TransformAr

Accelerating and upscaling transformational adaptation in Europe: demonstration of water-related innovation packages

Governance Framework Tool and Report

Deliverable 3.1

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A number of solutions exist to adapt to the consequences of climate change. An overview of existing solutions are provided in the 'catalogue of solutions' (Deliverable report 3.2). The catalogue provides an overview of adaptation solutions across sectors, covering various types of solutions including nature-based solutions, technical solutions and governance solutions.

This deliverable report elaborates on the governance solutions. In this report, governance solutions are defined broadly and classified under four types: i) multi-level governance, ii) market-based, iii) network & polycentric, and iv) community governance. Herein, good governance is not only a responsibility of authorities, but also engages companies and citizens. Effective governance requires the coordination of top-down and bottom-up approaches to governance.

The report also provides an overview of adaptation policy, funding schemes, potential governance arrangements and good governance practices. This report intends to provide inspiration for the development of transformational adaptation pathways that will be held in the demonstrators of the TransformAr project. To facilitate these processes of transformational adaptation, we provide an overview of the institutional and policy framework at national, regional and local levels in the 6 Lighthouse Demonstrators, including Lappeenranta (Finland), the City of Egaleo (Greece), Galicia (Spain), Guadeloupe (French Overseas Territory), Oristano (Italy) and the West Country Region (the United Kingdom).

LIST OF ACRONYMS

CF	Cohesion Fund
CoM	Covenant of Mayors for Climate & Energy
CPES	Channel Payments for Ecosystem Services
DNSH	Do No Significant Harm
EAFRD	European Agricultural Fund for Rural Development
EEA	European Environment Agency
EMFAF	European Maritime, Fisheries and Aquaculture Fund
EMFF	European Maritime and Fisheries Fund
EOF	Environmental Observations Forum
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Fund
EU	European Union
FRER	Fondo de Recuperación Ecologica y Resiliencia
JTF	Just Transition Fund
MATTM	Italian Ministry for the Environment, Land and Sea
MFF	Multiannual Financial Framework
NAP	National Adaptation Plan
NAS	National Adaptation Strategy
NGEU	NextGenerationEU
NRRP	National Resilience and Recovery Plans
OECD	Organisation for Economic Cooperation and Development
ONERC	National Observatory on the Effects of Global Warming
PES	Payments for Ecosystems Services
RAAP	Regional Adaptation Action Plans
RRF	Recovery and Resilience Facility
SAP	Sectoral Adaptation Planning
SDG	Sustainable Development Goal
SECAP	Sustainable Energy and Climate Action Plan
SFDRR	Sendai Framework for Disaster Risk Reduction
SYKE	The Finnish Environment Institute
UNFCC	The United Nations Framework Convention on Climate Change

1. Introduction

While the urgency of adapting to climate change is becoming increasingly widespread and is consistently rising on the policy agenda, its multi-sectoral and transboundary nature means that governing action can be complex – sometimes without clearly defined responsibilities, often requiring responses from many levels of government, the private sector, civil society and citizens. While several options and solutions exist to adapt and manage projected climate change impacts and their existing systems, their implementation largely depends on the capacity and effectiveness of governance and decision-making processes. In this report we refer to governance in the context of governing action on adaptation, and the inherent involvement of institutions, rules, organisations and actors – public, private and citizens. The role of the state and public institutions is especially important in climate adaptation responses, as climate change poses both direct and indirect risks to public welfare. Given the risks posed to public welfare, authorities in mature welfare states will therefore have direct responsibilities to take action on climate change adaptation (Glover and Granberg, 2020).

Successful action on climate change adaptation is dependent on governmental systems and the capacity of societal institutions to reduce climate risk and vulnerability effectively. Governmental systems are also key to ensure equity and climate justice when incremental and transformational adaptation is concerned (IPCC, 2022). Ever since the 2015 Paris Agreement when climate change adaptation was explicitly recognised as a "global challenge," policy responses are increasingly departing from the long-established idea that "mitigation is global, adaptation is local" (Burton et al., 2011, p. 481; Persson, 2019). For instance, the scholarly literature on the governance of climate change adaptation has until recently focused on sub-global levels of governance through community, local, urban, regional and national levels (see for example Meerow & Mitchell, 2017), but is now also taking global approaches into account (Persson, 2019). Nonetheless, effects are often felt at a local scale, which means that any action generally requires major input from local governments and communities as well (Birchall et al., 2021). While impacts may be local, adaptation governance is not – at least not entirely (Bednar et al., 2018).

Navigating the choices and the changes needed to adapt to new ways of living in response to climate stimuli will require strong multi-level and multi-sectoral decision-making to enable adaptation in the long-term. Furthermore, when considering the governance of adaptation, as put forward by Persson (2019), it is important to take note of the (i) adaptation problem, (ii) governance level, and (iii) actors involved when taking global governance arrangements into account. These three dimensions and therefore the response to climate change impacts can and should be combined in different ways, and are often interlinked as illustrated by the non-exhaustive dotted lines in Figure 1.

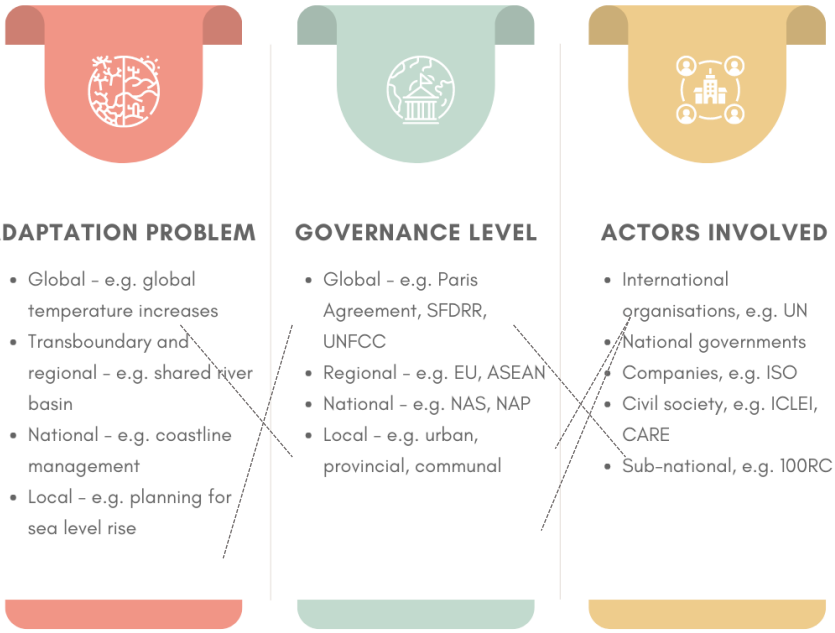

Figure 1. Conceptualising adaptation governance (figure adapted from Persson, 2019)

Furthermore, while the three dimensions illustrated in Figure 2 (civil society, the state and the private sector) are interlinked depending on the issue at stake, a key element that allows adaptation governance to further progress is through the involvement of civil society and the private sector. These actors need to have clearly defined roles and mandates for action. The adaptation governance literature also emphasises the importance of network coordination, in particularly when adaptation initiatives involve actors that cannot be defined within the national-regional-local lens (GIZ, 2019).

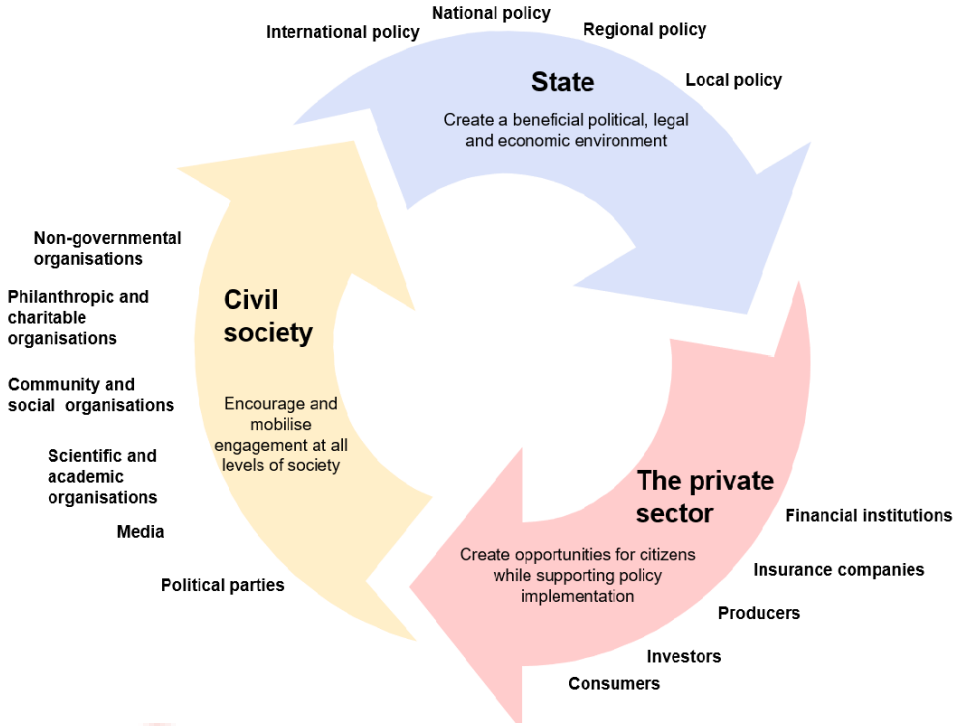

Figure 2. Governance through the lens of key three actors (adapted from GIZ (2019))

Moreover, different levels of government (including national and sub-national levels) need to coordinate action through the interdependencies found in local adaptation networks (Bednar et al., 2018). Adaptation governance is generally acknowledged in the literature as a system of multi-level governance, as adaptation governance implies "cascading decisions" - involving individuals and public bodies at local, regional and national scales (Ledda et al., 2020, p. 2; Agder et al., 2005). As illustrated through Ostrom's (2007) social-ecological system framework, it is also important to take associated actors, governance systems, and ecosystems as well as the broader social-ecological context into account when planning adaptation strategies, e.g. historical, political, economic and underlying system attributes, such as ecosystem characteristics.

Given the complex nature of governing adaptation to climate change, this report presents a review of governance arrangements so as to provide policy recommendations that can facilitate, support and enable transformational adaptation in Europe and beyond: good adaptation governance is key to introducing large-scale and disruptive transformational adaptation processes in vulnerable regions and communities. Though adaptation governance should generally be interlinked and multi-level, adaptation governance is in this report presented through the overarching lens of four major domains, as presented by Bednar and Henstra (2020) and adapted further: multi-level, market-based, network & polycentric and community governance – as certain actors and principles – depending on the type of governance, will be at the forefront guiding action. In section 3 we go into further detail on these four domains of governance and provide good practice examples that illustrate action taken on adaptation governance through the specific domain in question.

This report is written in the context of TransformAr – a project funded under the European Green Deal to develop and demonstrate solutions and pathways to achieve rapid and far-reaching transformational adaptation across the EU. Within this context, and as the European Union (EU) is a powerful force for climate action and adaptation policy (Oberthür and Dupont, 2021), we present an overview of the current policy framework and funding opportunities currently available to its members in Section 3, that also seek to also facilitate the spurring of ideas for replication and upscaling to its non-members. The first Specific Objective of TransformAr is to demonstrate the potential of co-innovation processes for Transformational Adaptation towards climate resilience in vulnerable regions and communities across Europe. This is to be realised via 6 Lighthouse Demonstrators, including Lappeenranta (Finland), the City of Egaleo (Greece), Galicia (Spain), Guadeloupe (French Overseas Territory), Oristano (Italy) and the West Country Region (the United Kingdom). To facilitate these processes of transformational adaptation, we therefore provide an overview of the institutional and policy framework in these six countries at national, regional and local levels in Section 4. We present these in the context of the European Commission's Adaptation Preparedness Scorecards that were provided for all EU Member States as part of its evaluation of the EU Strategy on Adaptation to Climate Change. In 2021, the European Union released an Impact Assessment of the EU Adaptation Strategy, and one issue that was highlighted concerned the "insufficient knowledge to support decision making." This report is written with this limitation in mind – to shed light on the existing governance frameworks that can eventually support decision-making processes and action on climate change adaptation.

2. Adaptation policy in the European Union and United Nations

2.1 International Adaptation policy

Several multilateral and international frameworks have been introduced under the United Nations (UN) in recent years from the Paris Agreement on climate change, the Sendai Framework for Disaster Risk Reduction (SFDRR) to the 2030 Sustainable Development Agenda with the Sustainable Development Goals. Since the Paris Agreement introduced the global goal on adaptation, adaptation and mitigation are considered as equal pillars in international climate policy and encourages parties to develop or enhance "relevant plans, policies and/or contributions" (EEA, 2020; UNFCCC, 2015, Article 7). In 2023, a global stocktake on adaptation progress will be undertaken, and every 5 years from then on. Based on this stocktake, national actions and international cooperation on adaptation should be updated and improved. 195 countries adopted the Paris Agreement in 2015 (EEA, 2020). Considering that climate change increases the incidence of extreme weather events, disaster risk reduction as covered under the Sendai framework is also an essential part of climate change adaptation. The Sendai framework uses the term 'resilience' rather than 'adaptation'. Sustainable Development Goal (SDG) 13 focuses on climate action. Amongst others, under SDG13, resilience and adaptive capacity to climate-related hazards and natural disasters is to be reinforced worldwide.

2.2. EU Adaptation Strategy & Adaptation Mission

The European Union has become a global leader in action on climate adaptation. Building on the first EU Adaptation strategy from 2013 and inspired by the Paris Agreement and the Sendai Framework for Disaster Risk Reduction and the Sustainable Development Agenda, the European Commission adopted a renewed Adaptation strategy in 2021, as well as the EU Adaptation Mission. The Strategy is part of the Green Deal action plan and outlines a long-term vision for the EU to become a climate-resilient territory by 2050, entirely adapted to the inevitable impacts of climate change. The Adaptation strategy pursues three objectives: (i) smarter adaptation, (ii) more systemic adaptation and (iii) faster adaptation. Improving knowledge, planning and speeding up adaptation actions, at both local and regional levels are important aspects of the EU Adaptation Strategy. The EU Adaptation Mission contributes to the Strategy by delivering a portfolio of actions towards climate resilience, through the Horizon Europe programme. The Mission more specifically aims to achieve resilience by 2030 for at least 150 regions and communities. The mission will support regions and communities to prepare and plan for climate resilience, and accelerate transformative adaptation through the development of transformative pathways and the testing of solutions. For at least 75 regions and communities, the Mission aims for large-scale demonstrations of systemic transformations.

