plan's goals. These measures will aid the EU in achieving its environmental and climate targets, doubling the circularity rate of material use, and meeting energy efficiency goals by 2030.

Products and their usage significantly impact the environment, making consumption within the EU a major driver of climate change and pollution. The ESPR is part of a suite of measures critical to realizing the 2020 Circular Economy Action Plan's goals. These measures will aid the EU in achieving its environmental and climate targets, doubling the circularity rate of material use, and meeting energy efficiency goals by 2030.

[30] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781&qid=1719580391746

[31] https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/ecodesign-sustainable-products-regulation_en

It sets the conditions for the performance and information of a product known widely as the 'ecodesign requirements' – for almost all categories of goods to:

- Improve product durability, reusability, upgradability and reparability
- Make products more energy and resource-efficient
- Address the presence of substances that inhibit circularity
- Increase recycled content
- Make products easier to remanufacture and recycle
- Set rules on carbon and environmental footprints
- Improve the availability of information on product sustainability
- Depending on the product use, the ecodesign regulation defines that products will have on or more of the following characteristics:
- Use less energy
- Last longer
- Can be easily repaired – see also the Right to Repair regulation.
- Parts can be easily disassembled and put to further use
- Contains fewer substances of concern
- Can be easily recycled
- Contains more recycled content
- Has a lower carbon and environmental footprint over its lifecycle

This directive is coupled with the EU Ecolabel regulation32 (please see Regulation (EC) No 66/2010 on the EU Ecolabel[33]) and the Green Public Procurement (GPP) criteria.

[32] European Commission (2010). Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel.

[33] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32010R0066&from=EN#d1e303-1-1

5.5 Amendment of the Alternative Fuels Infrastructure Regulation

To boost the deployment of the infrastructure necessary for alternative fuels the Amendment of the Alternative Fuels Infrastructure Regulation[34] aims to:

- Revise the Directive on Deployment of Alternative Fuels Infrastructure: The document highlights the revision of the 2014 Alternative Fuels Infrastructure Directive, which aimed to improve coordination for the development of alternative fuel infrastructure in the EU.
- Meet the targets of the Fit for 55 Package by setting mandatory national targets for the deployment of alternative fuels infrastructure for various types of vehicles and vessels.
- These mandatory national targets for the deployment of alternative fuels infrastructure, include electric charging infrastructure for light-duty road vehicles, hydrogen refuelling stations, and electricity supply for vessels and stationary aircraft.

This is still under discussion and the European Parliament's position is advocating for specific targets, such as having at least one electric charging pool for cars every 60 km along the TEN-T road network by 2026 and hydrogen refuelling stations along main EU roads every 100 km by 2028. These targets aim to facilitate the development of alternative fuels infrastructure across the EU.

5.6 Revised Industrial Emissions Directive

Regulation (EU) 2024/1244[35] of the European Parliament and of the Council of 24 April 2024 on reporting of environmental data from industrial installations, establishing an Industrial Emissions Portal and repealing Regulation (EC) No 166/2006

The revised Industrial Emissions Directive (IED) aims to further reduce industrial pollution, aligned with the goals of the European Green Deal to achieve climate neutrality by 2050.

The main features and changes compared to the previous directive are:

Before the revision

1. **Scope**: The original IED primarily regulated large industrial installations such as power plants, chemical production facilities, and waste management sites.
2. **Emission Limits**: Set limits on emissions of key pollutants, including sulfur dioxide (SO_2), nitrogen oxides (NOx), and particulate matter (PM), based on Best Available Techniques (BATs).
3. **BAT Reference Documents (BREFs)**: Provided guidelines on the best available techniques for various industries, updated periodically.
4. **Permitting and Compliance**: Required installations to obtain permits and comply with emission limit values (ELVs) and other conditions specified in those permits.
5. **Monitoring and Reporting**: Mandated regular monitoring and reporting of emissions to ensure compliance with permit conditions.
6. Public Access to Information: Ensured public access to information on industrial emissions and environmental performance of installations.

New Features and Changes:

1. Extended Scope: The revised IED includes additional sectors such as large-scale livestock farming, mining, and more food production industries, broadening the range of regulated activities.
2. Stricter Emission Limits: New, more stringent ELVs for pollutants like SO_2, NOx, and PM, reflecting the latest scientific and technological advancements.

[34] https://eur-lex.europa.eu/EN/legal-content/summary/deployment-of-alternative-fuels-infrastructure.html
[35] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202401244

3. Updated BATs: Emphasis on adopting the latest and most effective pollution control technologies, with BREFs updated more frequently to incorporate new innovations.
4. Pollution Prevention: Greater focus on preventing pollution at the source, including measures for cleaner production techniques and improved resource efficiency.
5. Enhanced Monitoring and Reporting: Improved and more frequent monitoring requirements, with increased transparency and public access to emissions data.
6. Streamlined Permitting Process: A more efficient permitting process that includes periodic reviews to ensure permits reflect the latest scientific knowledge and technological advancements.
7. Public Participation: Enhanced mechanisms for public involvement in the decision-making process, ensuring communities can voice concerns and contribute to environmental protection efforts.
8. Support for Innovation: Measures to encourage research and development in new pollution control technologies, facilitating a smoother transition to greener industrial practices.

Overall, the revised IED aims to tighten regulations, broaden the scope of industries covered, and enhance transparency and public engagement in efforts to mitigate industrial pollution and protect the environment.

It is important to note that all the data will be publicly available on an EU operated website and that will make all this information to the public meaning it will be much easier to take legal measures against governments.

5.7 The Corporate Sustainability Due Diligence Directive (CSDD)

Directive (EU) 2024/1760[36] of the European Parliament and of the Council of 13 June 2024 on corporate sustainability due diligence and amending Directive (EU) 2019/1937 and Regulation (EU) 2023/2859

- The Corporate Sustainability Due Diligence Directive forms a landmark piece of legislation from the European Union aimed at promoting sustainable and responsible business practices. Officially proposed in February 2022, this directive mandates that companies identify, prevent, mitigate, and account for human rights abuses and environmental harm throughout their supply chains. It is expected to affect 5500 companies based within the EU and around 1000 non-EU companies.

Key Requirements

- Due Diligence Obligations: Companies must conduct due diligence on their operations and supply chains to identify and address potential human rights and environmental impacts.
- Risk Management: Firms are required to establish and implement risk management processes to prevent or mitigate adverse impacts.
- Reporting and Accountability: Companies need to publicly report on their due diligence efforts and results. This includes annual disclosures of identified risks and measures taken.
- Corporate Governance: Integration of sustainability risks into corporate governance structures, ensuring that directors consider these factors in decision-making processes.
- Stakeholder Engagement: Engaging with stakeholders, including affected communities and civil society organizations, is a critical component of the directive.

The directive applies to:

- Large EU companies with over 500 employees and a net turnover exceeding €150 million.
- Non-EU companies operating in the EU with a net turnover of more than €150 million.
- Smaller EU companies in high-risk sectors, with over 250 employees and a net turnover exceeding €40 million.

The CSDD directive will have significant implications for businesses:

- Increased Compliance Costs: Companies will need to invest in robust due diligence processes and reporting mechanisms.
- Supply Chain Scrutiny: Businesses must closely monitor their supply chains, potentially leading to shifts in supplier relationships and sourcing strategies.
- Legal and Financial Risks: Non-compliance can result in legal penalties and reputational damage, incentivizing firms to adhere to the directive's requirements.
- Competitive Advantage: Firms that excel in sustainability may gain a competitive edge, appealing to consumers and investors prioritizing ethical practices.

In essence, the Corporate Sustainability Due Diligence Directive is poised to drive significant changes in corporate behavior, fostering greater accountability and sustainability across the business landscape in the EU.

[36] https://eur-lex.europa.eu/eli/dir/2024/1760

5.8 The Corporate Sustainability Reporting Directive (CSRD)

Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting.

The Corporate Sustainability Reporting Directive (CSRD) aims to enhance and standardize sustainability reporting across businesses within the European Union. Adopted on April 21, 2021, the CSRD updates and expands the existing Non-Financial Reporting Directive (NFRD) to address the increasing demand for transparent, comparable, and reliable sustainability information from companies.

Key Aspects of the CSRD:

- *Scope Expansion*: The CSRD extends its reach to a broader range of companies, including all large companies and all companies listed on regulated markets, except listed micro-enterprises. This expands the number of businesses required to report on sustainability, ensuring more comprehensive coverage.
- *Reporting Standards*: Companies are required to report according to European Sustainability Reporting Standards (ESRS) developed by the European Financial Reporting Advisory Group (EFRAG). These standards aim to ensure consistency, comparability, and reliability in the reported information.
- *Detailed Reporting Requirements*: The CSRD mandates more detailed disclosures on a range of environmental, social, and governance (ESG) factors. Companies must provide information on how their operations impact the environment and society, as well as how sustainability issues affect their business performance and strategy.
- *Digitalization of Reports*: The directive requires companies to digitally tag their reported information, facilitating accessibility and comparability through the European Single Access Point (ESAP).
- Assurance and Verification: Companies' sustainability reports must be audited by an independent assurance services provider. This adds a layer of credibility and reliability to the reported data.

Impact on Businesses:

The CSRD will significantly affect businesses by increasing the administrative burden and compliance costs associated with enhanced reporting requirements. Companies will need to invest in robust data collection and management systems to gather the required sustainability information. Enhanced transparency may also drive companies to adopt more sustainable practices to meet stakeholder expectations and regulatory requirements. Moreover, the standardized reporting will improve comparability, helping investors and other stakeholders make more informed decisions. Businesses that proactively adapt to these requirements can benefit from increased investor confidence and a stronger reputation for sustainability.

The CSRD imposes additional responsibilities on companies, but it also provides an opportunity to demonstrate commitment to sustainability and potentially gain a competitive edge in a market increasingly focused on ESG factors and criteria through the regulatory landscape.

The EU Member States were meant to include CSRD in their national legislation by July 2024 so that companies that fall into the categories stipulated in the Directive can start reporting. At the time of writing this document, some member states have failed to do so by the aforementioned deadline.

5.9 EU Nature Restoration Law

The much-awaited EU Nature Restoration Law[37] discussed at length in Brussels with many months of deliberations, political machinations[38] and finally adopted by the European Council in June 2024 in a landmark process that has been applauded by many nature conservation entities[39] and other stakeholders, forms a first continent-wide, comprehensive law of this kind. It is also an integral part of the EU Green Deal and the EU Biodiversity Strategy and the end result of the communication of the Commission in 20 May 2020 titled: 'EU Biodiversity Strategy for 2023: Bringing nature back into our lives" that set out the "EU Biodiversity Strategy for 2030".

Figure 15: EU Nature Restoration Law (22 June 2022

It is the legislative measure par excellence that focuses on addressing and reversing the critical biodiversity loss and degradation, and thus restoring natural ecosystems across Europe. What is important to note is that the law sets legally binding targets to restore 20% of the EU's land and sea areas by 2030, with an ultimate goal of addressing all ecosystems in need of restoration and make Europe the first climate-neutral continent by 2050. This law sets ambitious targets for the restoration of terrestrial, freshwater, coastal, and marine ecosystems, aligning with international biodiversity and environmental commitments, the first of its kind at a global level.

The Law outlines various specific and measurable targets aimed at reversing the damage done to Europe's natural environments, including:

- **Terrestrial and marine ecosystems:** restoration of degraded habitats – at least 20% of the EU's land and sea areas must be restored by 2030; this target rises progressively, aiming for the restoration of all ecosystems in need by 2050.
- **Pollinator populations**: reversal of decline – the decline in pollinator populations must be halted by 2030, with subsequent increases monitored every six years.
- **Forests and trees:** biodiversity improvements – measures must be implemented to improve several indicators of forest ecosystem health; 3 billion trees to be planted within the EU by 2030.
- **Urban ecosystems (green spaces):** no net loss – by 2030, there must be no net loss of urban green spaces compared to 2021, with increases mandated thereafter.
- **Agricultural land:** indicators of biodiversity – a positive trend in biodiversity indicators such as the grassland butterfly index, the share of agricultural land with high-diversity landscape features and the stock of organic carbon in cropland mineral soil must be ensured by 2030.

[37] https://data.consilium.europa.eu/doc/document/PE-74-2023-INIT/en/pdf
[38] https://www.irishexaminer.com/farming/arid-41423626.html
[39] https://www.nature.org/en-us/newsroom/europe-nature-restoration-law/

- **Wetlands:** restoration and rewetting – at least 30% of drained peatlands used for agriculture must be restored by 2030, with one-quarter rewetted; these targets increase to 40% and 50% by 2040 and 2050, respectively, though rewetting remains voluntary for farmers.
- **Rivers**: connectivity and restoration – at least 25,000 km of rivers must be restored to a free-flowing state by removing barriers and obstructions to their connectivity.

The Law underscores the significant economic and social benefits of restoring nature:

- **Economic benefits:** the European Commission estimates that every euro invested in nature restoration can generate between €4 and €38– or €8 and €38 according to other sources – in economic benefits, stemming from ecosystem services such as pollination, water purification, flood control, and carbon sequestration.
- **Job creation and economic growth:** the World Economic Forum highlights that nature-positive policies could generate up to $10 trillion in new annual business value and create 395 million jobs globally by 2030.
- **Food security and climate resilience:** restoring natural ecosystems supports food security and enhances climate resilience by stabilizing ecosystems and mitigating climate-related risks.

Additionally, the new Law poses some significant considerations for businesses, especially those in agriculture, forestry, urban development, and industries dependent on natural resources. Key impacts and implications to be taken into consideration include:

- **Compliance and reporting**: businesses will need to align with new regulatory standards, including reporting on nature-related risks and impacts as per the Corporate Sustainability Reporting Directive (CSRD) that has to be put into force by July 2024 by EU member states and affects businesses active within and outside of the EU.
- **Operational changes:** industries affected, especially in agriculture and forestry, have to meet new biodiversity and restoration targets; this will affect operations and practices with a potential additional cost on production and operations.
- **Opportunities for innovation:** the Law encourages investment in nature-positive initiatives, offering businesses opportunities to innovate in sustainable practices and products.
- **Financial impacts**: compliance may involve significant upfront costs, but at the same time, as noted above, investing in restoration can yield high returns, with every euro invested potentially generating €4-8 to €38 in benefits as has been highlighted by the EU Commission.

Member states will play a key role in implementing the Law's ambitious restoration plans. Each state is required to submit detailed national strategies to the European Commission, outlining how they will meet these targets and monitor progress using standardized biodiversity indicators. Specifically, the following are some key points of its implementation and monitoring:

- **National Restoration Plans:** EU member states are required to develop and implement National Restoration Plans outlining specific measures to achieve the law's targets, much like the National Energy and Climate Plans to be presented in the next section.
- **Periodic Reviews:** progress will be reviewed every six years, with adjustments made as necessary to meet long-term goals.
- **Emergency Brake:** to address potential negative impacts on food security or other critical sectors, an emergency brake mechanism allows for temporary suspension of specific targets under exceptional circumstances that threaten food security.

5.10 The Climate and Energy Program

To fulfill their climate related obligations, the EU Member States had to develop a National Energy and Climate Plan (NECP)[40] that would outline how each country intends to meet its targets for reducing emissions, increasing renewable energy, and improving energy efficiency from 2021 to 2030.

The key obligations of each Member State, among others, include the following:

- Set Targets: Each NECP must include national targets for greenhouse gas reductions, renewable energy integration, and energy efficiency improvements in line with EU-wide goals.
- Policy Measures: Member states must detail the specific policies and measures they will implement to reach these targets. This can include regulatory changes, investments in renewable energy infrastructure, incentives for energy efficiency, and measures to phase out fossil fuels.
- Progress Monitoring and Reporting: Countries are required to regularly monitor and report their progress towards these targets. This ensures transparency, enables the identification of gaps or delays, and allows for timely adjustments to strategies.
- Stakeholder Involvement: The preparation of NECPs must involve consultation with stakeholders, including local governments, industry representatives, and civil society, to ensure a comprehensive and inclusive approach.

Details about the NECPs can be found on the relevant EU website which also lists the NECP of each EU country that are updated every two years according to the structure, format and key technical data requested and set out in the Implementing Regulation[41].

5.11 The Recovery and Resilience Funding Program

The EU Recovery and Resilience Facility[42] (RRF) is the central component of Next Generation EU, a €750 billion temporary recovery instrument designed to support member states in overcoming the economic and social impacts of the COVID-19 pandemic. The RRF aims to promote a green and digital recovery, strengthen economic and social resilience, and foster sustainable growth.

The main features of the funding program include:

- Funding Allocation: The RRF provides €672.5 billion in grants and loans to member states, with funds distributed based on the severity of the pandemic's impact and economic needs.
- Reform and Investment Plans: To access funds, each member state must develop a National Recovery and Resilience Plan (NRRP), detailing proposed reforms and investments that align with EU priorities, particularly the green and digital transitions.
- Green and Digital Goals: At least 37% of the spending in each plan must support climate objectives, and 20% must promote digital transformation.
- Milestones and Targets: Plans must include clear milestones and targets, ensuring that funds are used effectively, and reforms are implemented on time.

To fulfill their obligations under the RRF, each member state must:

- Develop and Submit an NRRP: Outline how they intend to use the funds to support reforms and investments that align with the EU's objectives.

[40] https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en
[41] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R2299
[42] https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility_en

- Implement Reforms and Investments: Execute the proposed measures, ensuring they contribute to the green and digital transitions.
- Report Progress: Regularly report on the implementation of their plans, meeting the agreed milestones and targets.

At the time that funding was first allocated the EU also defined how much funding will be allocated in each of the predefined sectors and the environment features very high in priorities. The EU bodies follow very closely the implementation of this program with around two inspections per year for each member state.

6 The Framework Directives

Framework Directives are Directives that have influenced most of the EU environment and climate related policies as they are designed to establish a general system or framework for achieving specific goals within member states. They allow member states some flexibility in how those goals are achieved. In the following sections, we will be looking at some of these Directives that address challenges and set the landscape for climate change action and adaptation, including the Water and Air Quality ones.

6.1 The Water Framework Directive (WFD)

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

The Water Framework Directive (WFD) is a pivotal piece of legislation aimed at protecting and improving the quality of water resources across the European Union, especially important as parts of the EU start facing water shortages and an EU campaign to save water is now set in place (please see the #WaterWiseEU campaign, an initiative to contribute towards a water-resilient Europe by 2050). Adopted in 2000, its main provisions can be summarized as follows:

Figure 16: #WaterWiseEU campaign

Integrated River Basin Management: The WFD introduces a holistic approach to water management based on natural geographical and hydrological units, known as river basin districts (RBDs), rather than political or administrative boundaries. Each member state must identify and manage these RBDs, which may span multiple countries.

Environmental Objectives: The directive sets ambitious environmental objectives for all EU waters (rivers, lakes, groundwater, and coastal waters). The primary goal is to achieve "good status" for all waters by a specified deadline, which involves both good ecological and chemical status for surface waters and good quantitative and chemical status for groundwater.

River Basin Management Plans (RBMPs): Each RBD must develop and implement a comprehensive River Basin Management Plan. These plans, updated every six years, detail the current status of water bodies, pressures and impacts, and measures needed to achieve the WFD objectives. Public participation in the preparation of these plans is mandatory to ensure transparency and stakeholder engagement.

Monitoring and Reporting: Member states must establish monitoring programs to assess the status of their water bodies and ensure compliance with the directive's objectives. Regular reporting to the European Commission is required, providing data on the status and trends of water bodies and the effectiveness of implemented measures.

Program of Measures: To achieve the environmental objectives, member states must design and implement a Program of Measures (PoM). These measures can be basic (mandatory) or supplementary (optional) and must address the main pressures affecting water bodies, such as pollution from agriculture, industry, and urban areas.

Economic Analysis: The WFD requires an economic analysis of water use within each RBD. This includes assessing the cost-effectiveness of different measures and ensuring that water pricing policies provide adequate incentives for efficient water use and recovery of costs associated with water services.

Public Participation and Consultation: The directive emphasizes the importance of public participation and stakeholder consultation in water management processes. This ensures that decisions are transparent, inclusive, and consider the views of all relevant parties.

6.2 The Waste Framework Directive

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

The Waste Framework Directive is a fundamental piece of European Union legislation that establishes the framework for waste management across member states. Its main provisions focus on protecting the environment and human health by preventing or reducing the generation of waste, and by promoting waste reduction policies, recycling and reuse.

Waste Hierarchy: The directive establishes a five-step hierarchy for waste management:

1. prevention,
2. preparing for reuse,
3. recycling,
4. other recovery (e.g., energy recovery), and
5. disposal.

This hierarchy prioritizes the most environmentally friendly options, encouraging member states to take measures that move waste management up the hierarchy.

Extended Producer Responsibility (EPR): EPR schemes make producers responsible for the entire lifecycle of their products, particularly for take-back, recycling, and disposal. This incentivizes producers to design products with longer lifespans and easier recyclability.

Prevention Programs: Member states must develop waste prevention programs aimed at reducing the quantity of waste generated and the harmful substances within waste. These programs focus on promoting sustainable production and consumption patterns.

Recycling and Recovery Targets: The directive sets specific recycling and recovery targets for member states. For example, by 2020, member states were required to recycle 50% of household waste and 70% of construction and demolition waste. These targets help drive improvements in waste management performance across the EU.

Waste Management Plans: Each member state is required to prepare waste management plans outlining their strategy for handling all waste within their jurisdiction. These plans must align with the principles of the waste hierarchy and include measures to achieve the set recycling and recovery targets.

Definitions and Classifications: The directive provides clear definitions and classifications for different types of waste and waste management activities. This standardization ensures consistency and clarity across member states, facilitating better regulation and reporting.

End-of-Waste Criteria: The directive establishes criteria under which certain waste ceases to be waste and becomes a secondary raw material. This helps promote recycling and the use of recovered materials, reducing reliance on virgin resources.

Environmental Protection and Public Health: The directive includes provisions aimed at protecting the environment and human health from the adverse effects of waste management. It requires member states to take the necessary measures to ensure waste is managed without endangering human health or harming the environment.

Reporting and Review: Member states must regularly report on the implementation of the directive, including progress towards recycling and recovery targets. The European Commission reviews these reports to ensure compliance and the effectiveness of waste management practices.

6.3 The Air Quality Framework Directive

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

Best known as the Ambient Air Quality Directive, the Air Quality Framework Directive[43] establishes measures aimed at maintaining air quality where it is good and improving it where it is not. The main provisions of the directive are:

Air Quality Standards: The directive sets legally binding limits and target values for several key air pollutants, including sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), lead, benzene, carbon monoxide (CO), and ozone (O_3). These limits are designed to protect human health and the environment.

Assessment of Air Quality: Member states are required to assess air quality through measurements, modelling, and other empirical techniques. The directive stipulates the criteria for the siting of sampling points, the minimum number of sampling points, and the methods to be used for measuring pollutants.

Zones and Agglomerations: For the purposes of air quality assessment and management, member states must divide their territories into zones and agglomerations based on population density and pollution levels. This zoning helps in implementing tailored air quality plans and measures.

Air Quality Plans and Programs: When air quality standards are exceeded in any zone or agglomeration, member states must prepare and implement air quality plans and programs to achieve compliance. These plans should include measures to reduce pollutant emissions from various sources such as traffic, industry, and residential heating.

Public Information: The directive emphasizes the importance of keeping the public informed about air quality. Member states must ensure that up-to-date information on air quality is available to the public, including information on any exceedances of air quality standards and potential health effects.

National Emission Ceilings: While not directly part of this directive, the directive works in conjunction with the National Emission Ceilings Directive, which sets limits on the total emissions of key pollutants that each member state can emit, helping to reduce transboundary pollution.

Measures for Specific Pollutants: The directive includes provisions for specific pollutants, such as $PM_{2.5}$, which are recognized for their severe health impacts. For instance, it sets a target value for $PM_{2.5}$ and requires member states to implement measures to reduce exposure.

Reporting and Review: Member states must regularly report air quality data to the European Commission. This data is used to evaluate compliance with air quality standards and the effectiveness of implemented measures. The Commission, in turn, reviews the implementation of the directive and proposes adjustments if necessary.

Flexibility Mechanisms: The directive allows for certain flexibilities, such as time extensions for meeting air quality standards under specific conditions. This acknowledges the challenges that member states may face in achieving compliance and provides a structured approach to addressing these challenges.

[43] https://environment.ec.europa.eu/topics/air/air-quality_en

7 Climate-Related Strategies

In order to fulfill the goals and objectives set in the EU Green Deal that will continue in the new EU Commission (2024-2029), the European Union has adopted a number of strategies, plans and policies related to climate change that cut across different sectors, including the Farm to Fork Strategy and the Circular Economy Action Plan, that are discussed at length in this section and give a good understanding on how the EU is integrating climate in policies and in their implementation.

7.1 The 'Farm to Fork' Strategy[44]

Figure 17: Farm to Fork strategy (EC)

Current food systems account for significant biodiversity loss in most EU member states, a substantial share of GHG emissions, especially through livestock, considerable consumption of natural resources, increased socio-economic inequalities due to unfair returns, especially for primary producers, and adverse health impacts[45]. Recognizing these adverse effects and in order to address them at a pan-European level, the Farm To Fork Strategy (F2F) was introduced in 2020. This initiative advocates for a just transition to a more sustainable EU food system that benefits all members of the value chain, including consumers and producers, while bringing environmental, health, social and economic benefits for all. The F2F Strategy seeks to contribute to achieve the EU Green Deal targets and the United Nations Sustainable Development Goals, also known as the UN 2030 Agenda.

The F2F Strategy aims to reduce the environmental and climate footprint of food systems, strengthen resilience, ensure food security, and lead a global transition in food systems, while taking advantage of new business opportunities. Key goals and targets are set for this purpose.

Regarding goals, the initiative seeks to:

- Ensure that the food chain, encompassing production, processing, distribution, consumption, and food waste, has a neutral or positive environmental impact.
- Ensure food security, nutrition, and public health by always guaranteeing access to healthy and environmentally friendly food.
- Generate fairer economic returns to farmers and create new businesses opportunities.

Regarding targets, the strategy includes concrete actions[46] such as:

- Reducing the use and risk of pesticides by 50% by 2030.
- Reducing the use of fertilizers by at least 20% by 2030.
- Reducing sales of antimicrobials used for farmed animals and aquaculture by 50%.

[44] European Commission, Farm to Fork Strategy: for a fair, healthy and environmentally-friendly food system: https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en

[45] URBACT Knowledge Hub, Can public procurement be a leverage for local food transition?, 10th of April, 2024: https://urbact.eu/knowledge-hub/food/public-procurement-food-transition

[46] European Commission, Questions and Answers: Farm to Fork Strategy - building a healthy and fully sustainable food system, 2020: https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_885

- Increasing agricultural land under organic farming to 25%, up from the current level of 8%.

Achieving these ambitious goals and targets requires financial and technical support for member states. The initiative presents the **Common Agricultural Policy** and **Common Fisheries Policy** as key tools to advise and financially support farmers and fisheries in the transition towards sustainability. These tools should help producers improve their environmental performance while guaranteeing a decent income for them and their families[47]. Moreover, the Strategy sets tools to support Research and Innovation, and sustainable investments in relevant areas to achieve its goals.

The F2F Strategy hinges upon EU trade policies and international cooperation to boost the global transition towards sustainable food systems, in line with the UN 2030 Agenda, but also with the EU's leadership role in sustainability and climate change policies. To this end, there are EU trade policies and instruments, such as bilateral agreements, that can be used to secure commitments from third parties towards sustainable practices in the food value chain, in line with the objectives of the strategy. Furthermore, international cooperation on food research and innovation in relevant areas for environmentally friendly, fair, and healthy food systems is encouraged by the initiative.

A legislative framework for sustainable food systems was supposed to be put forward at the end of 2023 to support the implementation of the strategy and accelerate the shift to sustainable food systems[48]. However, it has not yet been worked on. At the same time, given the backlash from farmers regarding[49] the F2F Strategy in many EU countries, the EU has been engaging in a strategic dialogue with farmers in order to address their needs and make adjustments to the EU agricultural policies accordingly.

7.2 Circular Economy Action Plan

The Circular Economy Action Plan (CEAP 2020) was adopted in March 2020[50] and is a comprehensive body of legislative and non-legislative actions, which aimed to transition the European economy from a linear to a circular model. It is one of the essential building blocks of the European Green Deal for sustainable growth. The Action Plan mapped out 54 actions, as well as four legislative proposals on waste. These legislative proposals were put forward by the European Commission along with the Action Plan and included targets for landfill, reuse, and recycling, to be met by 2030 and 2035, along with new obligations for separate collection of textile and biowaste. The Action Plan covered several policy areas, material flows, and sectors alongside cross-cutting measures to support this systemic change through innovation and investments. It also announced a sectoral strategy for plastics.

Figure 18:The Circular Economy Model (EP Research Service)

The four core themes of the Circular Economy Action Plan 2020 are:

1. Make sustainable products the norm in the EU;

[47] European Commission, Questions and Answers: Farm to Fork Strategy - building a healthy and fully sustainable food system, 2020: https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_885

[48] European Commission, Farm to Fork Strategy: for a fair, healthy and environmentally-friendly food system: https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en

[49] https://www.euronews.com/my-europe/2024/02/19/over-half-of-von-der-leyens-food-policy-promises-werent-met-analysis-shows

[50] European Commission, «A new Circular Economy Action Plan For a cleaner and more competitive Europe», COM/2020/98.

2. Empower consumers;
3. Focus on the lifetime of products through a sectoral lens;
4. Ensure less waste.

More than EUR 10 billion of public funding was allocated to the transition between 2016 and 2020.

The Plan lays out a forward-looking agenda for achieving a cleaner and more competitive Europe through collaboration with economic actors, consumers, citizens, and civil society organizations. It aims to accelerate the transformative change required by the European Green Deal, building upon circular economy actions implemented since 2015. It ensures that the regulatory framework is streamlined and tailored for a sustainable future, while maximizing new opportunities from the transition and minimizing burdens on individuals and businesses.

Consumer participation plays a big role in creating cost-saving opportunities within the circular economy. The European Commission combines regulatory support with target setting to support consumer empowerment and strongly focuses on consumer needs. Legislative action will emphasize transparency and availability of repair services and set minimum requirements for sustainability labels.

The CEAP 2020 also calls for the system-wide transformation of industrial processes within target sectors to unlock economic value and create important synergies. Creating synergies among these strategies means sharpening the goals and objectives of each framework to achieve climate neutrality and competitiveness, updating green technologies, and targeting circular, bio-based solutions.