In follow-up of the UNFCCC requirements, EU Member States also need to report to the European Commission on a 2-yearly basis (since 15 March 2021) about their national adaptation planning (NAP) and strategies (NAS), while also reporting on Sectoral Adaptation Planning (SAP), climate change impact and vulnerability assessments or adaptation portals and platforms. The online portal Climate-ADAPT provides an overview of the country profiles. Prior to the development of the 2021 Adaptation Strategy the EU Member States completed an adaptation preparedness scorecard in 2018 to understand their progress towards climate resilience.

2.3. Covenant of Mayors of Climate and Energy

In order to achieve the climate targets at EU level, action and ambition at a local scale is key. The importance of the local level for climate action was already recognised in the 2013 Adaptation Strategy. Consequently, the 'Mayors Adapt' initiative was set up as one of the strategy's actions. Herein, cities and town mayors were, and still are, persuaded to officially commit to achieving climate adaptation targets at local scale. Currently, Mayors Adapt fits within the Covenant of Mayors of Climate and Energy which integrates both climate mitigation and adaptation targets. The signatory cities are increasing their climate ambitions to reach a common vision: "By 2050 we will all be living in decarbonised and resilient cities with access to affordable, secure and sustainable energy."

In order to translate political commitments into actionable measures, signatories of the Covenant of Mayors commit to submitting, within two years of the local council decision, a Sustainable Energy and Climate Action Plan (SECAP) which outlines major actions to be undertaken. A local adaptation plan can be part of the SECAP or developed as a separate planning document. The developed climate action plans across Europe are brought together in the Covenant of Mayors database. In 2022, the Covenant of Mayors counts almost 11,000 signatory cities and towns in 54 countries, representing almost 340 million inhabitants (see Fig. 4 and Table 1). Of these, only 1,931 committed to adaptation targets. Only 168 action plans on adaptation are reported (Fig. 5), i.e., 8,75% of signatories on adaptation, while for climate mitigation action plans are submitted by 70% of the signatories. Reports on the monitoring of progress are submitted for 23% of the climate mitigation action plans and 2,9% of the adaptation action plans. More than 80% of the signatory cities to adaptation come from 6 EU countries: Italy (95), Spain (22), Belgium (15), Portugal (15), Greece (14) and Germany (11).

The majority of the Covenant signatories thus target climate mitigation. It can be concluded that adaptation planning at the local scale is lagging behind, both in terms in of commitments to adaptation, the submission of adaptation plans and the monitoring of progress.

Table 1: Overview of engaged cities in the Covenant of Mayors, for climate mitigation and adaptation

Number of engaged cities in Covenant of Mayors of Climate and Energy		
	Total (mainly climate mitigation)	**Climate adaptation**
Signatory cities	10,978	1,931
Action plans	7,765 (70.73%)	168 (8.7%)
Monitoring reports	2,545 (23.18%)	56 (2.9%)

(Status May 2022, source: Covenant of Mayors database)

Box 1. Good practice example: Water retention mechanisms in Lappeenranta, Finland

In its Sustainable Energy and Climate Action Plan (SECAP), the city of Lappeenranta states that various water retention methods will be implemented to reduce the impacts of floods and heavy rainfall. Increased evaporation and absorption must be attained by installing green roofs, sand beds and by reconstructing pavements with permeable asphalt technologies. This measure will be taken from 2022 until 2030. The city of Lappeenranta works on sustainable stormwater management in the TransformAr project.

Figure 3. Signatory cities to the Covenant of Mayors (status May 2022, source: Covenant of Mayors database, screenshot)

Box 2. Good practice example:

Training of volunteers on extreme climate events in Santa Maria Nuova, Italy

In Santa Maria Nuova in Italy, a project will be carried out between 2019 and 2025 to train volunteers on extreme climate events. Civil protection volunteers play a key role in guaranteeing effective and efficient support in case of a natural hazard emergency. Better prepared emergency services reduce damage and losses. Local volunteers receive training on how to respond to extreme weather events and high summer temperatures. Apart from the training, the Civil Protection Plan will also develop a database of citizens vulnerable to heat waves.

Figure 4. Signatory cities to the Covenant of Mayors that submitted an adaptation action plan (status May 2022, source: Covenant of Mayors database, screenshot)

Table 2. Connection of the TransformAr demonstrators to the engaged cities in the Covenant of Mayors for climate adaptation – (status May 2022, source: Covenant of Mayors database)

TransformAr demonstrators' involvement in the Covenant of Mayors for climate adaptation				
	N° of signatory cities (country level)		Demonstrator signatory to the Covenant of Mayors	
	on mitigation	on adaptation	on mitigation	on adaptation
Lappeenranta, FI	17 (FI)	0 (FI)	YES	NO
West Country Region, UK	61 (UK)	6 (UK)	YES (only for Cornwall council)	NO
Guadeloupe, FR	185 (FR)	6 (FR)	YES (for 4 municipalities)	NO
Oristano, IT	4,898 (IT)	95 (IT)	YES	YES
Galicia region, ES	2,849 (ES)	22 (ES)	YES (for 287 municipalities, not for the region as a whole)	NO
City of Egaleo, GR	229 (EL)	14 (EL)	YES	NO

Box 3. Good practice example:

Increasing green and shaded spaces in Vari-Voula-Vouliagmeni, Greece

The increase in green and shaded spaces in the Vari-Voula area will improve the quality of life of citizens and visitors and will contribute to reducing the heat stress and urban heat island phenomenon. Greek cities typically have densely built urban areas and limited green and/or open areas. Dense urban areas tend to be much warmer than rural areas, particularly at night – urban areas can often be up to 5 to 10°C warmer compared to the neighbouring rural areas. If trees are strategically placed - and as a result provide shade – they can directly reduce building temperatures by reducing the amount of solar energy that reaches a building's surface. Increased vegetation cools the air through evapotranspiration. Additionally ,the increased vegetation reduces the amount of cement and pavement present, while increasing soil. The soil then absorbs more water and increases evaporation, thus cooling the surrounding air. Greece experienced a record heatwave in summer 2021, with temperatures rising to 46 degrees Celsius.

3. Four approaches to adaptation governance: multi-level, market-based, network & polycentric, and community-led governance

Climate change adaptation requires action by multiple levels of government, the private sector, and civil society, in addition to "effective and simultaneous management and coordination of both top-down and bottom-up approaches" (Dickinson & Burton, 2011, p. 103). In this chapter we present the typology of four modes of governance that take both top-down and bottom-up approaches to adaptation governance involving state-led action to varying degrees, as illustrated and adapted from Bednar and Henstra (2018): **i) multi-level, ii) market-based, iii) network & polycentric, and iv) community governance.** More specifically, through the lens of these four domains, we present a summary of the policy and governance landscape in which climate change adaptation action can take place. We further seek to shed light on good practice examples that serve as illustrations of these modes of adaptation governance arrangements.

3.1. Multi-level and state-led approaches to governance

Multi-level and state-led governance refers to more of a top-down approach to state-centric governance. Even though non-state actors are involved and can provide information and knowledge, they are known to be "passive rule-takers" (Hall, 2011, p. 445). 'Command and control' instruments and regulations, from national policies, laws, regulations to permits are associated with hierarchical governance, and this approach has several strengths. First of all, it is a democratically legitimate approach to governance, where decisions flow indirectly from voters' mandates.[1] Secondly, state actors are more likely to have the resources and, in turn, the ability to deal effectively with complex tasks such as adaptation to climate change – by for instance, delegating tasks to departments and individuals with the relevant expertise. Inflexibility and lack of inputs from wider communities, nor consumers or producers may be a downside and in certain cases hinder innovation processes, however (Bednar and Henstra, 2018). The following section presents multi-level governance existing

[1]If a state hierarchy does not take public input into consideration, it will likely face resistance, and if the state hierarchy is represented by an authoritarian regime, this legitimacy does not apply.

at international, national, regional and cross-sectoral approaches to governance, and finally local adaptation governance – with a general focus on the EU.

National adaptation governance

As shown in Figure 5, all EU Member States have a dedicated adaptation policy (through a specific act to develop national adaptation strategies and policies) in place. Furthermore, all EU Member States have prepared climate change impact assessments and some Member States have begun with an evaluation of their strategies and adaptation measures. Non-binding policy frameworks for adaptation look to reduce vulnerability and increase resilience to impacts of climate change in the majority of cases. In addition, these frameworks aim to increase adaptive capacity and readiness to adapt to climate change impacts. The ministry of environment tends to be in charge of action on adaptation in most countries, and the inherent mechanisms that have been set up to coordinate action between administrative divisions and different levels of governance (EEA, 2020).

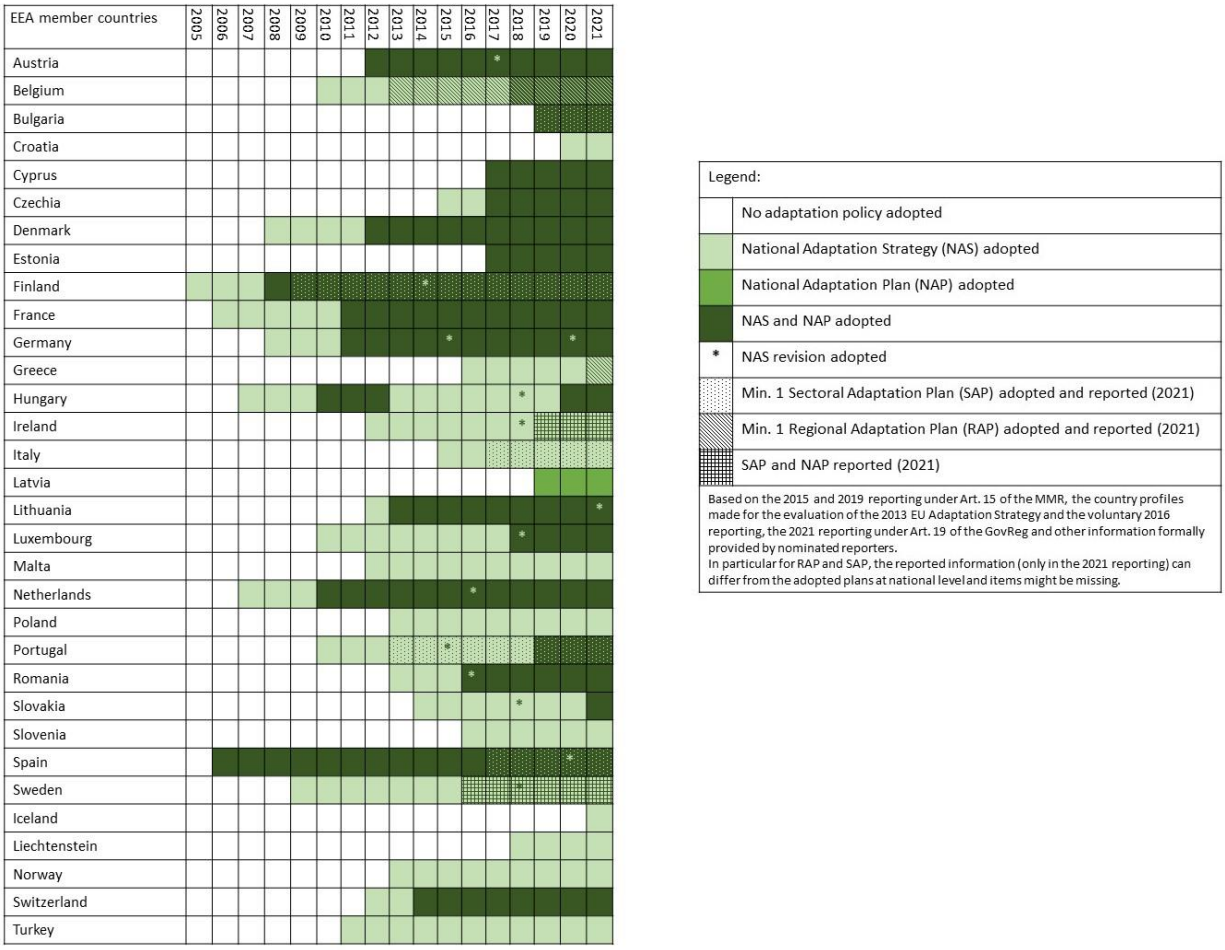

Figure 5. EEA overview of action on adaptation in EU Member States based on 2021 adaptation reporting, with elements from the 2019 reporting and the 2018 country scoreboard.[2]

As the EEA (2020) highlights, these mechanisms can include inter-ministerial committees (which exists in Austria and Germany), national coordination councils on climate change (currently in place in Bulgaria), and working groups on adaptation to climate change as already done in Czechia to only

[2] Source: EEA (upcoming) Assessment report on state of play of national adaptation actions - advancing towards climate resilience, European Environment Agency, publication foreseen in Q4 2022 and Climate-ADAPT (2022) Country Profiles (https://climate-adapt.eea.europa.eu/countries-regions/countries), European Environment Agency

name a few. In general, most countries are more likely to have established vertical coordination mechanisms on climate change adaptation than horizontal coordination structures.

As mentioned above, EU Member States are required to report to the European Commission every two years (since 15 March 2021) about their national adaptation planning (NAP) and strategies (NAS), while also reporting on Sectoral Adaptation Planning (SAP), climate change impact and vulnerability assessments or adaptation portals and platforms. The online portal Climate-ADAPT provides an overview of the country profiles. Prior to the development of the 2021 Adaptation Strategy the EU Member States completed an adaptation preparedness scorecard in 2018 to understand their progress towards climate resilience. Section 5 of this report provides an in-depth analysis of the national adaptation governance structures in place in TransformAr's demonstrators: Finland, France, Greece, Italy, Spain and the United Kingdom.