7.3 EU Strategy on Adaptation to Climate Change[51]

Climate change and some of its detrimental effects are inevitable, even with the achievement of climate neutrality. Reversing environmental damage will take decades, and its impact on the economy, health, and well-being will persist. Therefore, urgent adaptation to current and future climate impacts is necessary. In 2021, the EU introduced a new Strategy on Adaptation to Climate Change to guide the European Union towards climate resilience. This strategy aims for an EU society that is "*fully adapted to the unavoidable impacts of climate change by 2050*"[52]. It focuses on making adaptation efforts smarter, faster, and more systemic, while also enhancing international action.

Smarter: The strategy seeks to improve knowledge to inform effective actions. There is a need for more information about how quickly and extensively climate change will affect human life and for assessing the effectiveness of adaptation measures. Additional information is also required for conducting risk assessments, and user-friendly platforms for managing information and assessing risk, like Climate-ADAPT[53], should be strengthened. In this regard, relevant digital tools to provide information to stakeholders and facilitate risk assessment have been developed under the EU Mission on Adaption to Climate Change above-mentioned[54].

Systemic. The initiative stated that adaptation actions must be systemic, meaning that policy developments should occur at EU, national, regional, and local levels and all economic sectors and parts of society should actively participate in improving adaptation strategies and plans. Additionally,

[51] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN. (European Commission, 2021)

[52] Q&A: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_664

[53] https://climate-adapt.eea.europa.eu/en

[54] European Union, EU Missions. Adaptation to Climate Change: Activity Report, 2024: https://research-and-innovation.ec.europa.eu/document/download/eb7de6a7-b1b6-4a39-9c41-58db8d41d9e7_en?filename=ml-02-24-571-en-n.pdf

climate resilience must be integrated into macro-fiscal policy, and nature-based adaptation measures must be prioritized over other measures.

Faster. Previous efforts on climate resilience focused on awareness and policy development. In contrast, the new strategy emphasizes accelerating the development and rollout of adaptation solutions

International action. The EU has been a key player in the global fight against climate change. Reflecting its leadership role, the strategy seeks to boost support for international climate resilience and preparedness by increasing international financing and fostering stronger global collaboration and exchanges on adaptation with partner countries. Particularly, it focuses on cooperation with the countries and regions most affected by climate change and in greatest need of assistance.

The present project falls under this Mission and attempts to create tools, toolkits and other material to further promote the Mission and achieve its objectives. The Mission is part of the five EU Missions that address the most pressing challenges of the EU and will be further elaborated on in Section 8 of this Deliverable.

NEUROCLIMA project could sign the mission's charter as another way to reaffirm our commitment to Climate Change Adaptation.

7.4 Sustainable and Smart Mobility Strategy

The Sustainable and Smart Mobility Strategy was introduced in 2020 as part of the EU Green Deal and it focuses on decreasing transport emissions by 90% by 2050 given that transport is responsible for approximately a quarter of greenhouse gas emissions, thus making the shift to smart and sustainable mobility urgent.

The Sustainable and Smart Mobility Strategy focuses on three main objectives:

> *"(1) making all transport modes more sustainable,*
>
> *(2) making sustainable alternatives widely available in a multimodal transport system, and*
>
> *(3) putting in place the right incentives to drive the transition"55.*

In order to achieve these aforementioned goals, the strategy sets targets for sustainability, smart transport, and connectivity to be met by 2030 and 2050[56].

To achieve **sustainable mobility**, and in line with the EU Green Deal and other initiatives described in other parts of this deliverable, the strategy aims to reduce dependence on fossil fuels and incentivize the adoption of zero-emission technologies. Additionally, it advocates for more sustainable transportation alternatives and improving the efficiency of transportation systems through **multimodality**. Integration of ports, airports, and train stations is crucial to leverage the benefits of each transport mode. On the demand side, the strategy emphasizes the need for incentives that encourage sustainable choices, such as carbon pricing and the elimination of subsidies for fossil fuels.

Digitalization and **automation** are key enablers for sustainable and smart mobility. Through these enablers, the strategy aims to create a seamless, efficient, and safer transportation experience for consumers across different modes of transport. One specific action is the goal of making all modes of

[55] Sustainable and Smart Mobility Strategy – putting European transport on track for the future, 2020.

[56] R. Kwasniok & A. Bolmer The Sustainable and Smart Mobility Strategy of the European Commission – A critical assessment, 2021: https://www.changing-transport.org/wp-content/uploads/EU-Mobility-Strategy.pdf

transport paperless. The strategy also leverages AI and data to build innovative transportation systems.

Finally, **reinforcing the EU single market** is essential for resilience and connectivity. Transport must ensure affordable, safe, and accessible mobility in all cities for all passengers. The Strategy's target is building a multimodal Trans-European Transport Network with high-speed connectivity in different stages. Additionally, the strategy aims to reduce the death toll for all modes of transport to near zero by 2050.

The planned measures to achieve these targets include:

1. **Promoting zero-emission vehicles**: Introduce stricter CO2 emission standards for cars and trucks, aiming for a phase-out of internal combustion engine vehicles by 2035. This includes expanding the infrastructure for charging electric vehicles (1 million public charging points by 2025).
2. **Alternative fuels and electrification**: Promote the use of renewable fuels (such as hydrogen and sustainable biofuels), and increase electrification in road, rail, and maritime transport. For aviation, the **ReFuelEU Aviation** initiative will increase the use of Sustainable Aviation Fuels (SAF).
3. **Shift to sustainable transport modes**: Encourage the use of railways and inland waterways for freight and passenger transport. The policy emphasizes revitalizing rail networks and cross-border connections, supported by initiatives like the **Trans-European Transport Network (TEN-T)**.
4. **Digitalization and automation**: Invest in smart mobility systems, such as autonomous vehicles, connected transport infrastructure, and the EU-wide roll-out of 5G networks. These technologies aim to improve traffic flow, reduce congestion, and lower emissions.
5. **Urban mobility**: Develop Sustainable Urban Mobility Plans (SUMPs) in cities, promoting walking, cycling, and public transport, while reducing reliance on private vehicles. Measures also include creating low-emission zones in cities.
6. **Investments in infrastructure**: Upgrade and maintain the EU's transport infrastructure to be more resilient, sustainable, and interoperable, with significant investments directed towards cleaner technologies and renewable energy sources.
7. **Social inclusion and affordability**: Ensure mobility options remain affordable and accessible for all Europeans, particularly for vulnerable and rural populations, to reduce inequalities in transport access.

7.5 EU Biodiversity Strategy

Set as the EU response to the global post-2020 biodiversity framework[57], the EU's Biodiversity Strategy for 2030 is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems, especially after the COVID-19 pandemic, and forms an integral part of the European Green Deal.

The Biodiversity Strategy aims to build resilience as regards threats and challenges including:

- the impacts of climate change
- forest fires
- food insecurity
- disease outbreaks - including by protecting wildlife and fighting illegal wildlife trade.

[57] https://www.unep.org/resources/kunming-montreal-global-biodiversity-framework

7.6 The EU Forestry Strategy

The New EU Forest Strategy for 2030[58] was adopted in 2021 as a flagship initiative of the European Green Deal, in line with the climate-related policies analyzed in this section, and it has to be noted that all policies described go hand in hand and contribute to each other in a meaningful and impactful manner. The objective of the New EU Forest Strategy for 2030 is to "set a vision and concrete actions to improve the quantity and quality of EU forests and strengthen their protection, restoration and resilience".

The Strategy focuses on forest demands in the context of changing environmental conditions due to climate change and meeting socio-economic needs arising from climate change and is a set of policy objectives and commitments (Lier et al., 2022), being a fundamental part of the European Green Deal and contributing to the EU's **2030 Biodiversity Strategy** and **Climate Action Goals**. The policy aims to promote sustainable forest management, protect biodiversity, and enhance the role of forests in **carbon sequestration** to help achieve climate neutrality by 2050.

Forests are crucial for the EU's environmental and economic goals, as they cover about 40% of the EU's land area and provide key ecosystem services.

Main objectives of the strategy include the following:

1. **Protect and restore forests**: Preserve Forest ecosystems, halt deforestation, and restore degraded forests to improve biodiversity and ecosystem health.
2. **Enhance carbon sinks**: Strengthen forests' role in absorbing and storing carbon to meet the EU's climate neutrality target by 2050.
3. **Promote Sustainable Forest Management (SFM)**: Ensure forests are managed sustainably to balance ecological, social, and economic functions, benefiting both the environment and rural economies.
4. **Boost biodiversity**: Ensure forest management practices foster biodiversity, contributing to the EU's goal to protect 30% of its land and marine areas by 2030.
5. **Support rural communities**: Promote forestry as a source of sustainable jobs and growth, particularly in rural areas, while encouraging bioeconomy practices like using wood-based products as renewable resources.
6. **Monitoring and data collection**: Strengthen forest monitoring systems and improve data on the state of EU forests to enhance transparency, decision-making, and forest governance.

In alignment with the EU Green Deal, planned measures to achieve the objectives include the following:

1. **EU Forest Strategy for 2030**: The strategy sets the framework for sustainable and climate-resilient forest management. It proposes new regulations and measures to align forest management practices with the EU's climate and biodiversity goals.
2. **Afforestation and reforestation**: Encourage afforestation (planting new forests) and reforestation (restoring degraded areas) to enhance carbon sinks and biodiversity. These initiatives will be supported by EU funding, including the Common Agricultural Policy (CAP) and the LIFE programme.

[58] European Commission. New EU Forest Strategy for 2030. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2021) 572 Final; European Commission: Brussels, Belgium, 2021

3. **Forest protection and restoration**: Implement stricter rules to prevent deforestation and forest degradation, including a legally binding **EU Nature Restoration Law**. It sets targets for restoring degraded forest ecosystems, aiming to make at least 10% of the EU's forests strictly protected areas by 2030.
4. **Sustainable forest management (SFM) standards**: Develop and promote SFM standards to ensure that logging, land use, and forest product extraction are done in a way that preserves the ecological integrity of forests. The EU will set legally binding sustainability criteria and increase the use of forest certification schemes.
5. **Climate adaptation**: Enhance forests' resilience to climate change by promoting adaptive practices like selecting climate-resilient tree species and improving water management in forests.
6. **Forest monitoring and governance**: Strengthen forest data collection and monitoring through the **EU Forest Information System for Europe (FISE)**. This system will provide better data on forest conditions, deforestation rates, and biodiversity health, helping policymakers make informed decisions.
7. **EU Deforestation Regulation**: Implement measures to ensure that products sold in the EU do not contribute to global deforestation. This includes stricter rules for importers of commodities like palm oil, soy, and timber to ensure they are sourced from sustainably managed forests.
8. **Financial support and incentives**: Provide financial support for forest restoration, afforestation, and sustainable management practices through EU funding mechanisms, including the **Common Agricultural Policy (CAP)**, the **European Regional Development Fund (ERDF)**, and the **Just Transition Fund**.

The EU Forestry Policy integrates environmental, economic, and social objectives to ensure that forests remain a vital resource for climate mitigation, biodiversity conservation, and rural development. It supports the broader vision of achieving a sustainable and climate-neutral Europe by 2050.

7.7 RePowerEU

The REPowerEU plan is the European Union's strategy to reduce its dependency on Russian fossil fuels and accelerate the transition to clean energy, in response to the energy crisis triggered by the war in Ukraine. It aims to ensure energy security, reduce carbon emissions, and strengthen the EU's energy resilience.

Key features include:

1. **Diversifying energy supplies**: Expanding imports of Liquefied Natural Gas (LNG) and developing partnerships with reliable energy exporters like the U.S., Norway, and African countries.
2. **Boosting renewable energy**: Increasing the share of renewable energy in the EU's energy mix, with a target of 45% by 2030, up from the previous target of 40%. This involves expanding wind, solar, hydrogen, and biomethane capacities.
3. **Enhancing energy efficiency**: Raising the EU's energy efficiency target from 9% to 13% by 2030, focusing on reducing energy consumption in homes, industries, and public buildings.
4. **Accelerating clean technology deployment**: Promoting investments in technologies like heat pumps, batteries, and green hydrogen to decarbonize sectors like transport and industry.
5. **Speeding up permitting processes**: Simplifying and speeding up approval processes for renewable energy projects to accelerate their deployment.
6. **Energy savings**: Encouraging voluntary energy savings and potentially mandatory reductions in gas demand by 15%, especially during emergencies.
7. **Investment and funding**: Mobilizing an additional €300 billion in investments, using funds from the Recovery and Resilience Facility and other sources.

The overall target of REPowerEU is to fully eliminate the EU's reliance on Russian fossil fuels well before 2030, while also cutting emissions and boosting renewable energy production to meet climate goals.

7.8 The European Climate Pact

The European Climate Pact has been launched by the European Commission as part of the European Green Deal, and forms a movement of people, communities and entities united by a shared mission to build a more sustainable, fair Europe and help the EU to become climate-neutral by 2050. It was launched in December 2020, it encourages collective action to help the EU achieve its climate neutrality target by 2050 and meet interim goals, such as reducing greenhouse gas emissions by at least 55% by 2030. It also focuses on civic engagement through the Climate Pact Ambassadors initiative and on climate action at the citizen level, thus promoting climate change awareness and public participation in a wide range of activities and impact that can only benefit the EU. It is essentially a bottom-up approach to climate change that complements the EU wide policies and goals related to climate, thus creating a nexus between public policy regulations and civic and individual action.

The main objectives of the European Climate Pact:

1. **Raise awareness**: Increase understanding of climate change, its impacts, and the solutions available at the individual, community, and national levels.
2. **Foster engagement and participation**: Empower citizens and organizations to take action in their daily lives and to collaborate on projects that contribute to the EU’s climate goals.
3. **Promote climate-friendly behavior**: Encourage lifestyle changes, such as reducing energy consumption, minimizing waste, and promoting sustainable mobility, to reduce individual and collective carbon footprints.

4. **Build climate networks**: Create opportunities for cooperation and knowledge exchange among citizens, communities, businesses, and public authorities across Europe, fostering partnerships and shared solutions.
5. **Support local initiatives**: Help communities and local governments develop and scale up climate actions, supporting local innovation and sustainability projects.

Planned measures to achieve these objectives include the following:

1. **Climate Ambassadors and Pledge Program**: The Pact promotes a network of **Climate Ambassadors** who raise awareness and mobilize action in their local communities. It also encourages individuals, businesses, and organizations to make **climate pledges**—commitments to adopt greener practices, such as switching to renewable energy or reducing waste, which are tracked and promoted by the Pact.
2. **Support for local climate actions**: The EU Climate Pact provides technical and financial support for local climate initiatives, such as renewable energy projects, energy efficiency improvements, sustainable mobility solutions, and urban greening efforts. It encourages cities, regions, and businesses to apply for **EU funding programs** to scale up their efforts.
3. **Information and knowledge sharing**: The Pact creates online platforms and tools for citizens and organizations to share ideas, best practices, and lessons learned in climate action. The goal is to foster a collaborative community where solutions and innovative approaches to climate challenges are shared widely.
4. **Citizen dialogues and participation**: The Pact supports **citizen dialogues**, workshops, and consultations to engage the public in discussions on climate policy and actions. This aims to ensure that people from all walks of life are involved in shaping climate decisions and contribute their perspectives.
5. **Education and outreach**: Through partnerships with schools, universities, and educational institutions, the EU Climate Pact promotes climate education, raising awareness among young people about the importance of climate action and sustainability. It also seeks to involve youth in climate solutions through events, campaigns, and educational materials.
6. **Promoting climate innovation**: The Pact encourages the development and dissemination of green technologies and sustainable solutions by connecting innovators, entrepreneurs, and community leaders with resources and networks. This includes supporting initiatives that enhance the circular economy, promote renewable energy, or develop nature-based solutions to climate challenges.
7. **Carbon footprint calculators and resources**: The Pact provides practical tools, such as **carbon footprint calculators**, to help individuals and organizations measure their environmental impact and take steps to reduce it. These tools are accompanied by guides and best practices on how to reduce emissions.
8. **Partnerships with businesses and organizations**: The EU Climate Pact promotes partnerships with businesses, civil society organizations, and public authorities to support collaborative climate projects. It encourages private companies to integrate sustainability into their operations and supply chains while offering platforms for collaboration.

8 The Current Five EU Missions

Horizon Europe is a strategic funding program for research and innovation focused on fighting climate change, promoting sustainability, and boosting the EU's competitiveness and growth. With a budget of 95.5 billion euros, this program seeks to support and implement EU policies while tackling global challenges[59]. Within the Horizon Europe program, five EU Missions have been set out to address some of the greatest societal challenges. Each Mission consists of concrete actions and measurable goals to be achieved by a fixed date as described in the next chapters.

8.1 Adaptation to Climate Change[60]

Aligned with the EU's Adaptation Strategy, this Mission on Adaptation to Climate Change aims to help regions understand and address current and predicted climate change risks. It seeks to assist regions in developing pathways to confront these challenges and in testing and deploying new technologies that meet regional and local needs[61]. By 2030, the Mission aims to support at least 150 European regions and communities in becoming climate resilient and to scale up actionable solutions through 75 large-scale demonstrations across Europe.

8.2 Beating Cancer

The **EU Beating Cancer Plan** was launched in 2021 and is a comprehensive strategy designed to address the entire cancer care pathway—from prevention to treatment and survivorship—across the European Union.

This mission aims to "*improve the lives of more than 3 million people by 2030 through prevention, cures, and support for those affected by cancer*"[62]. It focuses on understanding cancer and its risk factors, enhancing prevention and early detection, optimizing diagnosis and treatment, and ensuring a quality life for patients and their families. The plan is structured around four key action areas,

[59] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

[60] European Union, EU Missions. Adaptation to Climate Change: Activity Report, 2024: https://research-and-innovation.ec.europa.eu/document/download/eb7de6a7-b1b6-4a39-9c41-58db8d41d9e7_en?filename=ml-02-24-571-en-n.pdf

[61] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en

[62] European Union, EU Missions Cancer. Concrete solutions for our greatest challenges, 2022: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/eu-mission-cancer_en

supported by €4 billion in funding, and is central to the EU's vision of building a strong **European Health Union**.

Main objectives of the plan are:

1. **Prevention**: Reduce the risk of cancer by addressing its main causes, such as tobacco use, unhealthy diets, alcohol consumption, lack of physical activity, and environmental hazards, given that approximately 40% of cancer cases are preventable.
2. **Early detection**: Improve access to and the effectiveness of cancer screening programs to ensure timely diagnosis, which increases the likelihood of successful treatment and recovery.
3. **Diagnosis and treatment**: Ensure equal access to high-quality care, innovative treatments, and personalized medicine across the EU, while strengthening research and innovation.
4. **Quality of life for patients and survivors**: Provide better support for cancer patients, survivors, and their families by enhancing rehabilitation, reintegration into society, palliative care, and mental health services.
5. **Addressing cancer inequalities**: Based on the axiom that affordable, preventive and curative healthcare of good quality is a right for everyone the Mission is addressing these disparities and establishes a registry to identify trends, disparities and inequalities between Member States and regions to inform targeted investment and interventions at EU, national and regional level.

Some planned measures include the following:

1. Prevention:

- **Tobacco control**: Strengthen tobacco control policies with the goal of creating a "tobacco-free generation" where tobacco use is below 5% by 2040. This includes further restrictions on advertising, packaging, and the sale of tobacco products, as well as new tobacco taxation.
- **Vaccination programs**: Promote and expand vaccination against cancer-causing infections such as **human papillomavirus (HPV)** and **hepatitis B**. The plan sets a target to vaccinate 90% of the EU population eligible for HPV vaccination by 2030 to prevent cervical and other cancers.
- **Healthy lifestyles**: Support public health campaigns promoting physical activity, healthy diets, and responsible alcohol consumption. The **Europe's Code Against Cancer** will serve as a reference guide for citizens to adopt healthier lifestyles.
- **Environmental and occupational risk reduction**: Reduce exposure to environmental and occupational carcinogens through stricter air, water, and soil quality standards, and better protection against hazardous substances in workplaces.

2. Early Detection:

- **Expanding cancer screening**: Ensure that 90% of eligible citizens have access to screening for **breast**, **cervical**, and **colorectal cancer** by 2025. Additionally, the plan aims to extend organized screening programs to other cancer types, including **lung** and **prostate cancer**, by leveraging advances in medical technologies.
- **European Cancer Imaging Initiative**: Use advanced digital tools, such as Artificial Intelligence (AI) and data analytics, to improve the accuracy and accessibility of cancer diagnostics across Europe. This initiative aims to foster the exchange of high-quality imaging data between healthcare providers.

3. Diagnosis and Treatment:

- **Comprehensive Cancer Care Networks**: Establish **Comprehensive Cancer Infrastructures** in all member states to ensure patients have access to the highest standards of care and cutting-edge

treatments. These networks will integrate research, clinical care, and training to improve outcomes.

- **Equal access to innovative treatments**: Promote the use of personalized medicine, where treatments are tailored to the specific needs of patients based on genetic and molecular profiling. The **Cancer Diagnostic and Treatment for All initiative** will work to extend innovative treatments to patients in all regions.
- **European Reference Networks (ERNs)**: Strengthen collaboration among cancer centers across the EU, particularly for rare cancers and complex conditions, by improving knowledge sharing and access to specialized care.
- **Cancer Research and Innovation**: Increase investment in cancer research through the **Horizon Europe** program, focusing on areas such as cancer biology, personalized treatments, immunotherapy, and minimally invasive technologies. This includes the creation of a **European Cancer Research Hub** to foster cross-border collaboration.

4. Quality of Life for Cancer Patients and Survivors:

- **Survivorship programs**: Develop EU-wide guidelines on survivorship, focusing on follow-up care, rehabilitation, and monitoring of long-term side effects. This includes preventing secondary cancers, providing psychological support, and helping survivors return to work and daily life.
- **Palliative and end-of-life care**: Improve access to palliative care, ensuring that patients have the best possible quality of life, regardless of their stage of illness. This also includes better pain management and mental health services.
- **Focus on children and young people**: Launch a **Helping Children with Cancer Initiative** to ensure that children and adolescents receive the best possible care, with a focus on long-term follow-up and supporting young cancer survivors.

5. Addressing Cancer Inequalities:

- **Cancer Inequalities Registry**: Establish a **Cancer Inequalities Registry** to track disparities in cancer outcomes between and within EU member states. This tool will help policymakers identify where improvements are needed and direct resources to regions or populations with poorer outcomes.
- **Support for vulnerable groups**: Special focus is given to reducing inequalities by ensuring that all citizens—regardless of socio-economic status, gender, or geographic location—have equal access to cancer care, prevention programs, and information.

Cross-Cutting Actions:

- **EU Cancer Knowledge Centre**: Create an **EU Cancer Knowledge Centre** to centralize and coordinate cancer-related information, best practices, and research findings, making them accessible to healthcare professionals and policymakers.
- **Data sharing and digital health tools**: Establish a secure **EU Health Data Space** to facilitate the exchange of health data, including cancer-related information, across member states. This aims to improve research and ensure that patients benefit from the latest treatments and care protocols.

8.3 Restoring our Ocean and Waters by 2030[63]

The Mission Restore our Ocean and Waters by 2030 aims to protect and restore the health of oceans and freshwater, river and lake bodies, contributing to the transition towards a sustainable blue economy. It strives to balance the protection and restoration of blue ecosystems with the increasing pressures on aquatic resources[64]. Three objectives have been set to achieve by 2030:

1. **Protect and restore marine and freshwater ecosystems and biodiversity**, in line with the EU Biodiversity Strategy 2030, which advocates for protecting nature and restoring degraded ecosystems.
2. **Prevent and eliminate pollution of our oceans, seas, and waters**, aligning with the EU Action Plan Towards Zero Pollution for Air, Water, and Soil. The latter aims to reduce pollution to levels no longer considered harmful to health or ecosystems, for instance, by reducing plastic litter and microplastics in blue ecosystems.
3. **Make the sustainable blue economy carbon-neutral and circular**, aligning with the European Climate Law and the Sustainable Blue Economy Strategy.

To achieve these objectives, two key projects are underway along with many other Horizon Europe funded projects. The first project involves developing a digital system aimed at sharing knowledge about oceans with the public, called Digital Twin of the Ocean. The second project focuses on establishing hubs, referred to as "lighthouses," to foster regional engagement and cooperation. These lighthouses are helpful in facilitating testing and deploying mission initiatives. There are four lighthouses already operational in major river or sea basins.

8.4 100 Climate-Neutral and Smart Cities by 2030[65]

EU cities play a significant role in energy consumption and CO2 emissions. The EU Climate-Neutral and Smart Cities initiative is designed to accelerate the transition of cities toward climate neutrality by 2050. Launched under the EU Mission for 100 Climate-Neutral and Smart Cities by 2030, this initiative focuses on fostering innovation, sustainability, and digitalization in urban environments.

The ultimate goal is to create cities that are not only climate-neutral but also smart and resilient, setting an example for the rest of Europe and the world.

Currently, 10 out of 112 cities have signed Climate City Contracts. These contracts specified comprehensive plans for achieving climate neutrality across various sectors like energy, buildings, waste management, and transport, along with related investment plans. Once approved by the European Commission, they facilitate access to EU, national, and regional funding.

The main objectives include:

1. **Achieving climate neutrality by 2030**: Help at least 100 cities become climate-neutral by reducing greenhouse gas emissions to net-zero well ahead of the 2050 EU-wide goal.
2. **Accelerating the green and digital transition**: Promote the integration of digital technologies to improve energy efficiency, mobility, and overall quality of life while reducing carbon emissions.

[63] https://missionoceanwaters.eu/#/

[64] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions EU Missions Two Years On: Assessment of Progress and Way Forward, 2023: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0457

[65] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/climate-neutral-and-smart-cities_en

3. **Involving citizens and stakeholders**: Foster citizen engagement, participatory governance, and stakeholder collaboration to ensure that climate-neutral policies and solutions reflect local needs and have broad public support.
4. **Creating scalable models**: Develop innovative and scalable solutions in cities that can be replicated across Europe to support climate-neutral transitions in other regions.

The planned measures are:

1. **Selection of 100 climate-neutral cities**: The initiative selected 100 EU cities across member states (with additional cities from countries associated with Horizon Europe) that will receive support to become climate-neutral by 2030. These cities will act as "innovation hubs," demonstrating how to integrate climate action into urban planning.
2. **Climate City Contracts**: Each selected city will sign a **Climate City Contract**, a non-binding agreement between the city, the European Commission, and national governments. This contract outlines the city's climate-neutrality goals, planned actions, and monitoring methods. It also includes commitments from local authorities to involve citizens, businesses, and research organizations in the process.
3. **Funding and technical assistance**: The initiative provides access to EU funding through programs such as **Horizon Europe**, the **European Regional Development Fund (ERDF)**, and the **Just Transition Mechanism**. In addition to financial support, cities will receive technical assistance, expertise, and guidance to develop climate action plans, implement green infrastructure, and integrate smart technologies.
4. **Sustainable urban mobility**: Cities will develop strategies to reduce emissions from transportation by promoting sustainable mobility options such as electric vehicles (EVs), public transportation, cycling, and walking. This includes expanding EV charging infrastructure, creating low-emission zones, and introducing digital solutions for traffic management.
5. **Energy efficiency and renewable energy**: Cities will prioritize energy efficiency measures in buildings and urban infrastructure, including retrofitting older buildings and constructing new energy-efficient ones. Cities will also invest in local renewable energy generation, such as solar and wind power, and aim to decarbonize heating and cooling systems.
6. **Smart city technologies**: The initiative promotes the deployment of digital and smart technologies to optimize urban services like energy use, waste management, and public transportation. This includes the use of sensors, data analytics, and artificial intelligence (AI) to improve urban sustainability, enhance citizens' quality of life, and reduce carbon footprints.
7. **Citizen engagement and participatory governance**: Cities are encouraged to actively involve residents in the design and implementation of climate and smart city measures. This includes public consultations, participatory budgeting, and citizen assemblies to ensure that local communities play a key role in shaping their climate-neutral future.
8. **Public-private partnerships and innovation**: The initiative supports collaboration between local governments, private companies, academic institutions, and civil society to drive innovation. Cities will foster public-private partnerships to develop and implement climate-neutral and smart technologies, such as sustainable urban mobility solutions, energy-efficient building systems, and circular economy practices.
9. **Monitoring and evaluation**: Each city will establish systems to monitor and report on progress toward climate neutrality. This involves tracking reductions in greenhouse gas emissions, improvements in energy efficiency, and the deployment of smart technologies. The initiative also encourages sharing best practices and learning among cities.

10. **International cooperation**: The initiative encourages cities to collaborate with counterparts outside the EU, particularly in developing countries, to share knowledge and solutions on climate action and smart city development. This fosters global cooperation in addressing climate challenges.

8.5 A Soil Deal for Europe[66]

The main goal of the Mission Soil Deal for Europe is to establish 100 living labs and lighthouses by 2030 to lead the transition to healthy soils. Living labs serve as experimental sites in regions or cities, while lighthouses, such as farms or parks, showcase good practices. The Mission objectives focus on reducing desertification, preventing erosion, lowering the EU's global footprint on soils, among others.

Citizen's engagement has been strongly promoted to reach the desired goals of the missions. Consequently, the 5 EU Mission set bottom-up solutions and local experimentation to achieve the goals[67].

Soils play a crucial role in absorbing carbon, filtering water, and providing nutrients for agriculture, but they are increasingly threatened by degradation, pollution, and unsustainable land use. The Soil Deal aims to reverse this trend and achieve sustainable soil management by 2030.

Main Objectives of the Soil Deal are:

1. **Restore soil health by 2030**: The primary goal is to ensure that at least 75% of European soils are healthy by 2030, supporting agriculture, biodiversity, and climate resilience.
2. **Combat soil degradation**: Address soil erosion, pollution, compaction, loss of organic matter, and desertification by promoting sustainable land use practices.
3. **Enhance carbon storage in soils**: Increase the capacity of soils to sequester carbon to help mitigate climate change and support the EU's climate neutrality target by 2050.
4. **Protect biodiversity and ecosystem services**: Promote soil biodiversity and ensure that soils continue to provide critical ecosystem services such as nutrient cycling, water retention, and habitat provision.
5. **Support sustainable farming and land use**: Align soil health goals with sustainable agriculture and forestry, ensuring that land management practices contribute to soil restoration while maintaining productivity.
6. **Raise awareness and engage stakeholders**: Increase public understanding of the importance of soil health and involve farmers, landowners, scientists, policymakers, and citizens in soil protection and restoration efforts.