Regional, local and sectoral adaptation governance

While the role of regional governance is an important part of the equation when it comes to ensuring successful adaptation governance, regional planning in multi-level adaptation governance has not been widely analysed in the literature. The regional approach is relevant due to the risk being addressed both at physical and governance levels.

Regional cooperation is especially important when it comes to water security for example. Even though rivers ignore borders, policies tend to be nationally developed. Taking regional components into account is crucial, as policies and actions decided at the national level directly affect any other country that shares the county in question's ecosystem. Action at the regional level can include collaboration between public, private and voluntary organisations at multiple levels to adapt to the effects of climate change (Tigre 2016; Tigre 2019). River contracts, as exemplified in Box 4, is one such policy instrument (Cialdea and Pompei, 2021).

Box 4. Good practice example: "River contracts" as example for multi-level governance

For rivers in **Spain, France and Belgium**, partnerships are formalised by "**river contracts**". A river contract is a means to restore, improve or conserve a river through a series of actions that are agreed in a broad participatory process with all basin users, private and public entities involved in water management. It often involves regional and local authorities. Parties to the Contract define their own management objectives and guidelines and develop a plan of action which benefits from the input of local expertise. A river committee acts as the permanent secretariat of the river contract. Typically involved sectors are the water, agriculture and environment sector. In Sardinia, following the similar concept, a coastal contract has been developed with all actors in order to jointly manage the coastline in the Oristano region.

Box 5. Good practice example:
Regional adaptation governance in Sardinia and the coastal contract (COAST)

The Regional Strategy for Adaptation to Climate Change (SRACC36) contains Sardinia's future climate scenarios to 2050, illustrates vulnerability and adaptive capacity, defines the implications of climate change in some priority sectors and multi-level governance for the integration of adaptation at the different levels. In this context, it defines the River/Lake/Coast Contract as an important tool to implement adaptation strategies such as the COAST, signed in February 2021. In the framework described above, COAST acts as a tool to test and modify the regional climate change strategy, with the main aim of increasing the resilience of the whole area of the Gulf of Oristano and the Sinis Peninsula - through the implementation of interventions to reduce the artificialisation of the territory and the restoration of natural systems - and to raise awareness among the population (Khamis et al., 2022). COAST is an instrument that will ensure greater coordination between different levels of spatial planning and authorities in charge of coastal wetlands management, while limiting conflicts between preservation issues and economic activities. COAST further promotes voluntary agreements between public institutions and private individuals, new forms of institutional cooperation, new ways of integrating the different practices of spatial and sectoral planning.

Figure 6. Sardinian wetland in the Gulf of Oristano. Source: TransformAr (2022)

Box 6. Good practice example:
Multilevel flood governance in Belgium

Land-use planning is central to the zoning of vulnerable infrastructure, industrial and domestic while at the same time also foreseeing space for nature. Expansions of cities and agricultural land change the water flow regime, and likely result in increased risk for floods and droughts, often downstream of new developments. Disaster-smart land-use planning aims to prevent damage and losses. Measures that (re-)organise land use in a sustainable, disaster-smart way can reduce the impacts of water scarcity and droughts e.g. by enhancing infiltration or improving the soil's water holding capacity. Examples of disaster-smart land-use planning refer to the regulation on the location where new infrastructure can be build, and to the removal or relocation of vulnerable structures from flood prone areas to areas with lower probability for floods. **Land-use planning is cross-sectoral and requires the engagement of multiple stakeholder groups, including authorities, communities and companies.**

The **Sigmaplan** provides protection for the region of Flanders, Belgium against the flooding of the Scheldt river in Belgium. At the start, the Sigmaplan aimed at providing a similar protection as the more famous Dutch Delta plan. However, the strategy taken under the Sigmaplan differed fundamentally. In addition to dike strengthening and heightening, and a storm surge barrier near Antwerp, the Sigma plan has constructed natural flood control areas upstream of the city of Antwerp. Flood control areas are low laying polders, connected to the river, that can absorb excess water and provide room to the river. At the same time, the Sigmaplan aims to create a multi-functional landscape, that will be beneficial for nature, tourism, shipping and agriculture. Farmers that are negatively affected by the creation of the flood control areas are financially compensated. The original Sigmaplan, started in 1977. An update version is currently under implementation and should be completed by 2030. The updated plan uses nature-based solutions in a disaster-smart and sustainable land-use planning.

Figure 7. The river Scheldt in Antwerp. Source: University of Antwerp (2022)

The implementation of top-down adaptation measures is in general governments' and local communities' responsibility. Even though the impacts of climate change are transboundary, its effects are local and can differ significantly from one area to the next depending on its level of vulnerability. Each local area – whether it is urban or rural – will have a particular set of geographical, physical, socio-economic, political and environmental factors that will inform the vulnerability of a community to climate change. These different parameters generally means that a one-size-fits-all policy framework cannot be applied when considering climate change adaptation (Climate Chance & Comité, 2019; European Committee of the Regions, 2020).

Detailed and local knowledge of a community is key to ensure a successful adaptation to the impacts of climate change. For instance, it is at the local level that it possible to assess the "translation of knowledge and capacities into behaviours and actions into real-life conditions" (OECD, 2009, p. 151; Climate Chance & Comité, 2019, p.33). Cities in particular, as a system concentrated human activities, will play an important role in future adaptation efforts and activities: half of the world's population lives in an urban setting, which is expected to increase to two-thirds by 2050 (Climate Chance and Comité, 2019). Many regions and municipalities have adaptation strategies at a territorial scale, and as exemplified by the #WeResilient strategy, they can provide guidelines, but their implementation cannot be enforced and ensured in the same was that top-down approaches can be enforced and ensured.

Box 7. Good practice example: local adaptation governance example

#WeResilient: Multi-scale risk-informed sustainable development (Italy)

The Province of Potenza (Italy) developed the **"#WeResilient strategy**", a territorial development strategy integrating environmental sustainability, territorial safety and climate change at provincial and local levels. The #WeResilient strategy aims to support and coordinate the 100 municipalities located in the Province in outlining and implementing local resilience and sustainable development strategies and actions. The strategy is composed of a long-term vision, an effective plan and subsequent concrete actions and strong multi-stakeholder and community engagement. The Province supported the creation of local conditions to manage hazard, mitigate risks and improve local sustainable development with a multiscale and multilevel holistic approach. The #WeResilient strategy accounted for the interdisciplinary nature of risk. DRR is considered in all decisions at all scales and in all dimensions. The enhancement of local resilience is seen as an essential pre-condition for achieving any sustainable social and economic development. The approach contributes directly to the Sendai framework and the Sustainable Development Goals. The Province is recognised by UNDRR as a role model for inclusive resilience by UNDRR, in recognition of the substantive community involvement (Attolico and Smaldone, 2019).

Since 2013, the province has included disaster resilience in its regional sustainable socio-economic development strategies, turning it into a real structural territorial action to be implemented by influencing and orienting urban planning. Meanwhile, the Province of Potenza, has established a permanent network for regional coordination around disaster risk reduction, investing in structural infrastructure as well as public awareness and communication campaigns. In 2022, the province of Potenza has been recognised by the UN-led coalition Making Cities Resilient 2030 for pioneering strategies to reduce the impact of disasters.

Box 8. Good practice example: regional and local adaptation governance in Normandy and the city of Rouen

The French National Adaptation Strategy and the creation of the Grenelle II law came before the regional climate plan in Normandy and the local climate plan for Rouen representing a more reactive rather than proactive approach to climate action. This example of the region of Normandy and the city of Rouen demonstrates a top-down approach to climate adaptation governance.

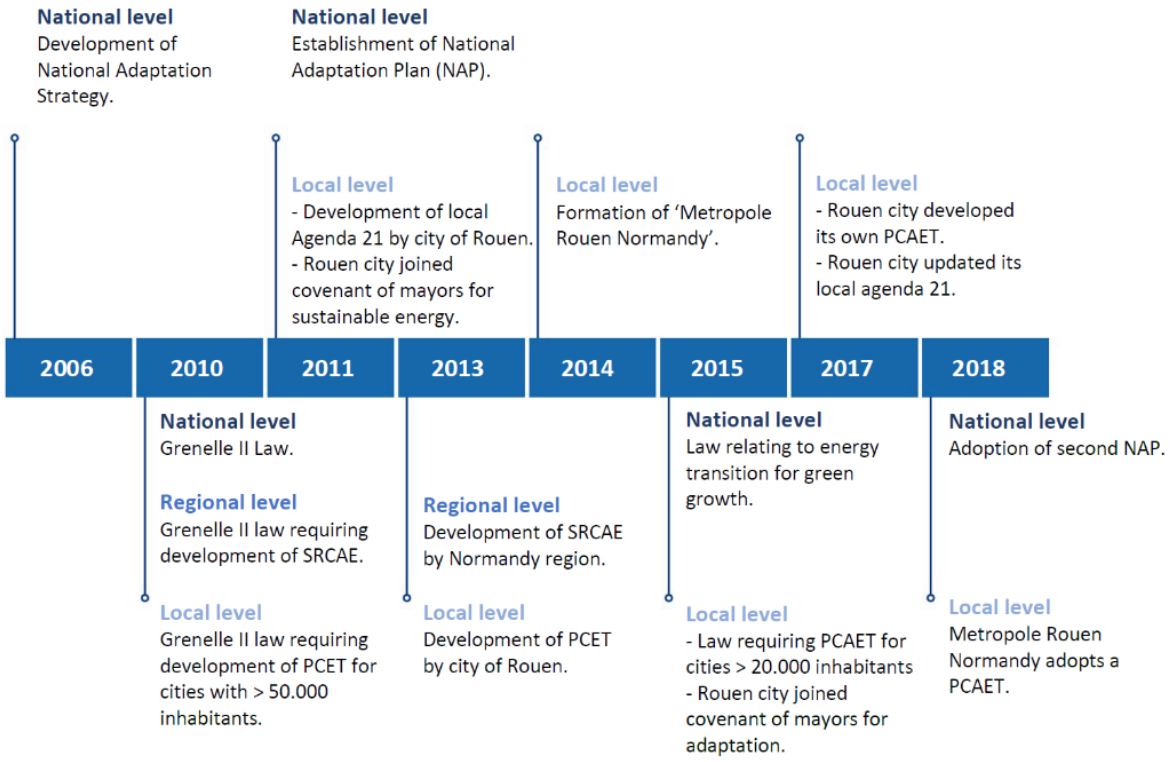

Figure 8. Timeline of strategy development at a national, regional, and local scale serving climate adaptation in Rouen, France. Source: Khamis (2021)

3.2. Market-based governance

Market-based governance in adaptation is coordinated through what can often be referred to as the 'invisible hand' of the market (Smith, 1795), or in other words, coordinated action that is enabled through market-driven behavioural change. Market-based governance differs from state-led and a top-down approach to governance in that any actor participating in the market will have some form of influence on the success or failure of the action on adaptation to climate change – whether it will be through negotiation or competition.

Economic instruments are well-known policy responses that allow for finite and scarce resources to be used in a more efficient way, and to also allow for risks to be better and more effectively shared. Such economic instruments can include taxes, subsidies, insurance, water pricing, intellectual property rights or any other instrument that will transmit a market signal that can shape and change the behaviour of market participants. Ideally, resources will be optimally priced-in (at a level equal to the social cost of the associated externality).

If the resource is correctly priced-in, market participants will be incentivised to invest in sustainable alternatives, reducing the need for further adaptation measures. A drawback that can arise from economic instruments is if negative externalities are not accounted for or correctly priced-in; when finite resources can be priced well below their social cost – which has for decades been the case for fossil fuel-based energies for example. Many examples illustrate the importance of market-based governance and economic instruments in climate change governance, such as water pricing. Over-use will be avoided when the finite resource – and in this case water – is correctly priced. Economic instruments are known to represent a flexible, as well as a low-cost alternative to other adaptation measures. Similarly, insurance schemes can also encourage behaviour to both reduce vulnerability and generate funds that will boost resilience to climate change (Chambwera et al., 2014).

Box 9. Good practice example: market-based adaptation governance:
Payments for Ecosystem services

An example of market-based adaptation that encourage adaptive behaviour governance are Payments for ecosystem services (PES) schemes. These schemes pay landowners, - often in rural areas - to preserve their land and properties in view of contributing to both climate change mitigation and adaptation. Nonetheless, PES schemes only work when the public sector makes sure that rights are well-defined, and that agreements respected (Chambwera et al., 2014).

PES is referred to as a number of innovative, market-based incentive schemes that reward land managers for maintaining and improving environmental benefits such as water quality, flood regulation, climate regulation and certain provisioning and cultural ecosystem services. PES schemes are voluntary and demonstrate outcomes and results that go beyond what would normally be expected of actors. PES schemes are also conditional on environmental improvements made.

As an example, the **Channel Payments for Ecosystem Services (CPES)** project (2017-2020) aimed to improve water quality in rivers and lakes located in the South of England and North of France through the implementation of Payments for Ecosystem Services schemes in six case-study catchments. It was a project managed within the Interreg VA France (Channel) England programme. Some conclusions were drawn from the 14 project partners:

- Sustainable PES is achievable, both in France and in the UK. It has required the development of a wide ranging and innovative toolbox of commercial, legal and intervention resources. resources.
- CPES undertook an extensive set of trials on a variety of farming practice interventions that together, will not only improve water quality but also have sustainable impact on biodiversity, soil health, carbon sequestration and sustainable food production.
- There is commitment from water companies to continue promoting PES schemes; from Eau de Paris and Seine Normandie in France and from Portsmouth Water and Southern Water in the UK.
- PES schemes make a direct connection between community engagement, commercial agreement and measurable outcomes that affect society as a whole which increases likelihood for success.
- Although PES schemes are relatively straight forward to achieve where there is a single large buyer (E.g. a water company), even this relationship can be commercially fragile. In this case and when there is no single large buyer, there is an opportunity to pursue an integrated approach covering multiple eco systems and multiple public and private buyers. Achieving this will require the development of relevant legal and financial agreements. These do not exist at this time.
- It is likely that such complex arrangements will require some form of market or not for profit intermediation/ brokering.