Planned Measures to achieve these objectives are:

1. 100 Living Labs and Lighthouses: The Soil Deal will establish 100 Living Labs and Lighthouses across Europe. These are experimental and demonstration sites where innovative practices for soil restoration and management are tested and shared. Living Labs are spaces for co-creation and experimentation, while Lighthouses serve as examples of best practices in soil health management.
2. EU Soil Health Law: The EU plans to introduce a Soil Health Law to set common standards and regulations for protecting and restoring soil across member states. This legislation will establish

[66] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/soil-deal-europe_en

[67] European Commission, EU missions – Concrete solutions for our greatest challenges, Publications Office of the European Union, 202: https://data.europa.eu/doi/10.2777/500470

clear guidelines on sustainable soil management, protection against soil sealing (covering land with impervious materials), and targets for reducing soil pollution and degradation.

3. Monitoring and data collection: The initiative includes the development of a comprehensive Soil Monitoring System to improve data collection on soil health across the EU. This system will track key indicators such as organic carbon content, erosion rates, and contamination levels, helping policymakers and land managers assess progress and adapt strategies.
4. Financial support for soil restoration: The Soil Deal will mobilize funding through various EU programs, including the Common Agricultural Policy (CAP), the Horizon Europe research program, and the European Regional Development Fund (ERDF), to support soil restoration projects. Farmers and landowners will receive financial incentives to adopt sustainable soil management practices, such as crop rotation, agroforestry, and organic farming.
5. Sustainable land management practices: The initiative promotes regenerative agricultural practices that improve soil structure and fertility while minimizing environmental impacts. This includes measures like reducing the use of chemical fertilizers and pesticides, promoting organic farming, and integrating agroecological methods such as cover cropping, no-till farming, and permaculture.
6. Soil carbon farming: One of the measures is to develop carbon farming initiatives that reward farmers for practices that increase soil carbon sequestration, such as afforestation, reforestation, and restoring peatlands and wetlands. This approach aims to enhance the role of soils as carbon sinks, contributing to the EU's climate goals.
7. Soil pollution reduction: The Soil Deal seeks to significantly reduce soil contamination from industrial activities, mining, and agricultural chemicals. The EU will strengthen regulations on soil contaminants such as heavy metals, pesticides, and microplastics, aiming for cleaner and safer soils.
8. Research and innovation: The mission includes substantial investment in research to develop new technologies and approaches for soil restoration and sustainable land management. The research will focus on topics like soil biodiversity, microbiology, and innovative farming techniques that promote soil health.
9. Public awareness and education: The Soil Deal aims to raise awareness about the importance of soil health through education campaigns and by engaging citizens in soil monitoring efforts, such as community science projects. It seeks to foster a culture of soil stewardship among the public.
10. International cooperation: The Soil Deal promotes cooperation with international partners to address global soil degradation challenges. The EU will engage in global efforts, such as the United Nations' Sustainable Development Goals (SDGs), to support soil health worldwide and combat desertification, particularly in vulnerable regions.

9 Stakeholder Engagement Background and Approach

This section of the Deliverable provides an overview of the impact assessment methodology to be used in the work packages and tasks of the NEUROCLIMA project, starting from a review of development of stakeholder analysis over time, to providing specific stakeholder analysis for the project, based on the workshops held by TRUENIQUE during the first seven months of the project with the participation of all consortium partners. It also provides guidance on future impact assessment studies to be used as a basis for developing tools, toolkits and education material. This part will also inform tasks and work packages in terms of user cases and material to be produced for different audiences, sectors and countries.

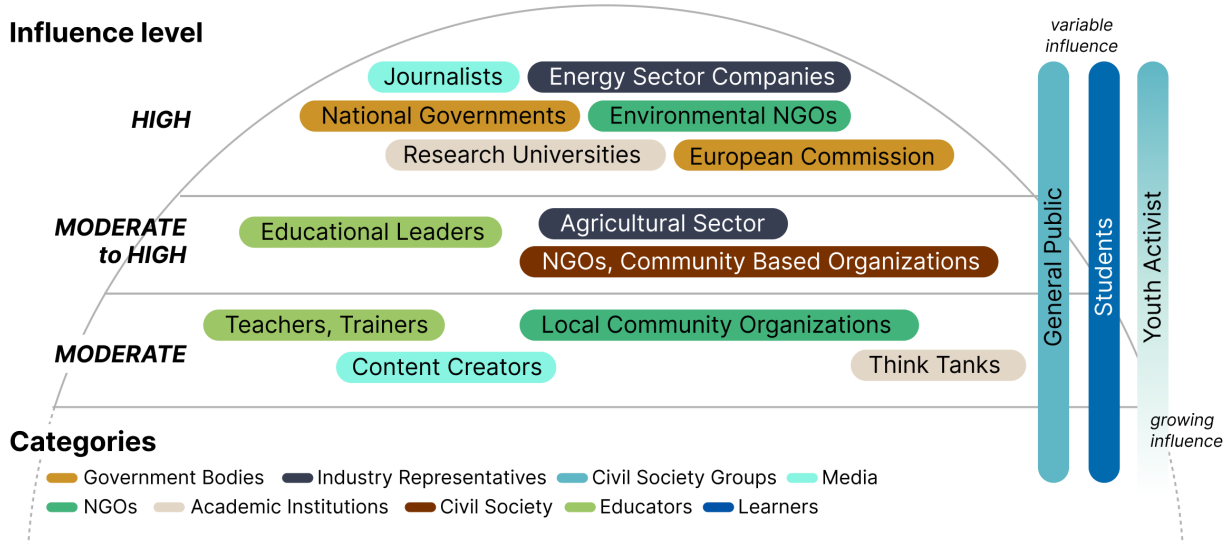


Figure 19: A stakeholders map showing their influence level

9.1 Why Stakeholder Analysis for Climate Change?

Stakeholder analysis is critical during the development and implementation phases of any project or policy to ensure that all relevant parties are considered, and their input is incorporated. This process is particularly important in climate change adaptation and urban renewal projects. According to (Dixit, 2013) embedding stakeholder participation within democratic frameworks and legal requirements enhances the legitimacy and acceptance of climate adaptation initiatives. They highlight the necessity of using various participatory tools at different stages of decision-making, such as disseminating information, gathering input, and facilitating collaborative decision-making.

(Burton & Mustelin, 2013)emphasize that public participation can significantly impact the success of climate change adaptation policies. They found that while many policies promote public participation, the actual implementation often treats the public as passive recipients of information rather than active participants. Effective stakeholder engagement requires concrete strategies and mechanisms to ensure meaningful public involvement.

9.2 Benefits and Challenges

The benefits of stakeholder analysis include enhanced problem understanding, increased transparency, and improved decision legitimacy. According to Ferretti (Ferretti, 2016), integrating stakeholder analysis with cognitive mapping and multicriteria evaluation enhances the transparency and consensus-building process. However, challenges include managing diverse views, preventing manipulation, and dealing with the intellectual demands of eliciting value functions.

Sprengel and Busch (Sprengel & Busch, 2011) support the view that stakeholder pressures influence corporate strategies to reduce greenhouse gas (GHG) emissions. Their study identifies four corporate response strategies: passive, compliance with legislation, responsiveness to stakeholders, and total environmental quality. They find that a company's GHG intensity significantly affects its response strategy, suggesting that enhancing corporate GHG transparency can enable primary stakeholders to exert additional pressure on firms.

In conclusion, effective stakeholder analysis is essential for developing robust and inclusive policies, particularly in climate change adaptation. The integration of stakeholder knowledge and perspectives can significantly enhance policy legitimacy and effectiveness, though it requires careful planning and management to address the inherent challenges.

Below you can see a template for stakeholder mapping and influence analysis that can be used in climate change mitigation and adaptation impact assessments.

Table 3: Stakeholder Mapping and Influence Analysis Template

Category	Stakeholder	Influence Level	Role and Impact on Climate Policy	Engagement Strategy
Government Bodies	European Commission	High	Regulatory power, policy-making authority.	Regular consultations, feedback mechanisms.
	National Governments	High	Local implementation of policies, varying influence based on political context.	Tailored engagement based on national priorities, joint initiatives.
NGOs	Environmental NGOs	High	Advocacy, public awareness, pressure on governments and corporations.	Collaboration on public awareness campaigns, joint advocacy efforts.
	Local Community Organizations	Moderate	Grassroots engagement, local policy acceptance.	Community meetings, localized initiatives.
	Energy Sector Companies	High	Economic power, impact on emissions, potential resistance to regulations.	Partnerships for green technology innovations, dialogue on regulations.

Industry Representatives	Agricultural Sector	Moderate to High	Impact on sustainable practices and adaptation measures.	Collaborations on sustainable practices, educational workshops.
Academic Institutions	Research Universities	High	Research and expertise, development of innovative solutions.	Joint research projects, data sharing, academic conferences.
	Think Tanks	Moderate	Policy recommendations, bridging science and policy.	Policy briefings, collaborative research.
Civil Society Groups	General Public	Varies	Public opinion, electoral pressure, democratic legitimacy.	Public consultations, information campaigns.
	Youth Activists	Growing Influence	Driving the climate agenda, influencing public discourse.	Youth forums, social media engagement.
Media Organizations	Journalists	High	Shaping public opinion, disseminating information.	Media briefings, training sessions on climate issues.
	Content Creators (e.g., game designers)	Moderate	Engaging the public through interactive and educational content.	Collaborations on educational projects, creative partnerships.
Educators	Teachers, Trainers	Moderate	Educating the next generation, influencing young minds.	Professional development programs, resource sharing.
	Educational Leaders	Moderate to High	Shaping educational policies and curricula.	Policy dialogues, collaborative curriculum development.
Learners	Students	Varies	Stake in democratic governance, potential for active participation.	Interactive learning experiences, participatory workshops.
Civil Society	NGOs, Community-Based Organizations	Moderate to High	Managing and empowering communities, representing diverse voices.	Community engagement projects, feedback loops.

Stakeholders play a crucial role in the development and implementation of climate policies. Their involvement ensures that diverse perspectives and expertise are considered, leading to more comprehensive and effective solutions. Engaging stakeholders such as government agencies, non-governmental organizations, academic institutions, and industry representatives is essential for achieving the project's goals. These stakeholders provide valuable insights, resources, and support, facilitating the adoption and success of climate initiatives. Collaboration among these groups fosters a sense of shared responsibility and commitment, ultimately driving the project towards its objectives.

10 Social Tipping Points

The concept of Social Tipping Points and Leverage points is extensively covered in D2.1 "Ethnographic research review and Innovation landscape analysis on social tipping and leverage points". It is presented here in brief for better comprehension and completeness.

Social tipping points refer to moments or thresholds where small changes in societal behavior, norms, or actions lead to rapid and often irreversible shifts in the larger social or environmental landscape. These tipping points are crucial in addressing major global challenges, such as climate change, inequality, and public health, because they can accelerate progress toward sustainable and positive change once a critical mass of people or institutions adopt new behaviors or policies.

Social Tipping Points are important to follow as:

1. *Accelerating Change:* Social tipping moments accelerate behaviour changes that would take decades. After a tipping point, social norms shift quickly, spurring broad adoption of new ideas or technologies.
2. *Catalyzing Systemic Transformation*: Societies can move from destructive practices to sustainable or equitable systems by reaching these points. This is crucial in environmental conservation, since gradual change may not be enough to prevent global warming.
3. *Non-linear Effects*: Slow, incremental change can accelerate exponentially at a tipping point. This quick transformation can change policy, market, and public opinion, causing systemic changes.

Examples of Social Tipping Points:

1. *Climate Change Action*: The global divestment movement, where institutions and investors pull out of fossil fuel investments, is approaching a tipping point. As more major financial actors divest, others may follow, creating a cascade effect that accelerates the transition to renewable energy.
2. *Public Health – Smoking Bans*: Many countries banned public smoking throughout the 1990s and early 2000s. Smoking in public areas became socially unacceptable once a critical mass of regions banned it, improving worldwide health.
3. *Renewable Energy Adoption*: Solar and wind energy adoption may reach a tipping point. As these technologies become cheaper and more accessible, they could replace fossil fuels and reduce greenhouse gas emissions worldwide.
4. *Plastic Bans*: Bans on single-use plastics are developing in several nations. As more governments pass laws, public awareness rises, which could lead to a tipping point where plastic alternatives become the norm, substantially lowering plastic pollution.

Social tipping points are pivotal because they can lead to rapid and widespread shifts, offering hope for solving global challenges more efficiently.

10.1 Climate change induced socio-economic tipping points

Review and stakeholder consultation for policy relevant research

Regarding the climate change-induced socio-economic tipping points that inform this Deliverable and the impact assessment methodology along with Deliverable D1.2 (please see for more information), this section draws on key findings from the paper, REF: Environmental Research Letters - Kees C H van Ginkel et al 2020 Environ. Res. Lett. 15 023001

The paper explores the potential existence and characteristics of climate change-induced socio-economic tipping points (SETPs) to inform climate policy, focusing on how abrupt changes in socio-economic systems may be triggered by climate change, define and characterize those SETPs, identify examples of policy-relevant SETPs in Europe, and provide recommendations for further research on their impacts and mechanisms.

Key findings are:

1. Definition of SETPs: SETPs are described as climate change-induced abrupt transitions of socio-economic systems into fundamentally different states, beyond critical thresholds perceived by stakeholders.
2. Examples of SETPs: Through stakeholder consultations, 22 candidate SETP examples were identified. Three examples are explored in depth:
    a. Collapse of winter sports tourism in the Alps due to reduced snow.
    b. Farmland abandonment in southern Europe driven by droughts and decreased agricultural profitability.
    c. Sea-level rise-induced migration or forced coastal retreat.
3. Key Insights:
    a. SETPs are more clearly observable on small system scales (e.g., individual industries or regions).
    b. The interplay between climate drivers and socio-economic factors makes it difficult to isolate climate as the sole cause.
    c. The rate of climate change, rather than its magnitude, often leads to tipping points.
    d. On larger scales, SETPs are less obvious due to economic substitution effects and policy responses.
4. Policy Implications: Some adaptation measures may themselves be so transformative that their implementation represents a tipping point, highlighting the importance of stakeholder engagement in identifying and managing potential SETPs.

These results are useful as they inform our impact assessment methodology to be used in the project and they provide insights for other deliverables of NEUROCLIMA.

10.2 Findings on tipping points from the COACCH project

The COACCH project (Co-designing the Assessment of Climate CHange costs) has provided useful insights towards informing our understanding of climate change assessments. The objective of the COACCH project is to produce an improved, downscale assessment of the risks and costs of climate change in Europe. The project involves stakeholders from research, business, investment, and policy-making communities in the co-design, co-production, and co-dissemination of its research to ensure practical utility for its end users.

Potential Economic Impacts and Steps

The project investigates various socio-economic tipping points (SETPs), where gradual climate change may lead to sudden, significant changes in socio-economic systems, resulting in large economic costs. Potential economic steps and impacts studied include:

1. Agriculture and Food Shocks: Climate-induced agricultural yield shocks could lead to rural abandonment in vulnerable regions, particularly in Southern and Eastern Europe. This could cause shifts in land use, trade patterns, and lead to macroeconomic impacts such as a slight rise in food prices.
2. Migration: Climate extremes, such as drought, may act as stress multipliers, potentially leading to an increase in migration from Africa to Europe, especially under higher warming scenarios.
3. Energy and Transport Disruptions: The project also studies the potential for energy supply shocks due to wildfires and transportation network disruptions caused by river floods, which could lead to significant economic losses in terms of Gross Value Added (GVA)
4. Flood Insurance: Rising flood risks from climate change could make insurance unaffordable in several European regions, leading to declines in insurance uptake and exposing populations to greater financial vulnerability.