3.3. Network & polycentric adaptation governance

Network governance of climate change adaptation involves collaboration between various stakeholder groups, non-governmental and governmental organisations, as well as companies. Rather than representing a top-down hierarchical approach, network governance represents a more horizontal approach. It shall be highlighted, though, that governments can be active actors of network governance; take as example well-established initiatives, such as ICLEI, C40 and the EU Covenant of Mayors, that aim to cross-pollinate local solutions in the international realm.

These models of network governance are also referred to as meta-governance, multi-sectoral or multi-level governance, as well as polycentric governance. It is trust and reciprocity that in general is considered to bring actors together to form modes of network governance, that is considered to be a key component to bring forward different ideas, perspectives and expertise in solving complex societal issues. Nonetheless, criticism of this type of governance often arises due to its non-hierarchical nature which may in some cases (Hertting & Vedung, 2012). However, by collaborating with non-governmental organisations, as well as industry associations and other stakeholders, valuable resources and knowledge are brought to the fore to facilitate action on climate change adaptation.

Box 10. Good practice example: network-based adaptation governance in Galicia

In Galicia, behavioural change for transformational adaptation in the aquaculture sector is encouraged through the creation of a Resilience Index for the mussel aquaculture. The information gathered and modelled, and the prioritisation carried out through consultation processes with experts and stakeholders will be compiled in a resilience index, associating main risks and vulnerabilities with resilience factors and recommendations. The creation of this resilience index can be considered a form of network governance, bringing together non-governmental organisations, stakeholders and key participants that will eventually bring strategies of digitalisation and automation closer to the shellfish sector based on the integration of Internet of Things and artificial intelligence. The remote visualisation of the data on an internet-based platform is also valued; particularly in the marine sector, where the installation cannot be accessed quickly and at the desired time.

Box 11. Good practice example: market-based adaptation governance
Paris Climate Bonds

Green bonds are financial instruments that can be issued by both private and public organisations seeking capital, in compliance with the EU Taxonomy and the EU Green Bond Standards. Green bonds differ from standard bonds in the purpose of the financing: They provide an opportunity for environmentally conscious investors to invest in sustainable solutions, inclusive supporting local governments for funding green infrastructure.

In Paris, France, to achieve the climate resilience goals established by the 2007' *Plan Climat de Paris*, the city council announced in 2015 an investment worth 300 million euros in climate transition projects. From those, 115 million were invested in interventions aimed at making public buildings more energy efficient; 60 million to works aimed at protecting the city from the effects of climate change, and 5 million to generating renewable energy (NDC Partnership, 2019).

The Paris City Council found funding through the **issuance of a green bond**. Investors could invest in such green bond for the first time in late 2015. The **Paris Climate Bond** had a value of **300 million**, with a nominal interest rate of 1.75% per year. The bond was a success, as investor requests far exceeded the subscription amount. A **second**, broader **sustainability bond raised €320 million** in 2017 to finance both green and social policy goals of the city government (Ville de Paris, 2020). Two more sustainability bonds followed in 2020 and 2021.

In addition to financing benefits, green bonds cast climate plans like the Paris one in a **contract that makes results measurable and targets enforceable**. By making their environmental results public, green bond issuers create a **robust and transparent financing model** that all parties can gain from (UNDP, 2018).

Typical policy instruments that are associated with network and polycentric governance include self-regulation, accreditation schemes, and codes of practice for example (Hall, 2011). An important component of such a form of governance is a common interest to collaborate, in addition to an egalitarian distribution of resources and responsibilities among those taking part – ensuring improved trust and equality among participants (Bednar and Henstra, 2018). Horizontal and bottom-up approach to governance often increases the acceptability of adaptation measures in comparison to a top-down approach as trust often increases the greater the involvement of communities.

Box 13. Good practice example: Network-based adaptation governance

Climate Change Adaptation Network in Guadeloupe

The Climate Change Adaptation Network in Guadeloupe is a network that aims to encourage adaptation to climate change, based on the sharing of experiences. It is led by ADEME Guadeloupe, in cooperation with the Guadeloupe Region, the French Development Agency (AFD) and the Banque des Territoires (Caisse des Dépôts Group). In this context, calls for projects have been launched since 2014. They aim to support institutions in a vulnerability diagnosis process, via the "Climate Impact" method, then via the development of an Action Plan for adaptation to climate change. 11 Guadeloupe communities and one public institution are now involved in this process. In order to share and develop this approach, ADEME Guadeloupe recently submitted the CLARAC project — Caribbean local authorities resilience and adaptation to climate change — to the Interreg Caraïbe programme. With partners from Guadeloupe, Martinique and Dominica, this project aims to strengthen strategic ecosystems, through pilot actions to restore and preserve ecosystems, and to develop the capacity for action of local communities by acting on:

- Institutional capital: networking of actors, creation of an exchange platform;
- economic capital: mobilising financial funds to serve the objectives of communities;
- human capital: training of technicians and elected officials;
- Physical capital:economic reward system for territories that preserve their environmental heritage.

The Regional Observatory for Energy and Climate (OREC) publishes, every two years, a vulnerability profile of Guadeloupe to climate change and the key climate figures in Guadeloupe. Founded by ADEME Guadeloupe, the Region, the Department of the Environment, Planning and Housing (DEAL), EDF Archipel Guadeloupe and Météo-France, the observatory is hosted by the Synergîle competitiveness cluster.

3.4. Community-led governance

Community-led governance represents a bottom-up approach to governance, wherein community members take action on climate change adaptation without the direct support from state actors. Instead of acting as policymakers, local governments can instead act as 'policy takers' to provide resources to the communities promoting plans of action. Traditional policy instruments that are involved in community-led governance are relatively affordable and include educational campaigns, demonstrations and public deliberations to only name a few (Hall, 2011).

Box 15. Good practice example: Community-led governance

Self-adaptation: homeowners elevating their houses for protection against climate impacts

In New Jersey, USA, after Hurricane Sandy (2012) much of the buildings were destroyed and rebuilt on the same place, given that the regulation did not forbid occupation in high risk zones. In this process, however, homeowners have chosen to pursue self-adaptation through different strategies, such as putting houses up on stilts.

Community-led governance takes advantage of local contexts, cultures and knowledge in encouraging behavioural change within communities. There are certain drawbacks and risks that are associated with community-led governance, though – including too high expectations from local consensus, lack of local resources, and difficulties in establishing collaborations with state actors (Bednar and Henstra, 2018).

Box 14. Good practice example: Community-led governance

Citizens in Court for Climate Goals: The Urgenda Foundation v. State of the Netherlands

"The Urgenda Climate Case against the Dutch Government was the first in the world in which citizens established that their government has a legal duty to prevent dangerous climate change. On 24 June 2015, the District Court of The Hague ruled the government must cut its greenhouse gas emissions by at least 25% by the end of 2020 (compared to 1990 levels). The ruling required the government to immediately take more effective action on climate change.

On Oct 9, 2018, the Hague Court of Appeal upheld the District Court's ruling, concluding that by failing to reduce greenhouse gas emissions by at least 25% by end-2020, the Dutch government is acting unlawfully in contravention of its duty of care under Articles 2 and 8 of the ECHR. The court recognized Urgenda's claim under Article 2 of the ECHR, which protects a right to life, and Article 8 of the ECHR, which protects the right to private life, family life, home, and correspondence. The court determined that the Dutch government has an obligation under the ECHR to protect these rights from the real threat of climate change.

The Climate Case, which was brought on behalf of 886 Dutch citizens, made climate change a major political and social issue in the Netherlands and transformed domestic climate change policy. It inspired climate change cases in Belgium, Canada, Colombia, Ireland, Germany, France, New Zealand, Norway, the UK, Switzerland and against the EU."

4. Sustainable finance & funding

4.1. Taxonomy on Sustainable Finance

In order to better direct investments towards climate adaptation, and sustainable development more broadly, the EU Taxonomy on Sustainable Finance has been adopted in 2020. The Taxonomy describes which economic activities can be considered as environmentally sustainable. The classification of activities aims to help companies, investors and citizens to make sustainable investment decisions, and explicitly aims to avoid greenwashing. An economic activity is considered environmentally sustainable under the Taxonomy if it contributes substantially to one or more of the, in total six, environmental objectives (see box 16) and does not significantly harm any of the environmental objectives.

Box 16. The six environmental objectives of the EU Taxonomy on Sustainable Finance

1. Climate change mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine resources
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems

The EU Taxonomy Delegated Act specifically classifies which activities contribute to mitigating and adapting to the effects of climate change. It lists which activities may contribute substantially to climate adaptation, while at the same time indicating whether a 'Do No Significant Harm' (DSNH) check is needed for other environmental objectives. In order to comply, climate change adaptation solutions may thus not cause significant harm to the other (five) environmental objectives of the taxonomy, which are: climate change mitigation, the sustainable use and protection of water & marine resources, pollution prevention and control, circular economy, and the protection and restoration of biodiversity & ecosystems. Currently, 68 economic activities across various economic sectors have been listed for their potential to deliver a substantial contribution to climate change adaptation. Listed activities reduce the physical impact of climate change, but also support systemic adaptation and the monitoring of adaptation results. The EU Taxonomy Compass is designed as an online tool to facilitate more easy access to the content of the Taxonomy.

To assess whether a solution contributes substantially to climate change adaptation, a technical screening criteria have been developed. The Platform on Sustainable Finance is advising the Commission on the further development of the Taxonomy. The latter is now open to a consultation procedure (June 2022). Technical guidance is also developed in 2021 on how to apply the DNSH principle, in particular for the EU Recovery and Resilience Facility (see Figure 6). The guidance is applicable as well for adaptation planning at local and regional scale.

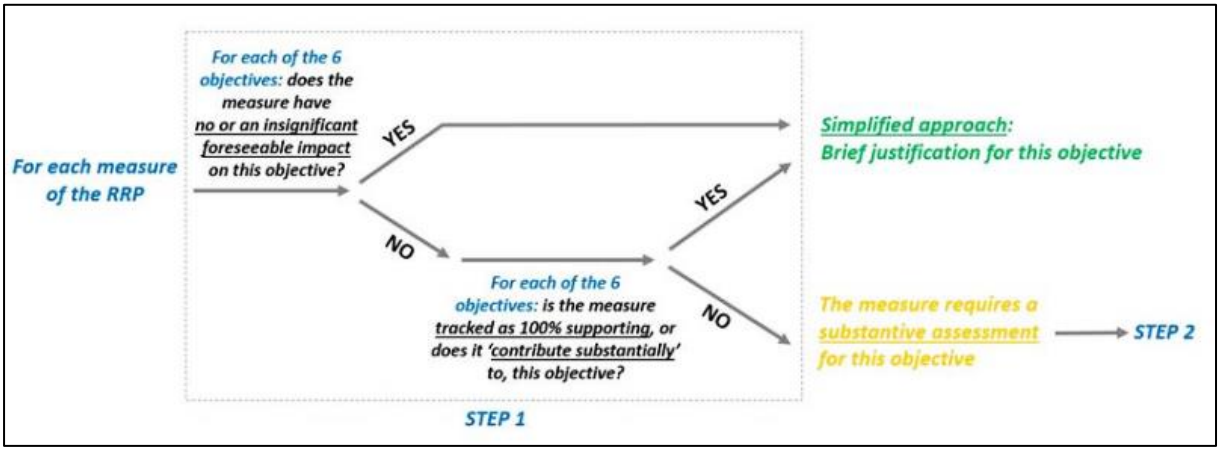

Figure 9. Decision tree to be followed for each measure of the Recovery and Resilience Plans

Box 17. EU-taxonomy aligned projects

In 2020, EY performed a study selecting a list of 'shovel-ready' investment opportunities that have the potential to fulfill EU Taxonomy requirements and the EU Circular Economy Action Plan. EY identified and analysed 2 000 projects which were in an advanced stage of development and expected a financial close within the next two years. The project list established focuses on five main sectors: energy, transport, buildings, industry and land use. Climate benefits of the projects were evaluated and referenced the EU taxonomy report and its technical annex from March 2020. EY noted that demonstrating compliance with EU taxonomy is a difficult exercise, especially in the building or land use sector, where the level of foreseen energy savings performance or the global environmental analysis determines compliance with EU taxonomy.

The 2020 study of EY underlines that the majority of project developers do not refer to the framework to demonstrate their project's climate benefits and do not disclose information that can prove compliance either. A distinction was therefore made between two types of projects; projects aligned with EU taxonomy and a clear climate benefit and projects with clear environmental benefits but for which a rigorous compliance check was not possible with the available information.

Some interesting conclusion can be drawn from the resulting project list. A significant number of projects are located in Central and Eastern European countries. Large economies (France, Germany, Spain and Italy) have projects evenly divided over all five sectors (energy, building, transportation, industry and land-use). The investment requirements of the selected projects would represent a significant portion of the EU stimulus grants. The project's investment size show great diversity, with 20% small projects (<€5 million) and 30% innovative start-ups and SMEs working on sustainable mobility solutions, green hydrogen, land remediation and low carbon constructional materials. EY concludes that the selection of these projects is just a small number of the green projects that are under development in Europe.

4.2. EU Funding for Adaptation

The EU finances adaptation to climate change in Europe through several instruments. A summary can be found on Climate-ADAPT and the European Commission's website. An overview is also given in Table 3. Overall, at least 30% of the EU overall budget (1,824.3 billion Euro) is earmarked for climate action (mitigation and adaptation) and supporting green projects. Climate adaptation actions therefore have to be integrated into all the major EU investment programmes. The 1,074.3 billion Euro foreseen under the regular EU budget, called the Multiannual Financial Framework (MFF) for 2021-2027, is complemented with 750 billion Euro that is allocated under the NextGenerationEU (NGEU).

NGEU has been setup to fuel recovery and resilience in response to the Covid-19 pandemic. A brochure on the EU's 2021-2027 long term budget and NextGenerationEU has been developed. The majority of the NextGenerationEU funds are spent under the Recovery and Resilience Facility (RRF). To benefit from the support of the Facility, Member States must submit their national recovery and resilience plans (NRRP) to the European Commission. The Member State is responsible for the actions that are included, the spending and consequent follow-up of the received funding. Each plan however shall include a minimum of 37% of expenditure for climate investments and reforms and a minimum of 20% to foster the digital transition. The currently approved national plans indicate that almost 40% of their spending is allocated to climate measures and more than 26% to the digital transition, above the set minimum thresholds. The Recovery and Resilience Scoreboard provides an overview of how the implementation of the Recovery and Resilience Facility (RRF) and the national recovery and resilience plans is progressing.

The main funds and programmes under the MFF are associated to the EU Cohesion Policy (about 1/3 of the EU budget), the Common Agricultural Policy (about 1/3 of the EU budget) and to a lesser extent the Common Fisheries Policy (6 billion Euro). These funds are managed by the Member States, through partnership agreements with the European Commission. The latter means that applications to funding need to be submitted and approved in the country. The EU Cohesion Policy, alternatively named the Regional Policy, is the EU's main investment policy, aiming for job creation, growth, social integration and better cooperation in the EU regions. Climate adaptation (incl. disaster risk reduction) and sustainable development are eligible under the Cohesion Policy. Investments under the Cohesion Policy is delivered through four funds: the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF) and the Just Transition Fund (JTF). In the period 2014-2020, the ERDF, ESF and CF, together with the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF), are jointly referred to as the 5 European Structural and Investment Funds (ESIF). A tracking system is put in place to follow the investments under ESIF in the past period (2014-2020). For the period 2021-2027, the ESF has evolved to ESF+, and the EMFF to the European Maritime, Fisheries and Aquaculture Fund (EMFAF).

Other EU financial instruments that are relevant to climate adaptation are managed centrally by the European Commission. These include the InvestEU Fund, LIFE and Horizon Europe. InvestEU combines 13 centrally managed EU financial instruments and the European Fund for Strategic Investments into one instrument. The LIFE programme is the EU's funding instrument for the environment and climate action, whereas Horizon Europe is the key EU funding programme on research and innovation.

Table 3. Overview of the EU investment funds and their target for climate investments

EU funding programme	Description	Climate contribution
Horizon Europe	Scientific, technological, economic, environmental and societal impact support to all forms of research and innovation.	35%
InvestEU	Providing the EU with crucial long-term funding, crowding in private investment, supporting the recovery and a greener, more digital and resilient Europe.	30%
European Regional Development Fund (ERDF)	Strengthening EU economic, social and territorial cohesion by correcting imbalances between regions through programmes implemented by local authorities. Mainly through INTERREG projects.	30%

Cohesion Fund (CF)	Reducing economic and social disparities and promoting sustainable development. Only for countries with lower-than-average Gross National Income.	37%
Recovery and Resilience Facility	Key instrument of NextGenerationEU to help the EU emerge stronger and more resilient from the current crisis through National Resilience & Recovery Plans (NRRP).	37%
Union Civil Protection Mechanism (rescEU)	Strengthening cooperation between EU Member States and 6 Participating States in the field of civil protection, with a view to improving prevention, preparedness and response to disasters.	N/A
European Social Fund+	Investing in people with the aim of building a more social and inclusive Europe.	N/A
European agricultural fund for rural development (EAFRD)	Supporting rural areas and strengthening the EU's agri-food and forestry sectors.	40%
European Maritime, Fisheries and Aquaculture Fund	Supporting small-scale coastal fisheries, young fishers and outermost regions, as well as the promotion of sustainable aquaculture.	30%
Programme for Environment and Climate Action (LIFE)	To achieve the shift towards a sustainable, circular and resilient economy, protect and restore the environment, halt and reverse biodiversity loss.	61%
Just Transition Fund	Supporting the transition towards climate neutrality by alleviating its socio-economic impact in the regions most affected.	100%
Overseas Countries and Territories	Promoting economic and social development of the Overseas Countries and Territories, increasing their resilience and competitiveness, reducing vulnerability	20%

***Source**: European Commission*

Table 4. Overview of expenditures of EU investment funds in TransformAr demonstrator countries

	European Structural and Investment Funds (ESIF)	National Resilience and Recovery Plans (NRRP)
FI	Open Data Portal – ESIF – Finland	Finland's recovery and resilience plan
UK	Open Data Portal – ESIF – UK	N/A
FR	Open Data Portal – France	France's recovery and resilience plan
IT	Open Data Portal – ESIF – Italy	Italy's recovery and resilience plan
ES	Open Data Portal – ESIF – Spain	Spain's recovery and resilience plan
GR	Open Data Portal – ESIF – Greece	Greece's recovery and resilience plan

Box 18. Good practice example: national resilience plans

National Reforestation Plan and Parnitha flagship investment, Greece

This project received a total funding of 223 990 000 EUR. The Green Recovery Tracker, using the EU taxonomy as their assessment methodology, indicates that the project has a positive climate impact, which means that the measures make a significant, transformative contribution to climate change mitigation. The project investment consists of (i) the restoration of 16,500 ha of degraded forest ecosystems in Greece and (ii) a flagship project for Mount Parnitha in the north of Athens, which will "restore its natural environment, better protect it from wildfires, while also improve access to it and reconstruct abandoned facilities for mild uses."

Box 19. Good practice example:

Monitoring climate change in the Pyrenees to help the territory adapt in Spain and France (OPCC2)

The EU-funded OPCC2 project (Interreg) is helping to tackle new challenges of climate change through education and awareness raising. The project has complied key information on climate change impacts on the Pyrenees region. The information is publicly accessible on a multilingual and easy-to-use digital platform. By 2023, the project coordinators estimate that 5.4 million people will have visited the platform and is therefore playing an important role in forming policymaking on the preparation, mitigation against and adaptation to the effects of climate change. The project started in 2016 with a total budget of 1.2 million EUR, of which the EU funded 780.000 EUR through the Interreg-programme. The OPCC website contains a range of educational information; a database on good practices, a geoportal showing data on the actual climate, predicted future climate, biodiversity, hydrology etc. OPCC also organizes summer schools and seminars.

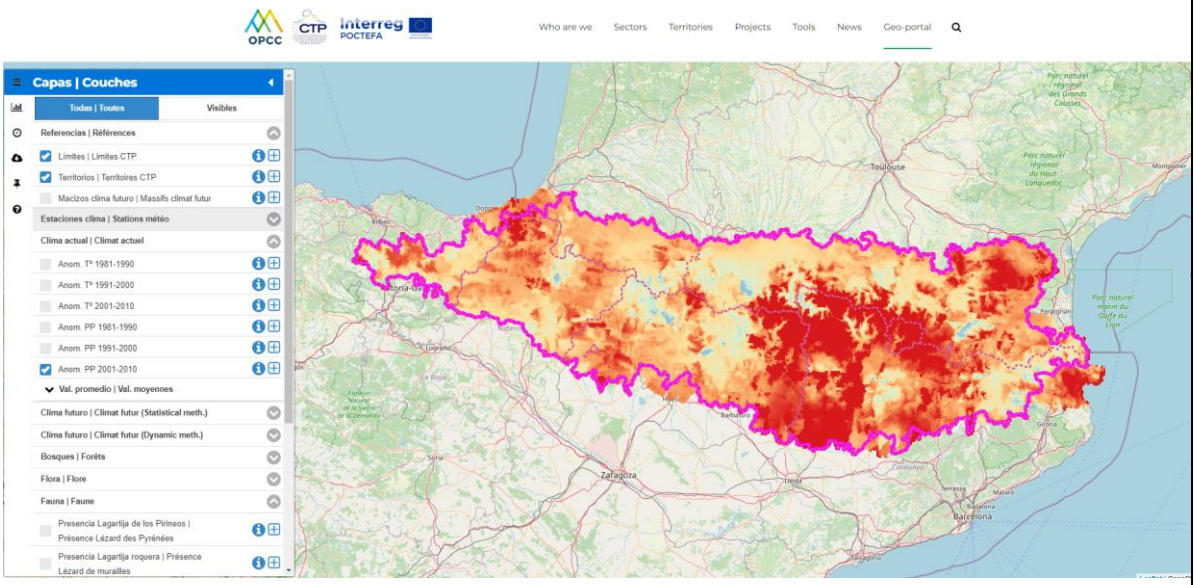

Figure 10. OPCC Geoportal

Source: OPCC Geoportal [online] URL: https://opcc-ctp.org/en/geoportal

Box 20. Good practice example:

European cities join forces to deliver blue-green infrastructure projects in Belgium, Germany, The Netherlands, Sweden, Norway and the United Kingdom

The BEGIN (Blue and Green Infrastructure through Social Innovation) cross-border project facilitates innovative blue-green infrastructure pilots in ten cities of the North-Sea region. These pilots help the cities respond to extreme weather and improve living environment, while at the same time boosting community cohesion. The projects reduce flood risk by up to 30%. The project was funded by the Interreg North Sea program with 3,5 million euro. The total project budget was 7,5 million euro. The approach to the project is included in city master plans and has contributed to national and regional policies. More than 5700 stakeholders – mostly citizens – helped co-create the projects. The project started in 2016 and is still ongoing. Pilot projects are e.g. reconnecting rivers and canals in Antwerp, a green corridor through Gent, a city park in Gothenburg and a wetland in Aberdeen.

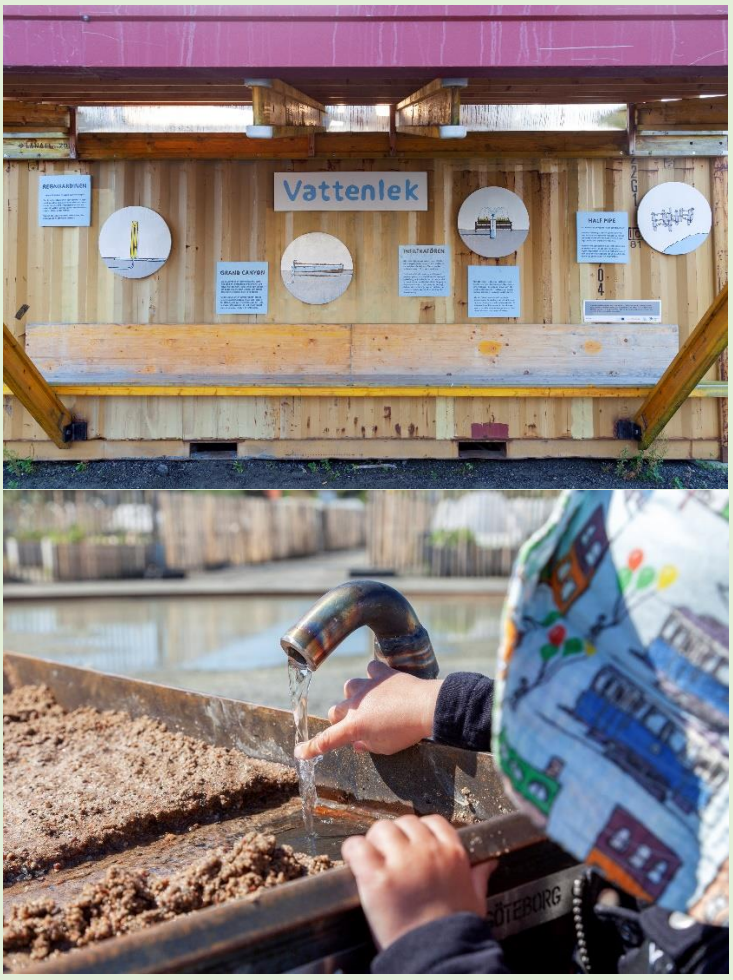

Figure 11. Jubilee Park in Gothenburg (source: Interreg North Sea Region BEGIN, 2022). Photographer: Cecilia Helsing, BEGIN project

4.3. Mainstreaming climate change adaptation in sectoral policy

Mainstreaming climate change adaptation into EU sectoral policies and EU funds is an essential component of the EU Adaptation Strategy.

For instance, the EU Adaptation Strategy states that:

"Climate change is having such a pervasive impact that our response to it must be systemic. The Adaptation Strategy stresses the importance of implementation of adaptation strategies and plans at all levels of governance. In this systemic approach, there are three cross-cutting priorities: integrating adaptation into macro-fiscal policy, nature-based solutions for adaptation, and local adaptation action"

And that

"Policy coherence must systematically consider adaptation to avoid inadvertently undermining it. Whenever relevant, EU and Member State policymaking should apply the following policy coherence principles: ensure that regulation and funding take into account disaster risk to avoid creating new exposure; reduce existing risk by building up resilience, prevention and preparedness; manage residual risk. These principles should be integrated, for example, in calls for tender and selection criteria for EU-funded projects as well as taken into due account when designing policies more generally."

5. The current state of adaptation in the TransformAr's six demonstrators

5.1. The Adaptation Preparedness Scorecard

In 2018, the European Commission developed Adaptation Preparedness Scorecards for all EU Member States as part of its evaluation of the EU Strategy on Adaptation to Climate Change. The Adaptation Preparedness Scorecards summarise legislative and executive frameworks, as well as adaptation measurement criteria that currently exist in all Member States. A summary table, presented below (Table 5), was developed based on the responses provided by the respective Demonstrators' National governments to the EU (European Commission, 2018). They reflect the state-of-the-art from a macro-governance perspective, and may not necessarily reflect the preparedness of a given region or sectoral of adaptation policy. Sometimes local authorities are more proactive that the national government, and other times the national government is more proactive than the local government.

In general, the evaluation illustrated that the EU Strategy on Adaptation to Climate Change has captured policymakers' attention to increase focus on climate hazards and boosting resilience in European regions and communities. For instance, as a result of the strategy, climate change considerations are increasingly being integrated into EU policies and budgets. Nonetheless, action is needed to synchronise the EU Strategy with action on sustainable development, biodiversity and risk reduction, in addition to cross-sectoral at local, regional and national levels.