Key Findings and Suggestions

- Socio-Economic Tipping Points: These tipping points could arise from sudden disruptions in systems like food production, migration, energy, and transport. The findings indicate that while large-scale SETPs are less certain, smaller regional tipping points are likely and could have significant economic impacts, especially in Southern Europe.
- Migration Impacts: Climate change may significantly increase migration flows, with estimates reaching up to 2 million migrants per year from Africa to Europe under higher warming scenarios by the end of the century. Adaptive policies and frameworks to address this issue are recommended.
- Macroeconomic Impacts: Climate-induced shocks could lead to regional GDP losses exceeding 5% by the 2050s in high-warming scenarios, which calls for improved economic flexibility and adaptation strategies to mitigate such risks.
- Adaptation: For mitigating risks from sea-level rise and extreme weather events, the COACCH project stresses the importance of proactive adaptation policies, such as enhancing flood protection systems and improving the resilience of energy and transport infrastructures.

Overall, the project highlights the urgency of addressing both climate and socio-economic tipping points to reduce long-term costs and avert major disruptions in European socio-economic systems. These climate and socio-economic tipping points are to be addressed and leveraged through the creation of the NEUROCLIMA tools and methodologies during the duration of the project.

10.3 Input from the Analytical Framework on Social tipping processes for sustainability

The paper "Social tipping processes for sustainability: An analytical framework" (Winkelmann et al., 2020) has also informed our analysis on the need for sustainability and the social tipping processes to accelerate understanding and action on sustainability.

Social tipping processes are defined as small changes that, due to positive feedback mechanisms, can shift a social system into a new, qualitatively different state. The paper focuses on understanding these dynamics, particularly in the context of sustainability transitions, and compares them to already established climate and ecological tipping points.

The main findings include the identification of key differences between social and climate tipping processes, such as the role of human agency, the complexity of social network structures, and the different spatial and temporal scales at which these processes occur.

One notable example of a social tipping process is the *Fridays For Future*[68] movement, which has played a significant role in pushing the European political system toward more aggressive climate policies.

The suggestions provided by the study emphasize the need to harness social tipping processes to accelerate the shift towards sustainability. This includes recognizing opportunities for intervention in social systems and utilizing movements and public opinion shifts to promote transformative policies. The framework can be applied more broadly to other areas of social change, beyond climate policy, and further research is encouraged to expand on the timescales, network effects, and feedback mechanisms that drive social tipping dynamics.

10.4 Findings on the importance of tipping points for sustainable development

Another paper (Bretschger & Leuthard, 2024) aims to explore the dynamics of social tipping processes in relation to sustainability transitions. Specifically, the focus is on understanding how small changes in social systems can lead to significant, self-amplifying transformations toward sustainability, especially in the context of climate action and ecological sustainability.

The objectives of the paper are to:

- Identify and characterize social tipping processes that can drive rapid social transformations.
- Differentiate social tipping processes from climate and ecological tipping points, with particular attention to human agency and social networks.
- Provide a framework for assessing how these tipping processes can facilitate swift transitions towards sustainability, drawing on examples like the FridaysForFuture movement.

In this context, its main findings, informing our research, are:

1. *Human Agency*: One of the key distinguishing features of social tipping processes is the role of human agency, where individuals and groups can consciously influence change, unlike non-human systems. This involves deliberate actions, foresight, and strategic decision-making.
2. *Social Networks*: The structure and quality of social networks play a critical role in amplifying social tipping processes, allowing for rapid information exchange and behavioral changes across communities.

[68] https://fridaysforfuture.org/

3. *Complexity and Non-linearity*: Social tipping processes exhibit greater complexity and non-linearity compared to ecological and climate systems, making them more unpredictable but also more susceptible to sudden shifts once a critical mass is reached.

The following suggestions by the paper were also considered important for our research:

1. Policymakers should focus on **facilitating tipping points** in social norms and behaviors by leveraging existing social networks and movements that promote sustainability (e.g., FridaysForFuture).
2. **Governance strategies** should incorporate the understanding of these non-linear dynamics, allowing for **anticipation and imagination** of future sustainable pathways.
3. Encouraging more **participatory approaches** in governance and social movements is crucial to drive the collective momentum needed to achieve tipping points toward sustainability.

11 Policy Impact Assessment

11.1 Impact Assessment on Climate Policies in the EU: What Lies Ahead

The European Union has long been a leader of global climate action at a global level with ambitious targets to reduce greenhouse gas emissions, increase renewable energy use, and enhance climate resilience through the EU Green Deal initiative and other policies related to climate action and sustainability as has been elaborated on in the first part of this Deliverable in detail. However, the implementation of climate-related policies across such a diverse and economically varied region with various actors and stakeholders presents both significant challenges and opportunities for policymakers, governments, citizens, the industry and other stakeholders. Based on a review of academic articles, policy reports, and EU-specific studies, and through interaction with the project's partners and stakeholders, we have noted some concerns and some recommendations as regards climate-related policies in the European Union that are presented in brief below.

Diverse Economic and Social Contexts in Different EU Regions

One of the central concerns that has been highlighted both interactions with the NEUROCLIMA stakeholders and in the literature is the economic and social diversity among EU member states, that affects the green transition that must be a Just Transition as well as the EU climate-related policies implementation. Countries with lower climate ambitions and climate priorities face greater difficulties in implementing climate policies. Certainly, costly climate policies implementation is based on economic disparities among EU member states, that is often highlighted in our interactions with stakeholders. These differences can impact the adoption and the success of climate action initiatives and policies, creating thus a two-tiered Europe (a phenomenon we see very often in other sectors as well including innovation) in terms of sustainability and climate change mitigation and adaptation policy implementation and practices.

Political Resistance

Political resistance is another significant challenge, particularly in countries with low climate change mitigation and adaptation priorities and where short-term economic interests are prioritized over long-term sustainability. For instance, Szymon Kardaś at ECFR discusses how Poland, an EU member state with strong ties to fossil fuels[69], often resists EU climate policies that threaten their energy security with a detrimental effect on losing out on EU funding. This resistance can lead to delays in policy implementation in individual countries and thus weaken the overall effectiveness of EU climate action and the objectives set. An instance of such political resistance can be seen in the EU member states that have yet to integrate the CSRD Directive in their national legislation despite the July 2024 deadline. On the other hand, others (Oberthür & Dupont, 2021) highlight the EU's use of financial incentives and conditional funding to align national interests with EU climate goals. These mechanisms have been successful in securing broader support for climate policies, particularly when combined with targeted communication strategies that emphasize the long-term economic benefits of a green transition.

Energy Transition: The Just Transition and Innovation

The transition to renewable energy forms a cornerstone of the EU's climate strategy with many countries shifting to RES and exploring emerging RES forms, such as wave energy. It must be noted,

[69] https://ecfr.eu/publication/energising-eastern-europe-how-the-eu-can-enhance-energy-sovereignty-through-cooperation-with-ukraine-and-moldova/

however, that this shift can pose challenges related to energy security, especially in countries heavily dependent on coal. The EU's Just Transition Mechanism that has been elaborated on in the first section of this deliverable is recognized as essential to the success of EU climate policies, making climate action equitable, ensuring that the costs and benefits of the transition to a low-carbon economy are fairly distributed and thus leading to a just and sustainable Europe. This is particularly important in regions dependent on fossil fuel industries, where job losses could exacerbate social inequalities, such as in Poland and Greece, and as highlighted in a 2020 report of CEPS titled "*The time for rapid redevelopment of coal regions is now*"(Egenhofer et al., 2020). Added to this, is technological innovation goes hand in hand with addressing and meeting the EU's climate targets, however gaps in infrastructure and technology deployment remain a challenge in many EU countries. The importance of systemic innovation, which is more than essential, not only involves the development of new technologies in these fields, but also the transformation of existing systems and practices.

Global Competition and Trade: The CBAM Case

The EU's ambitious climate policies could place European industries at a competitive disadvantage globally, particularly in sectors exposed to international competition, and as articulated by the industry. (Branger & Quirion, 2014)analyze the risk of carbon leakage, where industries relocate to countries with less stringent climate regulations, thereby undermining global emissions reductions. To address this, the EU has introduced the carbon border adjustment mechanisms (CBAM), which would levy tariffs on imported goods based on their carbon content. This approach is seen as a way to level the playing field for EU industries while encouraging other countries to adopt similar climate standards. However, in his interview with S&P, the CEO of the energy and metals company **Metlen**[70] suggests that the EU should rethink CBAM as it places the EU industry in a disadvantageous position.

Awareness Raising in Climate Action

The Neuroclima project partly studies behavioral change as regards climate action given that public engagement and civic participation in climate change activities form a fundamental part for the wide adoption and at the end for the success of climate policies. (Steg & Vlek, 2009)argue that without widespread public engagement, policies could face resistance or fail to achieve their intended outcomes. (Lorenzoni & Pidgeon, 2006) suggest that policymakers need to address these disparities by tailoring communication and engagement efforts to different demographic groups and cultural contexts.

Global Leadership in Climate Action

The EU's role as a global leader in climate action as aforementioned in this section and throughout this document is widely recognized both in the literature and in the global diplomacy, the industry and the market, influencing legislation in other parts of the world. (Oberthür & Dupont, 2021; Oberthür & Groen, 2018) discuss the EU's influence in international climate negotiations, where it has often set the agenda and pushed for more ambitious global targets. This leadership is seen as a key factor in the success of agreements like the Paris Agreement. It must be noted on the other hand that and (Bäckstrand & Elgström, 2013) caution that maintaining this leadership requires continuous commitment and coordination among member states. The authors suggest that the EU's ability to lead by example—through the successful implementation of its own climate policies—will be crucial in persuading other countries to follow suit; and indeed, in the Neuroclima partners and stakeholders' discussions, it is highlighted that in other geographies and jurisdictions this will take place.

Recommendations

[70] https://www.metlengroup.com/

In conclusion, when it comes to climate-related policy implementation in the EU, it has to be noted that there is a complexity of concerns and of many opportunities that is reflected in and arises from the diversity of stakeholders along with the global context that climate change and policies related to it take place in and that is increasingly becoming politicized and polarized, especially in the other side of the Atlantic and which might have an effect in Europe. Whilst economic disparities, political resistance, and the need for technological innovation pose significant challenges, the EU's commitment to a just transition, global leadership, and systemic innovation with policies, and financial instruments open the path to success. Certainly, there is a need for continued research and policy development coupled with awareness raising and civic engagement; all will be essential to navigating these challenges and realizing the opportunities for a sustainable and equitable future in Europe – the core of the EU Green Deal and part of the EU political commitments; the present project, NEUROCLIMA, aspires to contribute to these opportunities and provide a safe space for awareness raising.

11.2 Policy Impact Assessment Studies

A Policy Impact Assessment evaluates potential consequences of a policy, ensuring that benefits resulting from this policy outweigh risks. It's crucial for identifying unintended effects, and promoting transparency and accountability, thereby enhancing policy effectiveness and public trust and engagement. Assessing the impact of climate-related policies and EU missions for long-term sustainability involves a combination of quantitative and qualitative methodologies.

The methodologies discussed below are designed to evaluate the effectiveness, efficiency, and broader implications of policies and missions, ensuring they contribute to sustainable development goals. Any impact analysis is best applied before a policy is put into force, to be able to make informed decisions, but it also has immense value when it is done afterwards so that useful adaptations to policies can be made if needed.

11.3 Impact Assessment Methodologies

When creating an impact assessment analysis methodology, there are multiple approaches that may be used involving different data collection and modelling processes. The following sections are an overview of such methodologies.

11.3.1 Quantitative Methodologies

Statistical Analysis and Econometric Modelling

- Time-Series Analysis: This involves examining data collected over time to identify trends, patterns, and potential impacts of climate policies on various indicators such as greenhouse gas emissions, energy consumption, and economic growth.
- Panel Data Analysis: This uses data from multiple entities (e.g., countries, regions) over time to assess the impact of policies across different contexts.
- Regression Analysis: Regression models help in quantifying the relationship between climate policies and outcomes such as emission reductions, energy efficiency improvements, and economic performance.

Cost-Benefit Analysis (CBA)

- Monetary Valuation: CBA involves comparing the costs of implementing a policy with the monetary value of its benefits, such as reduced health costs due to lower pollution levels or avoided damages from climate change impacts.

- Discounting Future Benefits and Costs: This technique is used to assess the long-term sustainability of policies by considering the present value of future benefits and costs.

Computable General Equilibrium (CGE) Models

- Economic Simulation: CGE models simulate how an economy might respond to changes in climate policy, including shifts in production, consumption, and trade patterns.
- Policy Scenario Analysis: These models can compare different policy scenarios to evaluate their potential economic impacts and effectiveness in achieving sustainability goals.

Integrated Assessment Models (IAMs)

- Climate-Economy Interaction: IAMs integrate data from various fields (climate science, economics, energy systems) to assess the interactions between climate policies and socio-economic factors.
- Long-Term Projections: These models provide long-term projections of climate and economic outcomes under different policy scenarios.

11.3.2 Qualitative Methodologies

Stakeholder Analysis

- Engagement and Consultation: Engaging with stakeholders (e.g., policymakers, industry representatives, NGOs, and the public) to gather insights on policy impacts, feasibility, and acceptance.
- Delphi Method: This structured communication technique involves experts' iterative rounds of questioning to reach a consensus on the potential impacts and effectiveness of policies.

Case Studies

- In-Depth Examination: Detailed analysis of specific instances where climate policies have been implemented, assessing their outcomes, successes, and challenges.
- Comparative Analysis: Comparing different case studies to identify best practices and lessons learned.

Environmental Impact Assessment (EIA)

- Baseline Studies: Establishing the baseline environmental conditions before policy implementation.
- Impact Prediction: Predicting potential environmental impacts of policies and proposing mitigation measures.
- Monitoring and Evaluation: Continuous monitoring of environmental parameters to evaluate the actual impacts and effectiveness of policies over time.

Policy Evaluation Frameworks

- Theory of Change (ToC): Developing a detailed pathway of how and why a policy is expected to achieve its desired outcomes, identifying key assumptions and potential barriers.
- Logical Framework Approach (LFA): Using a structured approach to define objectives, inputs, outputs, outcomes, and impacts, along with indicators for measuring progress.

11.3.3 Mixed-Methods Approaches

Triangulation

- Combining Quantitative and Qualitative Data: Using multiple data sources and methods to cross-verify findings and provide a more comprehensive assessment of policy impacts.

- Holistic Analysis: Integrating quantitative models with qualitative insights to understand both measurable impacts and broader socio-economic implications.

Scenario Planning

- Exploring Futures: Developing multiple plausible future scenarios based on different policy choices and external factors and assessing their potential impacts on sustainability.
- Risk and Uncertainty Analysis: Identifying and evaluating risks and uncertainties associated with different policy scenarios, enhancing the robustness of policy recommendations.

11.3.4 EU-Specific Methodologies

European Environment Agency (EEA) Indicators

- Sustainability Indicators: Using a set of indicators developed by the EEA to assess the environmental, economic, and social impacts of policies.
- State of the Environment Reporting: Regular reporting on the state and trends of the environment in Europe, providing a basis for policy assessment.

Ex-ante and Ex-post Evaluations

- Ex-ante Evaluation: Assessing potential impacts of policies before their implementation to inform decision-making and improve policy design.
- Ex-post Evaluation: Evaluating the actual impacts of policies after implementation to understand their effectiveness and guide future policy development.