What became clear through the evaluation, was that a voluntary approach to adaptation (often at the level of the organisation taking action) has until now been at the forefront of action, but as public knowledge and urgency required increases, a more active and effective policy approach is needed. Improved transparency and visibility of adaptation preparedness, due to increased reporting obligations through existing EU monitoring mechanisms and EU-funded collaboration with local and regional actors to scale up adaptation efforts and disaster preparedness would support this process.

Adaptation to climate change is required across all levels of decision-making and governance. In this report we summarise the adaptation preparedness and the current state of adaptation at national, regional and local level in TransformAr's demonstrators: Finland (City of Lappeenranta), France (Guadeloupe Archipelago), Greece (City of Egaleo), Spain (Galicia Region), Italy (Oristano) and the UK (West Country Region). Sources include information provided through the SWD(2021) 26 communication on Forging a climate-resilient Europe, the Climate ADAPT web portal, the Grantham Research Institute on Climate Change and the Environment database on climate change laws, among others.

Table 5. Adaptation Preparedness Scorecards in TransformAr's demonstrators

STEP A: Preparing the ground for adaptation	Finland	France	Greece	Italy	Spain	UK
1. Coordination Structure						
A central administration body officially in charge of adaptation policy making	YES	YES	YES	YES	YES	YES
Horizontal (i.e., sectoral) coordination mechanisms exist within the governance system, with division of responsibilities	YES	YES	YES	YES	YES	YES
Vertical (i.e., across levels of administration) coordination mechanisms exist within the governance system, enabling lower levels of administration to influence policy making	YES	YES	YES	YES	YES	YES
2 Stakeholders' involvement in policy development						
A dedicated process is in place to facilitate stakeholders' involvement in the preparation of adaptation policies	YES	YES	YES	YES	YES	YES
Transboundary cooperation is planned to address common challenges with relevant countries	YES	YES	YES	YES	YES	YES

Step B: Assessing risks and vulnerabilities to climate change	Finland	France	Greece	Italy	Spain	UK
3 Current and projected climate change						
Observation systems are in place to monitor climate change, extreme climate events and their impacts	YES	YES	YES	YES	YES	YES
Scenarios and projections are used to assess the economic, social and environmental impacts of climate change, taking into account geographical specificities and best available science (e.g., in response to revised IPCC assessments)	YES	YES	YES	YES	YES	YES
Sound climate risks/vulnerability assessments for priority vulnerable sectors are undertaken to support adaptation decision making	YES	YES	YES	YES	YES	YES
Climate risks/vulnerability assessments take transboundary risks into account, when relevant	YES	IN PROGRESS	NO	IN PROGRESS	IN PROGRESS	IN PROGRESS

4 Knowledge gaps						
Work is being carried out to identify, prioritise and address the knowledge gaps	YES	YES	IN PROGRESS	IN PROGRESS	YES	YES
5 Knowledge transfer						
Adaptation relevant data and information is available to all stakeholders, including policy makers (e.g., through a dedicated website or other comparable means)	YES	YES	NO	IN PROGRESS	YES	YES
Capacity building activities take place; education and training materials on climate change adaptation concepts and practices are available and disseminated	YES	YES	NO	IN PROGRESS	YES	YES

Step C: Identifying adaptation options	Finland	France	Greece	Italy	Spain	UK
6 Identification of adaptation options						
Adaptation options address the sectoral risks identified in 3c, the geographical specificities identified in 3b and follow best practices in similar contexts	YES	YES	YES	YES	YES	YES
The selection of priority adaptation options is based on robust methods (e.g., multi-criteria analyses, stakeholders' consultation, etc.) and consistent with existing decision-making frameworks	YES	YES	YES	YES	YES	YES
Mechanisms are in place to coordinate disaster risk management and climate change adaptation and to ensure coherence between the two policies	YES	YES	YES	IN PROGRESS	IN PROGRESS	YES
7 Funding resources identified and allocated						
Funding is available to increase climate resilience in vulnerable sectors and for cross-cutting adaptation action	IN PROGRESS	YES	IN PROGRESS	IN PROGRESS	YES	IN PROGRESS

Step D: Implementing adaptation action	Finland	France	Greece	Italy	Spain	UK
8 Mainstreaming adaptation in planning processes						
Consideration of climate change adaptation has been included in the national frameworks for environmental impact assessments	YES	NO	YES	YES	YES	YES
Prevention/preparedness strategies in place under national disaster risk management plans take into account climate change impacts and projections	NO	YES	NO	NO	NO	YES
Key land use, spatial planning, urban planning and maritime spatial planning policies take into account the impacts of climate change	YES	YES	NO	NO	NO	YES
National policy instruments promote adaptation at sectoral level, in line with national priorities and in areas where adaptation is mainstreamed in EU policies	YES	IN PROGRESS	IN PROGRESS	IN PROGRESS	IN PROGRESS	YES
Adaptation is mainstreamed in insurance or alternative policy instruments, where relevant, to provide incentives for investments in risk prevention	NO	NO	NO	NO	NO	NO
9 Implementing adaptation						
Adaptation policies and measures are implemented, e.g., as defined in action plans or sectoral policy documents	YES	IN PROGRESS	NO	IN PROGRESS	IN PROGRESS	IN PROGRESS
Cooperation mechanisms in place to foster and support adaptation at relevant scales (e.g., local, subnational)	YES	NO	NO	NO	YES	YES
Procedures or guidelines are available to assess the potential impact of climate change on major projects or programmes, and facilitate the choice of alternative options, e.g., green infrastructure	NO	YES	NO	NO	YES	YES
There are processes for stakeholders' involvement in the implementation of adaptation policies and measures.	YES	NO	NO	YES	NO	YES

Step E: Monitoring and evaluation of adaptation activities	Finland	France	Greece	Italy	Spain	UK
10 Monitoring and reporting						
NAS/NAP implementation is monitored, and the results of the monitoring are disseminated	YES	YES	NO	NO	YES	YES
The integration of climate change adaptation in sectoral policies is monitored and the results of the monitoring are disseminated	YES	YES	NO	NO	YES	YES
Regional-, sub-national or local action is monitored, and the results of the monitoring are disseminated	YES	NO	NO	NO	YES	YES
11 Evaluation						
A periodic review of the national adaptation strategy and action plans is planned	YES	YES	YES	YES	YES	YES
Stakeholders are involved in the assessment, evaluation and review of national adaptation policy	YES	YES	NO	NO	YES	YES

5.2. Finland

The Finnish institutional and policy framework on climate change adaptation

- **Adaptation governance at the national level**

Finland adopted a **national adaptation strategy** in 2005, and was therefore one of the first countries to do so. **The National Climate Change Adaptation Plan 2022** was launched in 2014 and brought the 2005 strategy up to date. It identifies the most important tasks needed to promote adaptation nationally, and encourages Finnish society to take action on climate change adaptation in every sector. Monitoring the implementation of the plan is ensured by a multi-stakeholder group, while both local and regional authorities have incorporated adaptation action into their climate strategies. Seventeen Finnish cities are signatories to the Covenant of Mayors for Climate & Energy in relation to adaptation, including the city of Lappeenranta (CMCE, 2021; OECD, 2021).

An evaluation of the National Climate Change Adaptation Plan 2022 was conducted mid-term and found that knowledge of climate change and adaptation needs has improved and increased among administrative actors and authorities. The evaluation of the plan action on adaptation has been incorporated into the planning and activities of several different sectors – particularly in the water sector, where adaptation where digital monitoring and risk management processes have been developed (OECD, 2021).

Relevant national Finnish policies

Flood Risk Management Act (No. 620/2010): The Flood Risk Management Act is part of the adaptation strategy and looks to improve the organisation of flood risk management through the reduction of flood risks, as well as through the prevention and mitigation of adverse consequences caused by floods (by also building preparedness). The Act also coordinates flood risk management and other management plans of river basins, by taking into account requirements related to sustainable use and protection of water resources.
Land use and Building Decree enacted under the Land use and Building Act (132/1999): this act also seeks to support the relevant municipal and regional authorities to improve energy efficiency and sustainability of buildings, developments and plans in their jurisdiction. The update of the national governmental land-use guidelines in 2008 includes storms, heavy rains and urban flooding and the risks of major accidents as additional factors to consider during land-use planning processes.

- **Adaptation governance at the regional level**

As summarised in the Finnish country fiche for the EU adaptation preparedness scoreboard, the NAP stresses that municipalities ensure the integration of climate proofing reviews into the planning of emergency preparedness and security of supplies. The NAP requires the joint regional offices (ELY-keskus) of the Ministry of Employment and Economy, the Ministry of Environment, the Ministry of Transport and Communications and the Ministry of Agriculture and Forestry to guide municipalities in boosting climate resilience.

As further outlined in the Finnish country fiche, in 2017, the majority of Finnish municipalities implemented action on climate change adaptation. By the end of 2015, regional flood risk management plans were published for every significant flood risk area (21 areas) and implementation of identified measures is ongoing. The NAP further seeks to integrate adaptation multi-sectorally on a multi-actor basis. Moreover, adaptation is also taken into account in the Climate Act (which was also approved in 2015). The Climate Act maintains that national authorities need to promote the NAP in their actions, including - but not limited to - land use, buildings and construction, environmental

protection and the use and management of water resources. Research and communication are also highlighted as necessary to complement these actions.

- **Adaptation governance at the local level: TransformAr demonstrator Lappeenranta**

The climate programme of the city of Lappeenranta for 2021-2030 forms the basis for the carbon neutrality target by 2030 and its long-term emission reduction targets. The climate programme is developed based on the reporting model of Covenant of Mayors for Climate & Energy (CoM), and as a result the Sustainable Energy and Climate Action Plan (SECAP) is created and reported to the Covenant of Mayors for Climate & Energy reporting platform. The city of Lappeenranta committed to conduct SECAP when joining the Covenant of Mayors in 2016. The risks and vulnerability of climate change as well as adaptation to possible risks were assessed for the climate programme, and the risk and vulnerability assessments were carried out using an Indicator-based Vulnerability Assessment method. Experts from different organisations of the city of Lappeenranta and closely related companies (e.g., energy supply) took part in workshops on risk assessment and vulnerabilities. The assessed adaptation actions are closely connected with the new climate program 2021-2030 and are reported to the Covenant of Mayors platform. The implementation of the climate programme for 2021-2030 is followed yearly through the *Ilmastovahti* website. The implementation and follow-up actions are connected to the strategy of Lappeenranta.

Measuring and monitoring risks and vulnerabilities to climate change

Generation of official and local knowledge is supported by three main institutes: The Finnish Meteorological Institute, The Flood Centre of the Finnish Environment Institute and Finnish Meteorological Institute (established in 2014) and The Finnish Environment Institute (SYKE).[3]

SYKE is principally in charge of collecting information on floods and their impacts. SYKE also coordinates action for the Finnish Long-Term Socio-Ecological network (FinLTSER) network which gathers researchers and scientists working on related socio-ecological issues on platforms representing the major ecosystems such as marine, terrestrial, lake, sub-arctic and urban settings.

In 2008, the Group for Adaptation to Climate Change was formed to monitor and promote the implementation of the adaptation strategy. The Monitoring Group on Climate Change Adaptation was formed in 2015 to continue this work, including governmental officials from the Prime Minister's Office and the relevant ministries, agencies, regional and local actors, research institutes, fire and rescue services, and financial services. The monitoring group implements, follows-up and raises awareness on the NAP, but also seeks to encourage collaboration between relevant actors to promote action on adaptation.

The Climate Act states that the implementation of the NAP is to be monitored and reported to Parliament every electoral term (this reporting is included in the annual climate report as well).

Building capacity and knowledge transfer

As the OECD (2021) summarizes in its environmental performance review of Finland, awareness on vulnerability and risks as a result of climate change is high in Finland. The Climateguide.fi web portal has been set up to support both the general public and companies to consider the effects that climate change will have on them. It highlights that the economic impact of climate change will be and already is negative for certain sectors while also positive for others (as long as Finnish society takes action in

[3]See the Finland country fiche for the EU adaptation preparedness scoreboard for further details and the Climate ADAPT portal.

adaptation). For example, rising temperatures may be positive for agriculture, forestry and tourism. Nonetheless, economic losses will be felt in the water sector as a result of heavy rains and flooding.

While Finland is taking important steps on climate change adaptation, there is a long way to go and management of climate-related risks is still not sufficient. More awareness raising on risks (as well as costs and benefits of adaptation measures) is needed and better coordination of the work of the private and public sectors would improve action. Supporting tools such as guidance documents, monitoring and early warning systems for regional and local actors would help promote practical adaptation, and in turn, the reduction of climate-related risks (European Commission, 2018; OECD, 2021).

5.3. France and its overseas territories

The French institutional and policy framework on climate change adaptation

- **Adaptation governance at the national level**

France adopted a National Climate Change Adaptation Strategy, and a French National Adaptation Plan in 2018 (PNACC); building on the first plan was in place from 2011 – 2015. The second French National Adaptation Plan for Climate Change (PNACC-2), for the time span of 2018-2022, aims to better prepare France to address the global issue of climate change, involving the main sectors of the economy (agriculture, industry, tourism), with a particular focus on overseas territories, including Guadeloupe. The implementation of the necessary actions to adapt to climate change by 2050 is the principal objective, including the metropolitan and overseas French territories. This objective corresponds with the long-term objectives of the Paris among other international conventions. The Ministry for the Ecological and Inclusive Transition is responsible for policy on adaptation to climate change and PNACC-2 has four overarching goals:

1) Greater involvement of local actors;
2) Prioritisation of nature-based solutions, wherever possible, including coastal protection and green and blue infrastructure;
3) Stronger attention to overseas territories, including Guadeloupe, Guyane, Martinique and La Réunion through adapted measures;
4) Involvement of Large economic sectors , and the monitoring of measures by a specialised committee of the National Council of the ecological transition (Conseil national de la transition écologique - CNTE) which involves key stakeholders and societal actors.

At the sub-national level, Climate-Air-Energy Plans are put forward at the regional, departmental, and city level, and includes requirements for climate adaptation action.

Relevant national French policies

Farming, forest and food framework No. 2014-1170: this law promotes guarantees for the sustainable management of the agricultural and forestry sectors. The importance of the carbon sequestration function of forests for climate change adaptation is recognised in the framework.

Climate Convention report: The Climate Convention is the 150-member strong citizen assembly that came to existence after French President Macron announced its creation on April 25th, 2019, and Prime Minister Philippe sent a mission letter to the Economic, Social and Environmental Council (CESE) to supervise it. On June 21st, the Convention voted on the 150+ proposals that were elaborated during previous work sessions to deliver a final report that was sent to the Minister Borne for Ecological and Social Transition. The Convention proposes to organise a referendum with two questions: 1) amend the Constitution to introduce the fight against climate change; 2) create the crime of ecocide. Other measures to be enshrined into law or policy include: the renovation of existing buildings to improve energy efficiency; the Fight against the artificialisation of soils and urban sprawl; to-guarantee a "less animal and more vegetable" diet, by strengthening the law on equal access to food; to reduce greenhouse gases emissions from agriculture: to rethink trade policy to include climate considerations; to display the carbon footprint of products and service; to regulate advertising to curb overconsumption; to reduce the use of private cars, road freight, and reduce maximum speed on highways; to upgrade the car and plane fleets; to transform production, and to incentivise the private sector further to reduce its GHG emissions. The climate convention report seems to have a focus on sustainable development and climate mitigation rather than climate adaptation.

France Relaunch Plan ("France Relance"): the 100 billion Euro (40 % of which comes from the European Union stimulus plan) France Relaunch Plan seeks to support the economic, social and ecological rebuilding of France from 2020-2030. While none of the topics to be allocated budget to focuses specifically on adaptation, some axes are highly relevant (e.g. the promotion of biodiversity and the limiting of the artificialisation of soils).

- **Adaptation governance at the regional level**

France's implementation of the revised Environmental Impact Assessment Directive includes a requirement to consider the incorporation of climate impacts and adaptation issues into mainstream planning mechanisms at local and regional level, but also into specific planning policies on coastal zones, and strategies on heatwaves and flood risks, as summarised in the French EU country fiche.

- **Adaptation governance at the local level**

The evaluation of the 2011 NAP (conducted in 2015) highlighted that coordination with local governments was lacking and called for this to be improved. Guidelines for climate impacts of major projects have been published by ADEME. Furthermore, through the French Grenelle II law (2010)[4] and the law relating to the energy transition for green growth (2015), it became mandatory for local authorities with more than 20 000 inhabitants to develop their territorial energy climate plans (Khamis, 2021).

Measuring risks and vulnerabilities to climate change

The National Observatory on the Effects of Global Warming (ONERC) is responsible for monitoring progress on adaptation to climate change, and a committee of the National Council for Ecological Transition (CNTE) is in charge of monitoring. The monitoring of extreme weather events as well as the climate in general is carried out by Météo France - the national weather and climate service. They also publish an indicator of population exposure to extreme weather events.

PNACC-2 aims to also address gaps currently existing in sectoral vulnerability assessments and has a strategy for green jobs an training needs that are relevant for adaptation. A wide range of information activities on climate issues and climate risks are also carried out by the national education system as well as through the implementation agency (ADEME) for energy, environment, and sustainable development.

Building capacity and knowledge transfer

In 2010, the Ministry for The Ecological Transition called on the expertise of the French climate science community, including researchers from CNRS/INSU/IPSL and LGGE, Météo-France, BRGM, CEA, CETMEF and CNES, to conduct a scientific assessment of France's climate conditions in the 21st century. The "Climate of France in the 21st Century" series provides reference climate indices to serve as a basis for developing climate change adaptation policies. This tool is essential for the many actors involved in adaptation, including local authorities, the private economic sector, associations and governmental departments. For this reason, the production of this reference data is one of the key actions of the first National Climate Change Adaptation Plan (NAP), which came into force on July 19, 2011. The National Observatory on the Effects of Global Warming (ONERC) organizes and disseminates this scientific information under the title "France's Climate in the 21st Century".

[4] Published on 12 July 2010, the Grenelle II Law presents concrete actions needed to reach the defined 2020 targets in six main sectors: buildings and urbanisation, transport, energy and climate, biodiversity, health and governance.

The Drias Futures of Climate portal is intended for a wide range of users, from experts (researchers, academics, etc.) to non-specialists (project managers, decision-makers, teachers, etc.), involved in impact and adaptation studies on climate change. Access to these data is essential to allow vulnerability studies of territories necessary for the definition of climate change adaptation policies by local authorities.[5]

Since the beginning of 2021, the Drias Futures of Climate portal has a new dataset that has been developed within the framework of the climate services agreement supported by the Ministry for The Ecological Transition, with the scientific support of the CNRM, Cerfacs and the IPSL. Thirty regionalised simulations from the Euro-Cordex ensemble covering the three climate scenarios RCP2.6, RCP4.5, and RCP8.5 were selected to constitute a set that is more easily usable for impact studies than the full ensemble, which includes several hundred simulations.

This service has been completed for the public by the web application Climat HD: (**Climat d'Hier et de Demain**), which offers an integrated vision of past and future climate change, at national and regional levels. Climat HD summarises the latest work of climate scientists: key messages and images to better understand climate change and its impacts.

[5] For further details, see The Seventh national communication of France (UNFCCC, 2017), the Climate ADAPT portal and the French country fiche on the EU adaptation preparedness scoreboard.

5.4. Greece

The Greek institutional and policy framework on climate change adaptation

- **Adaptation governance at the national level**

The **Greek National Adaptation Strategy (NAS)** was adopted in 2016, which the Parliament endorsed with the Law 4414/2016. The NAS outlines main objectives, guidance and tools to support the implementation of adaptation policies and actions, and will be reviewed in 2026 (Ministry of Environment and Energy, 2016; OECD, 2020).

As listed by the OECD (2020), the principal objectives of the Greek NAS are to:

1) establish and enhance decision-making procedures;
2) link adaptation with sustainable growth through implementation of regional/local action plans;
3) promote adaptation in all economic sectors, especially the most vulnerable;
4) create a monitoring, evaluation and updating mechanism; and
5) build capacity and raise awareness.

The **National Climate Change Adaptation Committee (NCCAC)** advises the Ministry of Environment and Energy (MoEE) and drives the implementation, the development of the NAS and supports adaptation policies. The NCCAC consists of members various levels of government, industry, academia and civil society.

Relevant national Greek policies

Law 4759/2020 on the Modernisation of Spatial and Urban Planning Legislation and other provisions: This document amends previous legislation and notably amends spatial planning with regard to renewable energy projects.

Greece's recovery and resilience plan: Greece has approved a €30.5 billion recovery and resilience plan, consisting of – as listed by the Grantham institute - "€17.8 billion in grants and €12.7 billion in loans. 37.5% of the plan's total allocation for reforms and investments supports climate objectives, including: electricity infrastructure, energy efficiency in residential buildings (targeting renovating more than 100,000 residences, including low-income households, to increase energy efficiency) and sustainable mobility."

- **Adaptation governance at the regional level**

Instead of developing a national action plan, law 4414/2016 sees that the 13 administrative regions of Greece will develop **Regional Adaptation Action Plans (RAAPs)** that will implement the NAS in 7-year cycles (at the time of publishing this report, these are still under development). Quality is ensured for the RAAPs through technical specifications listed in the NAS. To make sure that the RAAPs are compliant with the technical specifications set out in the NAS, the MoEE reviews them before endorsement. If the MoEE identifies that further national action is required, this will be taken up at higher levels. This bottom-up approach accounts for regional circumstances but this may also mean that national action can be delayed. The RAAPs are also sought to inform the mainstreaming of adaptation (for example in disaster risk management plans). The RAAP is also open to public consultation (by members of regional municipalities and regional representatives of governmental authorities, regional stakeholders as well as citizens' representatives).

- **Adaptation governance at the local level**

The draft of the NAS was open to public consultation before being finalised (by members of the academic community, various ministries, the Hellenic National Meteorological Service and civil society). Implementation of adaptation actions continuous on a multi-sector level.

Measuring risks and vulnerabilities to climate change

The Hellenic National Meteorological Service, the Ministry of Rural Development and Food, the Institute of Mediterranean Forest Ecosystems and Forest Products Technology, the National Observatory of Athens, the Hellenic National Platform for Disaster Risk Reduction (coordinated by the General Secretariat for Civil Protection) and a number of national research centres are involved in climate observation in Greece. The NAS is developed based on a vulnerability assessment conducted by the Climate Change Impacts Study Committee (CCISC) in 2011 that was developed based on simulations if projected future climate change impacts. The NAS contains adaptation actions per sector. It is expected that the RAAPs identify any additional regional and sectoral needs.

Monitoring implementation

Continuous monitoring of the effectiveness of implemented regional adaptation actions is expected through each RAAP, while the Central Union of Greek Municipalities and the Union of Greek Regions will respond to the NCCAC, which has the principal responsibility to monitor national climate change adaptation progress. Each RAAP will develop an indicator-based monitoring and evaluation system to allow for this continuous monitoring system to take place (OECD, 2020).

The NAS and RAAPs will be evaluated and revised every decade (at least). The NCCAC will also monitor and evaluate the NAP provide policy recommendations, as well as legislative and other possible measures and actions. Stakeholders will be engaged to develop, monitor, evaluate and review the NAS and RAAPs.[6]

Building capacity and disseminating knowledge

The adaptation governance in Greece can be considered to represent a bottom-up approach (EC, 2018) – where regions are responsible for the vulnerability assessments, monitoring, in addition to policy development and funding acquisition. Data on adaptation is currently not publicly available, and funding is currently sought by the MoEE to develop a National Adaptation Knowledge Hub (building on the experience of France and Spain), in addition to increasing capacity building and training programmes that would be accessible to interested stakeholders. Such platforms could boost collaboration between regions and relevant target groups.

Thanks to an eight-year long EU LIFE project entitled AdaptInGR: Boosting the Implementation of Adaptation Policy across Greece, MoEE sought to improve administrative and financial capacity in response to climate change adaptation. AdaptInGR will contribute to the development of a monitoring and evaluation framework, among other tasks. The MoEE and National Centre for Environment and Sustainable Development will take over the work of the project upon its completion (including training, monitoring and information-sharing responsibilities).

[6] See the Greek country fiche on the EU adaptation preparedness scoreboard and the Climate ADAPT portal for further details.

5.5. Italy

The Italian institutional and policy framework

- **Adaptation governance at the national level**

The Italian Climate Adaptation Strategy was adopted in June 2015 and targets several sector in its action on adaptation such as: water resources; desertification, soil degradation and drought; hydrogeological risks; biodiversity and ecosystems; health; forestry; agriculture, aquaculture, marine fishery; energy; coastal zones; tourism; urban settlements; and critical infrastructures.
As listed in the Italian country fiche, to develop the NAS, the following background documents were prepared:

- A national climate impact and vulnerability assessment of the national sectors
- An analysis of the European and national policy framework for climate adaptation
- Elements for a strategy document: 'Elementi per una Strategia Nazionale di Adattamento ai Cambiamenti Climatici' (ESNACC). A public consultation process on its contents was closed in January 2014.

The NAS provides guidance on how to address climate change in diverse socio-economic sectors and systems and it aims to: "raise awareness on the impacts of climate change; identify vulnerabilities and adaptation options for relevant natural and socio-economic systems, and describe opportunities that may be associated to climate change; promote participation of stakeholders in defining strategies and sectoral adaptation plans to make later implementation more effective; increase awareness about climate change risks and adaptation through a range of communication activities; specify methods to be used to identify the best options for adaptation actions while highlighting the co-benefits" (Grantham Research institute, 2022).

In 2017 Italy approved the *Piano Nazionale di Adattamento ai Cambiamenti Climatici*l (PNACC) (National Adaptation Plan (NAP)) to support the implementation of the National Adaptation Strategy. The Ministry for the Environment, Land and Sea (MATTM)'s Directorate General for Climate and Energy developed the NAP (while preparatory work was done by national, regional and local institutions, as well as research centres). and it seeks to guide ministries, regions and local authorities to mainstream adaptation criteria into policymaking.

Relevant national Italian policies

Act No. 225 establishment of the National Civil Protection Service: The National Civil Protection Service seeks to protect the integrity of life, property, settlements, and the environment from natural disasters and catastrophes (including climate-related disasters and seeks to ensure preparedness to climate-related risks). Forecasting, disaster prevention, and emergency response is the responsibility of the Civil Protection Department. Particular disaster risk management purposes are assigned to subnational and local governments.

- **Adaptation governance at the regional level**

Local authorities, regions and central government, coordinated by the MATTM, are expected to implement the NAS through specific adaptation plans. In 2016, the Institute for Environmental Protection and Research (ISPRA, 2016) carried out a survey on the development of climate adaptation strategies (and plans) at the regional level. The results saw that around 50% of regions (e.g., Sardinia, Calabria, Apulia) recognised the importance and multi-sectoral nature of

adaptation in their governance models. As summarised in the Italian country fiche, some other regions were reviewing their regulatory measures (e.g., EIA) and planning tools (e.g. EU Structural Funds) to better integrate adaptation (e.g. Abruzzo, Molise), while other regions were promoting adaptation at the local level by supporting cities and municipalities who have joined the Covenant of Mayors for Climate and Energy (CoM), as territorial coordinators (e.g. Lazio, Abruzzo). The Lombardy Region has now approved its Regional Adaptation Strategy, and Sardinia has developed a Regional Adaptation Strategy to Climate Change to (1) assess climate vulnerability and risk, (2) identify adaptation options, and (3) define a governance system for including adaption in regional plans and programmes (Spano et al., 2019).

Measuring risks and vulnerabilities to climate change

The Department of Civil Protection's hydro-meteorological networks, the Air Force Meteorological Service and the National System for Environmental Protection seek to to define a national set of climate impact indicators, as well as a more comprehensive set relating to extreme weather events. Web portals which contain relevant data include the ISPRA website; the Long-Term Ecosystem Research in Europe website; the Polaris website on areas of potential flooding in Italy; and the Government's public safety website. A monitoring network to support infrastructural projects cope with hydrogeological risk is also set up.