By employing these methodologies on climate-related policies and missions each policy's contribution to long-term sustainability can be thoroughly assessed for, enabling continuous improvement and adaptation in response to emerging challenges and opportunities.

It is important to note here that the European Commission regularly carries out impact assessments and public consultations and in most cases the impact assessment is available separately or included in a "*Commission working paper*".

11.4 Planning an Impact assessment

There are several key steps that are critical from the planning stage in order to ensure a thorough and effective evaluation of a proposed policy or project.

These steps are:

1. Scoping:
    a. Define Objectives: Clearly articulate the purpose of the impact assessment and the specific objectives to be achieved.
    b. Identify Stakeholders: Determine who will be affected by the policy or project and involve them in the assessment process.
    c. Determine Scope: Establish the boundaries of the assessment, including geographic, temporal, and sectoral limits.
2. Baseline Study:
    d. Collect Data: Gather data on the current state of the environment, economy, and society relevant to the policy or project.
    e. Establish Baseline: Create a comprehensive baseline against which potential impacts can be measured.
3. Impact Identification:
    f. Identify Impacts: Determine the potential positive and negative impacts of the proposed policy or project.
    g. Categorize Impacts: Classify impacts by type (e.g., economic, social, environmental) and significance (e.g., major, minor).
4. Impact Prediction:
    h. Analyse Data: Use qualitative and quantitative methods to predict the likely impacts.
    i. Model Scenarios: Develop models or scenarios to understand how different factors might influence outcomes.
5. Impact Evaluation:
    j. Assess Significance: Evaluate the significance of each identified impact in terms of magnitude, duration, and likelihood.
    k. Cost-Benefit Analysis: Perform economic analyses to compare the benefits and costs associated with the impacts.
6. Mitigation Measures:
    l. Develop Mitigation Plans: Identify strategies to avoid, minimize, or compensate for negative impacts.
    m. Enhance Positive Impacts: Propose measures to enhance any positive outcomes.
7. Public Consultation:
    n. Engage Stakeholders: Conduct consultations with stakeholders to gather feedback and incorporate their views.
8. Revise Proposals: Adjust the policy or project based on stakeholder input and further analysis.8. Decision-Making:
    o. Compile Report: Prepare a comprehensive impact assessment report summarizing findings, conclusions, and recommendations.

p. Make Decisions: Use the report to inform decision-makers and guide the final decision on the policy or project.

9. Monitoring and Evaluation:
   q. Establish Monitoring Plan: Develop a plan to monitor the implementation of the policy or project and its impacts over time.
   r. Evaluate Outcomes: Periodically assess the actual impacts against predicted outcomes and adjust strategies as necessary.
10. Documentation and Reporting:
   s. Document Process: Maintain detailed records of the assessment process, including methodologies, data sources, and stakeholder consultations.
   t. Communicate Results: Share the findings with stakeholders and the public, ensuring transparency and accountability.

These key steps form a structured approach to impact assessment, ensuring that all relevant factors are considered and that potential impacts are thoroughly evaluated.

11.5 What are we looking for?

In order to assess the impact of certain policies climate change adaptation, we will need to focus on the following issues:

11.5.1 Environmental Impact

This assessment will focus on the impact on various environmental parameters emerging from climate change and its causes, of these, the most commonly used are:

- **Air Quality:** Assessment of emissions, air pollutants, and their impact on human health and the environment.
- **Water Quality**: Evaluation of potential contamination or changes in water bodies, including rivers, lakes, and groundwater related to climate change.
- **Soil Quality:** Analysis of soil contamination, erosion, and degradation related to climate change.
- **Biodiversity**: Impact on flora and fauna, including endangered species and ecosystems.

Questions to ask related to this:

- Environmental Quality:
  - How has the climate-related policy affected air, water, and soil quality in the region?
  - Have there been any noticeable changes in biodiversity and ecosystem health?
- Resource Management:
  - What impacts have been observed on natural resource consumption and sustainability?
  - How has the policy influenced waste management and recycling efforts?
- Climate Change:
  - Has there been a measurable reduction in greenhouse gas emissions?
  - What are the observable effects on climate resilience and adaptation measures?

11.5.2 Social Impact

This examines the impact on people:

- **Population and Demographics**: Effects on population size, structure, and distribution.

- **Health and Well-being:** Impact on physical and mental health, healthcare services, and overall well-being.
- **Cultural Heritage:** Effects on historical sites, cultural practices, and heritage.
- **Community Structure:** Changes in community cohesion, social networks, and quality of life.

Questions to ask related to this:

- Public Awareness and Education:
  - How has the policy improved public awareness and education regarding environmental issues?
  - What changes have been seen in community engagement and participation in environmental activities?
- Social Equity:
  - How have different social groups (e.g., low-income, marginalized communities) been affected by the policy?
  - What steps have been taken to ensure fair and equitable access to environmental benefits?
- Cultural Impact:
  - Have there been any changes in cultural practices and traditions due to the policy?
  - How has the policy influenced local heritage and historical sites?
- Public Health: Assessment of potential health risks, including exposure to pollutants, hazardous materials, and disease vectors.
- Healthcare Services: Impact on the availability and quality of healthcare services.

Questions to ask related to this:

- Public Health:
  - How has the policy impacted public health, particularly in relation to environmental factors (e.g., air quality, water safety)?
  - Are there any measurable changes in the incidence of environmentally-related diseases?
- Healthcare Access:
  - Has the policy improved access to healthcare services related to environmental health issues?
  - What preventative measures have been implemented to mitigate health risks?
- Mental Health:
  - What impact has the policy had on the mental health and well-being of the community?
  - How have stress levels and mental health issues related to environmental concerns been addressed?

11.5.3 Economic Impact

- Employment: Job creation or loss, changes in employment patterns, and impact on local labor markets.
- Income and Poverty: Effects on income levels, poverty rates, and economic inequality.
- Economic Development: Contribution to local and regional economic growth, infrastructure development, and investment.

Questions to ask related to this:

- Economic Growth:

  - What is the policy's impact on local and national economic growth?
  - How has it influenced job creation and employment rates in relevant sectors?
- Business and Industry:
  - How have businesses and industries adapted to the new environmental regulations?
  - What economic opportunities or challenges have arisen from the policy?
- Cost-Benefit Analysis:
  - What are the direct and indirect costs associated with the policy?
  - How do these costs compare with the long-term economic benefits?

11.5.4 Risk Assessment

Hazard Identification: Identification of potential hazards associated with the project or policy.

Risk Analysis: Evaluation of the likelihood and impact of identified risks.

Mitigation Measures: Development of strategies to mitigate identified risks.

Questions to ask related to this:

- **Risk Assessment:**
  - What risks (environmental, social, economic) have been identified in relation to the policy?
  - How are these risks being assessed and prioritized?
- **Risk Mitigation:**
  - What measures are in place to mitigate identified risks?
  - How effective have these measures been in reducing risk?
- **Emergency Response:**
  - How has the policy influenced emergency preparedness and response capabilities?
  - What improvements have been made in managing environmental disasters and emergencies?

11.5.5 Cumulative Impact

Synergistic Effects: Assessment of the combined effects of the proposed project with other existing or planned projects.

Long-term Impacts: Evaluation of long-term and indirect impacts on the environment, society, and economy.

Questions to ask related to this:

- **Long-term Environmental Effects:**
  - What are the projected long-term environmental impacts of the policy?
  - How are these impacts being monitored and managed over time?
- **Synergistic Effects:**
  - Are there any synergistic or cumulative effects when combined with other existing policies?
  - How are these combined effects being assessed and mitigated?
- **Cross-Sectoral Impact:**
  - How does the policy interact with other sectors (e.g., agriculture, transportation, energy)?
  - What comprehensive strategies are in place to address cross-sectoral impacts?

12 Conclusion

The aim of this document was to enhance the project's ability to contribute meaningfully to climate resilience and sustainability efforts across Europe. It set the stage for further research, stakeholder engagement, and the development of innovative solutions to address the complex challenges of climate change adaptation and mitigation.

In conclusion, the present deliverable provides a detailed overview of climate-related policies at both global and EU levels, with a particular emphasis on EU Missions and impact assessment methodologies designed to promote long-term sustainability within the NEUROCLIMA project.

The key components of the document are:

- A detailed mapping of major climate policies, from international agreements to specific EU directives and strategies.
- An analysis of the five EU Missions and their objectives related to climate action and sustainability.
- An overview of stakeholder analysis theory and its importance for climate policy implementation.
- A framework for impact assessment methodology, including quantitative and qualitative approaches.
- A brief discussion of social tipping points and their relevance to climate policy and societal transformation.

The purpose of this document is to inform the other work packages and tasks on the policy landscape and assessment approaches. Furthermore, it will provide a foundation for developing tools, toolkits, and educational materials, offer guidance on stakeholder engagement and impact evaluation for future project activities.

By synthesizing policy information, methodological approaches, and practical guidelines, this deliverable has established a knowledge base to support the creation and implementation of pilot cases throughout the project duration.

13 References

Bäckstrand, K., & Elgström, O. (2013). The EU's role in climate change negotiations: from leader to "leadiator." Journal of European Public Policy, 20(10), 1369–1386. https://www.tandfonline.com/doi/abs/10.1080/13501763.2013.781781

Bailey, I. (2010). The EU emissions trading scheme. *Wiley Interdisciplinary Reviews: Climate Change*, *1*(1). https://doi.org/10.1002/wcc.17

Branger, F., & Quirion, P. (2014). Would border carbon adjustments prevent carbon leakage and heavy industry competitiveness losses? Insights from a meta-analysis of recent economic studies. *Ecological Economics*, *99*, 29–39. https://www.researchgate.net/publication/257606684_Would_Border_Carbon_Adjustments_prevent_carbon_leakage_and_heavy_industry_competitiveness_losses_Insights_from_a_meta-analysis_of_recent_economic_studies

Bretschger, L., & Leuthard, M. (2024). *The importance of tipping points for sustainable development* (Issue 24/392). ETH Zurich, CER-ETH - Center of Economic Research. https://doi.org/10.3929/ethz-b-000664830

Burton, P., & Mustelin, J. (2013). Planning for Climate Change: Is Greater Public Participation the Key to Success? *Urban Policy and Research*, *31*(4). https://doi.org/10.1080/08111146.2013.778196

Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and Amending Council Directive 96/61/EC, Pub. L. No. Directive 2003/87/EC (2003).

Dixit, A. F. J. (2013). *Stakeholder Participation in Climate Change Adaptation Planning*.

Egenhofer, C., Ferrer, J. N., Kustova, I., & Popov, J. (2020). The time for rapid redevelopment of coal regions is now. *CEPS Policy Insights*, *13*(2020).

European Commission. (2013). EU over-achieved first Kyoto emissions target, on track to meet 2020 objective. *Https://Climate.Ec.Europa.Eu/News-Your-Voice/News/Eu-over-Achieved-First-Kyoto-Emissions-Target-Track-Meet-2020-Objective-2013-10-09_en*.

European Commission. (2021). Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change. *European Commission*, *6*(11).

Ferretti, V. (2016). From stakeholders analysis to cognitive mapping and Multi-Attribute Value Theory: An integrated approach for policy support. *European Journal of Operational Research*, *253*(2), 524–541. https://ideas.repec.org/a/eee/ejores/v253y2016i2p524-541.html

Feyen, L., Ciascar, J., Gosling, S., Ibarreta, D., Soria, A., Dosio, A., Naumann, G., Russo, S., Formetta, G., Forzieri, G., Girardello, M., Spinoni, J., Mentaschi, L., Bisselink, B., Bernhard, J., Gelati, E., Adamovic, M., Guenther, S., de Roo, A., … Olariaga, M. (2020). JRC Science for Policy Report JRC PESETA IV final report. *Publications Office of the European Union*. https://doi.org/10.2760/171121

IPCC. (2023). Intergovernmental Panel on Climate Change - AR6 Synthesis Report: Climate Change 2023. In *Climate Change 2022 – Impacts, Adaptation and Vulnerability*.

IPCC Core Writing Team, H. L. and J. R. (eds.). (2023). IPCC, 2023: Sections. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. *H. Lee and J. Romero*.

Lier, M., Köhl, M., Korhonen, K. T., Linser, S., Prins, K., & Talarczyk, A. (2022). The New EU Forest Strategy for 2030: A New Understanding of Sustainable Forest Management? *Forests*, *13*(2). https://doi.org/10.3390/f13020245

Lorenzoni, I., & Pidgeon, N. F. (2006). Public views on climate change: European and USA perspectives. *Climatic Change*, *77*(1–2), 73–95. https://link.springer.com/article/10.1007/s10584-006-9072-z

Oberthür, S., & Dupont, C. (2021). The European Union's international climate leadership: towards a grand climate strategy? *Journal of European Public Policy*, *28*(7), 1095–1114. https://doi.org/10.1080/13501763.2021.1918218

Oberthür, S., & Groen, L. (2018). Explaining goal achievement in international negotiations: The EU and the Paris Agreement. *Journal of European Public Policy*, *25*(5), 708–727. https://doi.org/10.1080/13501763.2017.1291708

Oberthür, S., & von Homeyer, I. (2023). From emissions trading to the European Green Deal: the evolution of the climate policy mix and climate policy integration in the EU. *Journal of European Public Policy*, *30*(3). https://doi.org/10.1080/13501763.2022.2120528

Pedersen, J. T. S., van Vuuren, D., Gupta, J., Santos, F. D., Edmonds, J., & Swart, R. (2022). IPCC emission scenarios: How did critiques affect their quality and relevance 1990–2022? *Global Environmental Change*, *75*. https://doi.org/10.1016/j.gloenvcha.2022.102538

Sprengel, D. C., & Busch, T. (2011). Stakeholder engagement and environmental strategy–the case of climate change. *Business Strategy and the Environment*, *20*(6), 351–364. https://doi.org/10.1002/bse.684

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, *29*(3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004

The European Green Deal, COM(2019) 640 final (2019).

Winkelmann, R., Donges, J. F., Smith, E. K., Milkoreit, M., Eder, C., Heitzig, J., Katsanidou, A., Wiedermann, M., Wunderling, N., & Lenton, T. M. (2020). Social Tipping Processes for Sustainability: An Analytical Framework. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3708161

ANNEXES

Funded by
the European Union

14 ANNEX 1: Interview Guidelines and Consent Forms

Regarding the undertaking of an impact assessment study for climate related policies in specific industries and sectors, there are certain guidelines to be taken into consideration and certain forms to be signed by interviewees to achieve compliance with EU regulations, such as GDPR and the EU AI Act - these can be helpful in later stages of the project and in setting a framework for interviews and surveys to be conducted for other Neuroclima deliverables and surveys, such as in WP3. Such forms and guidelines can be found below in accordance with the GDPR and the AI Act that are explained in the next section.

14.1 GDPR and AI Act

The newly adopted European AI Act is a broad instrument that supplements existing EU legislation. Article 2(7) of the AI Act specifies that this regulation does not impact EU Data Protection Law, particularly the GDPR, the Law Enforcement Directive (LED), and the EUDPR. Therefore, AI systems that process personal data must adhere to both the AI Act and EU data protection laws. This approach makes sense since the GDPR, LED, and EUDPR provide a detailed framework for personal data protection in the EU. However, the AI Act does not explicitly require AI systems to meet GDPR standards to enter the European market, despite recommendations from the EDPS and EDPB for such a requirement. Specifically, these bodies suggested that certification of high-risk AI systems should verify GDPR compliance.