Monitoring progress and accountability

Regions and cities are undertaking adaptation planning and implementing adaptation actions, and cities are committed to report every two years on adaptation activities under the Mayors Adapt initiative. The national system for collection, elaboration and dissemination of environmentally relevant climate data (SCIA) further aims to establish among all the relevant institutions dealing with meteorological networks and observations, a common procedure for calculating, updating and representing Italian climate data.[7]

Building capacity and disseminating knowledge

Italy does not yet have a dedicated website that consolidates data relevant to climate adaptation. The MATTM regroups key documents such as the NAS on one website, such as the vulnerability assessment by CMCC. Scientific data and monitoring is provided by separate institutes.

[7] For more information, see details on national circumstances relevant to adaptation actions provided by Climate ADAPT and the Italian country fiche on the EU adaptation preparedness scoreboard.

5.6. Spain

The Spanish policy and institutional framework on climate change adaptation

- **Adaptation governance at the national level**

The first Spanish **National Climate Change Adaptation Plan** (Plan Nacional de Adaptación al Cambio Climático – PNACC) was adopted in 2006 and was in force until 2020. The current National Climate Change Adaptation Plan is in force from 2021 to 2030 and is implemented through a series of work programmes targeted to priority areas. The PNACC is the Spanish public administration's reference framework to address adaptation through action and tools for assessment in the sectors known to be most affected, including the water management sector, agriculture, forests, biodiversity, coasts, health and tourism.

Spain's national energy policies underline the importance of climate resilience. For instance the 2020 National Energy and Climate Plan (NECP 2021-2030) highlihgts the need for resilience and climate change adaptation in sectors such as water, transport infrastructure, forestry, and coastal and marine environments (IEA, 2021).

The Climate Change Office (OECC) – part of the Ministry for the Ecological Transition – oversees policymaking on adaptation. The National Climate Council (CNC) makes recommendations, while the Coordination Commission of Climate Change Policies (CCPCC) adopts adaptation plans and reports and coordinates action between national, regional and local levels. The PNACC was adopted after public consultation with public administration, civil society and interested sectors and parties.

Relevant national Spanish policies

Law 2/2013 on the protection and sustainable use of coastal areas: Law 2/2013 incorporates regulations to tackle the effects of climate change on coastal areas promoting protection, preservation, or restoration of these areas. A system for coastal areas under high risk is introduced, which limits activities that can be carried out. Evaluation of the possible effects of climate change on coastal zones is required. A provision is also included that states that projects may be cancelled in the case of risks of sea level rise. The Ministry of Agriculture, Food and Environment is required to develop a strategy for coastal adaptation to the impacts of climate change diagnosing climate risks that affect the coast, and measures to mitigate them.

Royal Decree 903/2010, on the Assessment and Management of Flood Risk: Decree 903/2010 promotes knowledge and assessment of the risks associated with flooding and supports coordinated action by all levels of government and society to reduce the negative consequences of flooding. It establishes the development of flood risk assessments, hazard maps, flood management plans, multi-sectoral coordination, public participation, and cooperation between different authorities. The decree takes into account the Committee of Competent Authorities in districts with intercommunity basins and existing regulations on civil protection, ensuring coordination with the new plans of flood risk management.

Royal Decree No. 19/2016 - Flood risk management plan of the Galicia-Costa Hydrographic Demarcation: This Royal Decree approves the Flood Risk Management Plan of the Galicia-Costa Hydrographic Demarcation. The actions promoted by the General State Administration and provided for in the Flood Risk Management Plan of the Galicia-Costa Hydrographic Demarcation will be submitted, prior to its completion, to an analysis of its technical, economic, and environmental feasibility. In any case, these actions will be subject to the current regulations on evaluation.

Royal Decree No. 425/2016 - Regulatory basis for the granting of subsidies from the General State Administration to Agrarian Insurance: This Royal Decree establishes the regulatory basis for the granting of subsidies from the General State Administration to the subscription of Agrarian Insurance, in the form of a state contribution to the payment of the premium, whose total amount to be paid by farmers they will be granted directly to farmers.

Royal Decree 690/2021 regulating the Ecological Restoration and Resilience Fund: Tthis royal decree regulates the *Fondo de Recuperacion Ecologica y Resiliencia* (FRER), which seeks to develop measures supporting the achievement of the objectives contemplated in the framework of the Recovery, Transformation and Resilience Plan within the scope of the Ministry for the Ecological Transition and the Demographic Challenge. The fund can act as a co-financing instrument to ensure territorial cohesion, as long as they are compatible with the objectives assigned in the Recovery, Transformation and Resilience Plan. Actions that can be funded by the FRER include those dealing with "Climate change, its mitigation and adaptation and the strengthening of climate resilience.", and "meteorology and climatology."

- **Adaptation governance at the regional level**

Every region in Spain, except for Asturias and Rioja, have adopted regional action plans or adaptation strategies, which covers 97 % of the Spanish population (EC, 2018). To date, 1922 municipalities are signatories to the Covenant of Mayors for Climate and Energy.

- **Adaptation governance at the local level**

Several stakeholders support the actions outlined in Spain's national climate and energy plans. Locally, the Spanish Cities Network for Climate, which is a voluntary association of municipalities, supports climate action development and promotion through the establishment of adaptation strategies and plans. At the same time, the Spanish Climate Change Office (OECC) co-authored guidelines for preparing local climate change adaptation plans prepared in 2015 (IEA, 2021).

Measuring risks and vulnerabilities to climate change

The measurement and analysis of atmospheric climate data is undertaken by the Spanish Meteorological Agency (AEMET), which follows IPCC scenarios (latest AR5 scenarios) when preparing its regional scenarios. Together with Portugal, Spain also addresses transboundary risks and vulnerabilities surrounding issues of biodiversity, marine ecosystems and forestry that affect both countries. A project entitled "Climate Change on the Spanish Coast" (C3E) was coordinated by the University of Cantabria, on behalf of the OECC, and developed databases and tools to assess vulnerabilities and impacts, and eventually identify adaptation measures in coastal areas. The *Centro de Estudios y Experimentación de Obras Públicas* (CEDEX) has also carried out carried out scenarios to monitor the impact of climate change on water resources and droughts in Spain.

Monitoring implementation

Several monitoring reports tracked and evaluated the first National Adaptation Plan. For instance, every three years a report is published by the OECC to assess the implementation of the PNACC. The contents of these reports include focus on the work done on adaptation in various sectors, as well as regions through factsheets and checklists.

Building capacity and disseminating knowledge

The AdapteCCa adaptation platform is a tool developed by the OECC to facilitate knowledge exchange for experts, institutions and interested parties on the impacts and vulnerabilities of

climate change and adaptation.[8] Workshops are also organised by the OECC and the national center for environmental education (CENEAM) to gather researchers, policymakers, as well as civil society to develop solutions for climate change adaptation. The CLIVAR-Spain scientific committee also publishes assessment reports that list Spanish research groups involved in monitoring and measuring climate change impact and adaptation in Spain (IEA, 2021).[9]

[9] See the Spanish fiche for the EU adaptation preparedness scoreboard and the Climate ADAPT portal for further details.

5.7. United Kingdom

The British institutional and policy framework

- **Adaptation governance at the national level**

In the United Kingdom, there is a legal requirement to develop a national adaptation programme (NAP) under the Climate Change Act. The NAP has to establish objectives relating to climate adaptation and time-scaled proposals and policies in order to meet those objectives. The first NAP was published in 2013 and contains over 370 actions (including programmes focusing on highest order risks – that are guided by magnitude, confidence and urgency scores) . As the political and administrative structure is devolved in the UK, the NAP mainly concerns England, and separate programmes have been developed by the devolved administrations (for Scotland, Wales, and Northern Ireland). The latest version of the NAP, covering 2018-2023, focuses on areas of major importance, guided by this assessment of the magnitude, confidence and urgency scores assigned to particular risks.

The NAP also sets out four overarching objectives to address the greatest risks and opportunities arising due to climate change:

- Increasing awareness;
- Increasing resilience to current extremes;
- Taking timely action for long-lead time measures;
- Addressing major evidence gaps.

Relevant national British policies

As listed by the Grantham institute:

"**National Planning Policy Framework:** Sets out the Government's planning policies for England and how they should be applied in the context of local development plans and planning decisions under a "proactive approach". The framework requires local authorities to adopt development plans which include long-term strategic policies to address climate change, incentivizing the moving to a low carbon economy. It also includes adaptation measures, notably flooding and coastal change.

Environment Act 2021: Aims to improve air and water quality, tackle waste, increase recycling, halt the decline of species, and improve the country's natural environment to make it more resilient to climate shocks. This environment act does not directly target adaptation, however ensuring the protection and the development of the natural environment increases the ability of the territory to overcome climate-related stresses (e.g., natural buffer zones, increased permeability, etc.).

The UK Flood and Water Management Act – 2010: This Act makes provision about water, including provision about the management of risks in connection with flooding and coastal erosion. Article 7.2 specifies that the Environment Agency must specify the current and predicted impact of climate change on flood and coastal erosion risk management when coming up with a national flood and coastal erosion risk management strategy for England.

Water Act 2014 (creation of Flood Re scheme): Flood Re is a hybrid public private reinsurance scheme introduced by the UK Government under Part 4 of the Water Act 2014. It was designed in partnership with insurers aimed at making the flood cover part of household insurance policies more affordable. Every insurer that offers home insurance in the UK is required to pay into the Flood Re Scheme. Funds from this levy are then used to cover the flood risks in home insurance policies.

Agriculture Act 2020: The Agriculture Act 2020 establishes a new system of agricultural subsidies, replacing the Common Agricultural Policy of the European Union following the UK's withdrawal from the European Union. Section 1(1) of the Act provides that financial assistance may be provided to those involved in agricultural, horticultural, or forestry activities for a number of purposes, including "managing land, water, or livestock in a way that mitigates or adapts to climate change."

Green Finance Strategy: This document aims to set out a comprehensive approach to greening financial systems, mobilising finance for clean and resilient growth, and capturing the resulting opportunities for UK firms."

- **Adaptation governance at the regional level**

The UK NAP and the adaptation programmes adopted by the devolved administration cover the complete territories of the UK. Beyond the devolved administrations, there is no further regional sub-division of UK governance before the level of cities or councils/local authorities. For now, there has been no UK-wide assessment of adaptation strategies that are below the level of the devolved administrations of Scotland, Wales and Northern Ireland.

- **Adaptation governance at the local level**

In addition, several UK cities are now signatories to the EU Covenant of Mayors for Climate and Energy in relation to adaptation. Of these cities many have submitted adaptation action plans and are now in the monitoring phase.

Measuring risks and vulnerabilities to climate change

The UK's National Meteorological Service (Met Office) records weather and climate records. Climate-related impacts are monitored at local level in relation to changes in: temperature and the frequency of heatwaves, seasonal rainfall patterns resulting in drought and water stress or flooding, storm frequency, sea level rise and coastal flooding. The Met Office National Climate Information Centre (NCIC) tracks all UK records and notes extremes and exceptional weather in each year, producing case studies. Other agencies in charge of monitoring and providing data include the Natural Environment Research Council (NERC) research centres and other delivery partners; EA, NRW, SEPA, the Northern Ireland Environment Agency (NIEA), the Forestry Commission and others.

Monitoring progress and accountability

The NAP states that the government must report every 5 years on the risks to the UK of climate change, and publish a programme setting out how these will be addressed. The first climate change risk assessment was published in 2012. The Act also introduces powers for government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks. The Act introduces an Adaptation Sub-Committee of the Committee on Climate Change, providing advice to, and scrutiny of, the Government's adaptation work.

The ASC's first report to the UK Parliament on the implementation of the NAP was published in June 2015. The Government's response to the assessment was published in October 2015. In June 2017, the ASC published their second and final progress report on the first NAP. An official government response was due for publication in October 2017.

Building capacity and disseminating knowledge

The records and case studies are summarised at regional level in the annual State of the UK Climate report, which aims to provide an accessible, authoritative and up-to-date assessment of UK climate trends, variations and extremes.

The Environmental Observations Forum (EOF) is a Living With Environmental Change (LWEC) Partnership programme founded in 2008 to support better communication and sharing of information across the observations community. LWEC has since been reformed as the Research & Innovation for the Dynamic Environment (RIDE) Forum. The EOF has prepared the reports: 'Coordinating Climate Science and Risk Assessment Observations' and 'Consultation Responses to the Global Climate Observing System (GCOS) Implementation Plan', to assist in gaining a national overview of systematic observation activities.

Another important coordination mechanism is the Marine Science Coordination Committee (MSCC), which was formed in 2008 to develop and implement a Marine Science Strategy for the UK, and to improve UK marine science co-ordination.[10]

[10] See the UK fiche for the EU adaptation preparedness scoreboard, and the Climate ADAPT portal, and the Grantham institute for further details.

6. Conclusions and way forward

To facilitate the development of adaptation pathways in TransformAr's demonstrator sites, we developed a playbook, a catalogue of solutions and a governance baseline report. This report, the governance baseline report, provides an overview of adaptation policy, funding schemes, potential governance arrangements and good governance practices in the EU and in the member states in which the demonstrators are located. This report intends to provide inspiration for the development of transformational adaptation pathways that will be held in the demonstrators of the TransformAr project.

This deliverable report furthermore elaborates on governance solutions. In this report, governance solutions are defined broadly and classified under four types: i) multi-level governance, ii) market-based, iii) network & polycentric, and iv) community governance. Herein, good governance is not only a responsibility of authorities, but also engages companies and citizens. Effective governance requires the coordination of top-down and bottom-up approaches to governance.

This report together with the 'playbook' and the 'catalogue of solutions' serves as inspiration for the co-development of adaptation pathways in the demonstrators. In response to the feedback of multi-actor workshops and lessons learnt throughout the project, these three deliverables serve as the basis for a number of forthcoming deliverables including the 'best practice reports' (WP1), the 'toolkit for adaptive planning', the 'region-specific portfolios of solutions' (WP3), 'learning stories' (WP4), the 'catalogue of solutions' and the guidance document on transformational adaptation'.

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