Recital 63 of the AI Act clarifies that classifying an AI system as high-risk does not imply that its use is lawful under other EU or national laws, such as those protecting personal data or regulating polygraphs and similar tools for detecting emotional states. Additionally, Recital 63 states that the AI Act does not establish a legal basis for processing personal data, including special categories, unless explicitly stated otherwise in the Act.

As the AI Act and EU data protection laws operate concurrently, the EDPB and EDPS emphasized the need to avoid inconsistencies and potential conflicts with the GDPR, LED, and EUDPR within the AI Act. There are overlaps between the AI Act and EU data protection laws that could lead to legal ambiguities and conflicting interpretations. For instance, both the GDPR and AI Act have transparency obligations, but they differ in scope and requirements. Another example is the requirement for human intervention or oversight: the GDPR mandates human intervention for decisions based solely on automated processing, including profiling (Article 22(4) GDPR), while the AI Act requires human oversight for high-risk AI systems (Article 14 AI Act).

The AI Act also risks creating parallel enforcement structures with data protection authorities, which could increase legal uncertainty. The EDPB and EDPS recommended that national data protection authorities should enforce the AI Act. However, Article 70 of the AI Act leaves the designation of competent authorities to individual Member States, likely leading to different entities with overlapping responsibilities, as seen with the newly established Spanish Agency for the Supervision of AI.

14.2 GDPR Information Sheet

[INDICATIVE]

General introduction

You are invited to participate in a study that aims at [*state the aim of the study],* carried out by the Horizon Europe project NEUROCLIMA (G.A. N° 101137711). Pursuant to art. 13 of Regulation (EU) 2016/679 (General Data Protection Regulation), please note that NEUROCLIMA consortium partners acting as Joint Data Controller will process your personal data in compliance with the requirements of Regulation (EU) 2016/679 (General Data Protection Regulation) and Decree 196 dated 30 June 2003 as amended (Data Protection Code).

Joint data controllers involved in processing

[*Department*] – [*Institution*]

[*Address*];

e-mail: [*email to the institution* (head of the department, dean, rector, etc.)];

Data Protection Officer: [*address*]; e-mail: [*DPO's email*].

Purposes and methods of processing I

Your personal data and, in particular, the data relating to [*state the purpose of your endeavour*] - including information on your racial or ethnic origin and trade union and political affiliation - will be processed by specifically authorised persons, both with and without the use of automated equipment, for the following purposes:

[*state the specific purposes*]

(A) Participation in the research and related operations and activities

If you give your consent to participate in the study in question, some of your personal data will be collected through:

- online survey,
- focus groups, participatory labs,
- interview that could be sound recorded/filmed.

Information you will provide will be processed by our researchers, who will replace any identification data with a code. Please note that your data will be subject to pseudonymisation during the duration of the project as it may be in the interest of the [*state your institution*] to be able to contact you again in order to deepen some aspects of the research. Within 3 months after the end of the research and in case you have not given consent to dissemination with identifying data, your data will be completely anonymised.

Personal data without direct identification details (anonymized or pseudonymised) may also be exchanged and shared between the research consortium partners of the NEUROCLIMA project in order to carry out comparative analyses between different case studies.

The processing may also have as object some of your images (photographs, video recordings, audio-video recordings). The processing of these images will take place in compliance with the provisions of the law, guaranteeing, in all cases where this is possible, anonymity by obscuring the physical features. We would like to point out that, for the processing of images, you are required to express a specific consent, considering that, even in special cases, also images related to people whose face has been obscured may allow their identification.

The data collected and stored for the realization of the study in question, will be kept for 4 years.

(A1) Information concerning the transfer abroad to non-EU territory

Your personal data may be transferred, without your identification, to a Country not belonging to the European Union or to an international organization; in particular, they will be transferred to the [*state non EU partners]*. The transfer is lawful as it is based, pursuant to Article 45 of the GDPR, on the Decision of the EU Commission on the Adequacy [*state the signature of the Adequacy Decision*].

Purposes and methods of processing II

(A2) Information concerning the dissemination

We would like to point out that, if the interview, in any case without identification data, turns out to be socially valuable and usable for scientific purposes, this could be - with your consent - the subject of communication and/or dissemination. It should be noted that the communication or disclosure of the data described above will take place, with your consent, only after an assessment of the relevance and not excess of the treatment with respect to the purposes of collection or if the failure to publish what emerged in the interview negatively affects the quality of the research/study. The recording of the interview and/or the transcription of the content, in any case without identification data, could be communicated to the project partners and be the object of dissemination/publication (e.g. in scientific journals, internet, databases accessible to other researchers, repository of institutional or disciplinary data, i.e. information systems for document management managed by individual research institutions or by associations and consortia of research bodies for a particular scientific community, in which data and their meta-information are securely stored and reliable enough to guarantee its authenticity and inalterability and distributed to the public in a free and open form, etc.).

Purposes and methods of processing III

(A3) Information concerning the dissemination

If you are a known person or if you exercise a public function in a particular role or position, it could be of public interest or socially appreciable to let third parties know the information that emerged from the interview concerning the institution or role that You represent (for example, including your name and surname). You may therefore request that your identification data be processed and disseminated for the following purposes:

- for the purpose of allowing the processing and dissemination of information which, due to the nature of your role, allow researchers to discover, interpret and review theories, facts and behaviours relating to the field of knowledge on the aforementioned topics;
- filing of project documents, containing your data, on repository of institutional or disciplinary data;
- so that the information you provide will contribute to the formation of public opinion on your opinions and/or facts relevant to the community.

- The images may be disseminated pursuant to Law, on institutional sites as well as through social network channels (by way of example but not exhaustive, Facebook, Twitter, Youtube).

Finally, it is specified that your consent to the communication and / or dissemination of your interview implies the granting of a non-exclusive license, without limits of duration and for the whole world, transferable to third parties, for the use of images. This license includes the rights pursuant to Law, including by way of example but not exhaustive: right of publication; right of reproduction in any way or form; right of transcription, assembly, adaptation, processing and reduction; right of communication and distribution to the public, including the rights of projection, transmission and dissemination (purely by way of example through iptv, mobile terminals, voip, digital channels, etc.), also in a summary and/or reduced version, with any technical means, the right to keep a copy of the images, even in electronic form and on any known or future technological support for the purposes and within the limits defined above. The use of images does not give right to any compensation. In any case, any use of the portrait that could harm the honour, reputation or decorum of the person portrayed, shot or recorded is excluded.

(B) Conservation for administrative purposes

Your data will also be processed for administrative accounting purposes and kept for the time strictly necessary for the pursuit of these purposes, except for the ten-year period to ensure the fiscal, accounting and administrative requirements required by law and, possibly, longer terms, not determinable a priori, as a consequence of different conditions of lawfulness of the treatment (for example, legal actions that make the treatment necessary for over ten years).

Legal basis and nature of the provision of data

The legal basis of the treatments referred to in point (A1), (A1) and (A2) described above lies in the consent, pursuant to art. 6, first paragraph, lett. a) of the Regulation (EU) 2016/679 (General Regulation on Data Protection) and, in the case of special categories of personal data, of art. 9, second paragraph, lett. a) of Regulation (EU) 2016/679. The consent to the processing for the purposes described above is optional.

However, it is specified that the provision of data for the purposes referred to in points (A), (A1) and (A2) is not mandatory but is essential for the achievement of the purposes described. The refusal to grant them will not allow you to participate in the study in question.

The provision of data for the purposes referred to in point (B) is necessary to comply with legal obligations regarding the conservation of administrative and accounting documents. In this case the legal basis can be found in the art. 6, paragraph 1, lett. c) and e), of Regulation (EU) 2016/679.

Rights of the Data Subject

You, as a participant in this study and therefore a data subject, may exercise the rights granted pursuant and consequent to arts. 15-21 of the Regulation, including the right to request access to your personal data and its rectification or erasure, as well as to restrict the processing of your data, object to its processing and request its portability.

Please note that any consent given by you is given freely and may be revoked at any time, without any penalties or adverse effects, and without prejudicing the lawfulness of processing based on the consent given prior to revocation. Requests to exercise the above rights may be presented to:

- [institution] – [email address of the responsible office/person];

Lastly, should you believe that the processing of your personal data is in infringement of the provisions of Regulation (EU) 2016/679, you have the right to lodge a complaint with the data protection authority, pursuant to Article 77 of the Regulation (UE) 2016/679, or to refer to the appropriate courts (Art. 79 of the Regulation).

14.3 GDPR Consent Forms

1. Please, fill in your name and surname

- [Your answer]

2. Please, indicate the date of birth and city

- [Your answer]

3. pursuant to the provisions of Regulation (EU) 2016/679 and Decree 196/2003 and subsequent amendments and additions and having read the above "Information on the processing of personal data".

- [ ] give consent
- [ ] deny consent

4. for the processing - NECESSARY for the purpose of participating in the study in question – of my personal data for scientific research and statistical purposes in the manner and for the reasons described in the section entitled "Purposes and methods of processing" (point A).

- [ ] give consent
- [ ] deny consent

5. to the processing and the publishing - NOT NECESSARY for the purposes of participating in the study in question – of interviews without my identification data, with the methods and for the purposes described in point (A2).

- [ ] give consent
- [ ] deny consent

6. to the processing and the publishing - NOT NECESSARY for the purposes of participating in the study in question – of my identifying data (for example: name, surname or role) by communicating and disseminating the interviews, in the manner and for the purposes described in point (A3).

- [ ] give consent
- [ ] deny consent

7. Please, fill in your name and surname + date

- [Your answer]

14.4 Participation Information Form

1. Introduction

Dear Madam/Sir,

You are invited to take part in research conducted within the framework of the project NEUROCLIMA. Before deciding whether to participate, it is important that you have all the information necessary to adhere in an informed and responsible manner. We ask you to read this document and to ask the person who proposed this study all the questions that it considers appropriate.

Brief description and Objectives

[Provide a very short overview of the project aim and a specific aim for the task you are conducting]

The NEUROCLIMA research project aims to establish innovative frameworks and tools to support systemic transformations and citizen engagement towards climate resilience. By creating a "nervous system" that connects policymakers, public institutions, and citizens through explainable and trustworthy Human-AI decision support, the project fosters a bidirectional relationship between stakeholders. NEUROCLIMA will monitor emerging trends and needs, propose engagement frameworks, and provide recommendations to facilitate systemic change, ultimately enhancing trust and resilience within EU societies.

+ specific task you are conducting

3. What does participation in the study involve?

Participation in the NEUROCLIMA research project involves the optional and selective sharing of personal opinions through an interview or questionnaire.

4. Benefits, inconveniences and/or potential risks of participation

Participation in the research is voluntary and free. For the participants, collaboration may involve the sharing of cultural and political views, which is why the participant will be guaranteed a secure environment for data collection and the possibility to express different types of consent to their use for research purposes. Researchers expect information on the *[provide description of the information you are looking for].*

5. Withdrawal from research

You have the right to withdraw at any time your consent to participation in this research, without notice or specific reason.

6. Information on research results and incidental findings

You have the right to request information on the results and outcome of the search. Unexpected unintended findings may emerge during this research, which could include disclosures of identifiable criminal activity, human trafficking or other forms of illegal abuse. Researchers involved in this project may therefore be obliged to report such unexpected information to the relevant authorities, in accordance with the law of the country where the research is conducted. In such a case, the commitment to confidentiality and anonymity would not be upheld with respect to information concerning specific and identifiable violations of law. You do, however, have the right to be informed of any unexpected incidental findings arising through or in the course of your participation.

7. Measures planned to protect anonymity

The processing of the collected data will be carried out in such a way as to eliminate any reference that may allow the reconnection of individual statements to a specific person, unless the latter explicitly gives his or her consent to the disclosure of personal information. The results of the research

will be published in summary form and in no case any brief quotations will be ascribable to single persons, unless explicit consent is given.

8. Contacts

For any information and clarification on this research or for any need, please contact the researchers *[Name, Surname, Affiliation, email]* who are at your disposal for further information or clarification.

14.5 Informed Consent to participate in the research

1. Please, fill in your name and surname

- [fill in your Name Surname]

2. Please, indicate date of birth and city

- [fill in your place and date of birth]

The declaration of informed consent

I declare the below

- to have read the aforementioned information sheet received, to have understood both the information contained therein and the information provided orally by the staff involved in the research project and to have had ample time and opportunity to ask questions and obtain satisfactory answers from the staff in charge and to receive information on any unexpected incidental finding;

- to have understood that participation in the study is completely voluntary and free, that one can withdraw from the study at any time, without having to give explanations and without this involving any disadvantage or prejudice;

- to have understood the nature and activities that participation in the study entails and the related risks;

- to have understood that participation in this study will not entail the recognition of any direct or indirect economic advantage.

3. Declaration of consent (or not) to participate in the research. Please, fill in if you consent or not to participate in the research, in the knowledge that such consent is freely expressed and can be revoked at any time without this leading to any disadvantage or prejudice.

PLEASE, FILL IN 'CONSENT' / 'NOT CONSENT' + INDICATE PLACE AND DATE

- [Your answer]

4. Please, indicate your name and surname as a signature of the participant

- [Your answer]

---

15 ANNEX 2: Possible Participants to Impact Assessment

A list of relevant stakeholders and potential participants to our impact assessment is provided here. This list can help partners in setting up their impact assessment interviews and surveys at a later stage of the project and as deemed necessary:

#	Name of the Association
1	UNESDA - the European soft drinks industry
2	Independent Retail Europe
3	EuroCommerce is the principal European organisation representing the retail and wholesale sector
4	European Association for Storage of Energy (EASE)
5	The Association of European Renewable Energy Research Centres
6	WindEurope
7	Hydrogen Europe
8	European Insulation Manufacturers Association
9	EREF - European federation of national renewable energy associations
10	European Federation for Intelligent Energy Efficiency Services
11	Federation of the European electricity industry
12	ZVEI: Association of the Electrical and Digital Industries
13	FEAD - European Waste Management Association
14	Municipal Waste Europe
15	PRO Europe s.r.l. (Packaging Recovery Organisation Europe) – Green Dot
16	The European Alliance of Companies for Energy Efficiency in Buildings
17	European Biogas Association
18	Plastics Europe - Pan-European association of plastics manufacturers
19	WEEE Forum - not-for-profit electrical and electronic equipment waste (WEEE) producer compliance schemes
20	The European Organization for Packaging and the Environment
21	FoodDrinkEurope
22	European Dairy Association
23	European Association of Fruit and Vegetable Processing Industries
24	European Milk Board (EMB)
25	Copa and Cogeca are the united voice of farmers and agri-cooperatives in the EU
26	Airlines for Europe
27	Association of the European Heating Industry
28	European Biomass Association

29	HOTREC, Hotels, Restaurants & Cafés in Europe
30	European Heat Pump Association
31	European Automobile Manufacturers Association
32	European Environmental Bureau - EEB

European Associations

Moreover, approximately 145 associations are registered in EU as official lobbyists and they are all accessible at the following webpages:

EU Transparency Register	https://transparency-register.europa.eu/searchregister-or-update/search-register_en
Top Industry Associations in EU	https://www.aalep.eu/top-industry-associations-eu
EU Professional Associations concerning Food Contact Materials	https://food.ec.europa.eu/system/files/2021-04/cs_fcm_prof-contacts_en.pdf

Additional lists of stakeholders of the project are available and will be updated in a dynamic fashion to be used in other Work Packages and Deliverables of the Neuroclima project.