Transformative innovation for better Climate Change Adaptation – Case study: Norte, Portugal

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Contents

Abstract

The aim of this report is to investigate the potential for harnessing key features of Transformative Innovation to improve the design and the implementation of Climate Change Adaptation (CCA) strategies, based on empirical analyses. The study draws on the conceptual framework on this question previously defined for the JRC (European Commission, 2024), and the methodology for case studies articulated in the same report. The case study research comprises overall 14 case study reports covering 16 different territories from across the EU and beyond, casing various institutional contexts, a variety of biogeographical regions within different climate risks, different ranges of population sizes, and representing a diversity of approaches to CCA and transformative innovation[1] . The framework takes the form of an analytical grid, structured into seven sections, each of them representing a key feature of the 'transformative innovation' approach where the features are understood as essential conditions for the design and implementation of CCA strategies with this high level of ambition. Each section sets out the main question(s) to be addressed in relation to its respective transformative innovation feature. This report provides the findings for the region of Norte, Portugal, as at November 2023, and is the result of a collaboration between the Joint Research Centre (JRC), DG CLIMA and DG RTD.

[1] A full list of the case studies is provided in Annex 2.

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Executive summary

Policy context

Adapting to climate change has become an increasingly urgent priority for the EU and its territories. Given this urgency, and the systemic nature of climate resilience, new ways to accelerate adaptation are considered. Transformative innovation (TI) is at the focus of this report, particularly how it can help support and accelerate adaptation to climate change. The analysis in this report draws lessons for Norte (Portugal) on how a TI approach is already helping the territory in increasing climate resilience, and what can be done in addition, to further accelerate adaptation. The analysis is based on a theoretical framework along seven dimensions designed to compare TI and Climate Change Adaptation. It is one out of a series of 14 different case study reports covering 16 territories.

Main findings

Both Norte region and a number of municipalities in the region are signatories of the EU Mission on Climate Adaptation. While the national and local levels are the main levels of political representation and central actors in climate adaptation policies, there is an important role for the region and for the Inter-Municipal Communities (CIM). Features from transformative innovation can further support the region in its efforts towards systemic change, starting from the following state-of-play.

- Directionality: Centralisation means that local and regional strategies follow a top-down structure, aligned with international commitments but lacking explicit connections between innovation and CCA. However, the region is exploring relevant and acquiring new knowledge by networking with Inter-Municipal Communities (CIM), municipalities and national agencies.

- Instrument portfolios and funding synergies: Articulating CCA instruments and actors in Norte involves a complex interplay between national and subnational governance levels. There is an evident link between innovation and CCA in some municipalities' sustainable development efforts, and potentially in tourism. International collaboration varies among regional entities, with some leveraging EU funding for green projects. Connecting CCA with regional development, innovation and international collaboration helps address economic disruptions, promote sustainable growth, ensure a just transition, and unlock funding for municipalities.

- Ensuring cross-domain synergies: With the support of the Inter-Municipal Communities (CIM), municipalities align their plans with regional and national strategies and collaborate with each other to foster knowledge exchange. The region evaluates local instruments and their alignment with regional policies. Monitoring, financing, and stakeholder engagement are recognised as challenges requiring synergies. Signing and committing to climate action networks and joining forces with neighbouring municipalities are considered good practices.

- Stakeholder involvement: The degree of multi-actor involvement depends on municipality's capacity and progress in climate adaptation. Collaborative efforts with local communities, civil society, and researchers are crucial. Private sector engagement is limited by time constraints and organisational changes.

- Multi-level governance: Municipalities are tasked with creating action plans. To mitigate issues of 'silo thinking' and encourage collaboration between sectors and municipalities, the region and the Inter-Municipal Communities (CIM) act as intermediaries. They facilitate coordination between municipalities, gather regional knowledge, promote collaborations among local entities, and help address disparities in institutional capacities.

- Experimentation: Innovative public-sector ideas are constrained by organisational autonomy and institutional capacity, but supported by place-based innovation, multi-actor collaborations, and participatory processes with shared visions. Examples include a cross-border cooperation between Cerveira and Tomiño, and Esposende's case involving various private sectors in experimentation. Increasing responsibilities for municipalities is a key issue.

- Policy intelligence, learning and strategic capacity: Collaborative efforts among municipalities, facilitated by Inter-Municipal Communities (CIM) and the region, play a crucial role in bridging gaps and fostering policy mobility and learning. Another vital aspect of policy learning involves implementing monitoring measures to assess the impact of climate change actions. Monitoring examples include the use of remote sensors to quantitatively assess the impacts of climate change actions, however, more efforts are required in this regard.

Key conclusions

For each of the seven key transformative innovation features, possible ways towards a transformative climate adaptation approach for Norte include:

- Directionality: Creating a regional climate adaptation vision shared with municipalities, while engaging diverse stakeholders; aligning national and international commitments with local climate goals; improving collaboration among municipalities and national agencies; supporting municipalities with training and implementation support.

- Instrument portfolios and funding synergies: Streamlining overlapping objectives for better policy coordination; fostering collaboration and knowledge sharing among government agencies, local industries, civil society, and regional actors for holistic climate change solutions; expanding international collaborations, particularly those leveraging EU funding for green projects; embracing innovation as a problem-solving tool for climate change; encouraging a shift in perspective creating sustainable economic opportunities, e.g. in tourism.

- Ensuring cross-domain synergies: Identifying policy synergies through local multi-actor decision-making; fostering ongoing collaboration and knowledge sharing among municipalities, regardless of political differences; increasing collaborations with national entities to support action plans in municipalities with limited resources.

- Stakeholder involvement: Promoting collaborations between universities, research centers and municipalities; understanding place-specific challenges of stakeholder engagement; supporting inclusive engagement, community-based and nature-based solutions.

- Multi-level governance: Setting up regional fora for municipalities to discuss climate adaptation; supporting municipalities with limited capacities through resources, training, and partnerships; considering the specific regional context in climate adaptation.

- Experimentation: Promoting research on climate change's socio-economic impacts, informing effective policies; viewing experimentation as a process, fostering ongoing reflection and collaboration; shifting the perspective on innovation to experiment problem-solving.

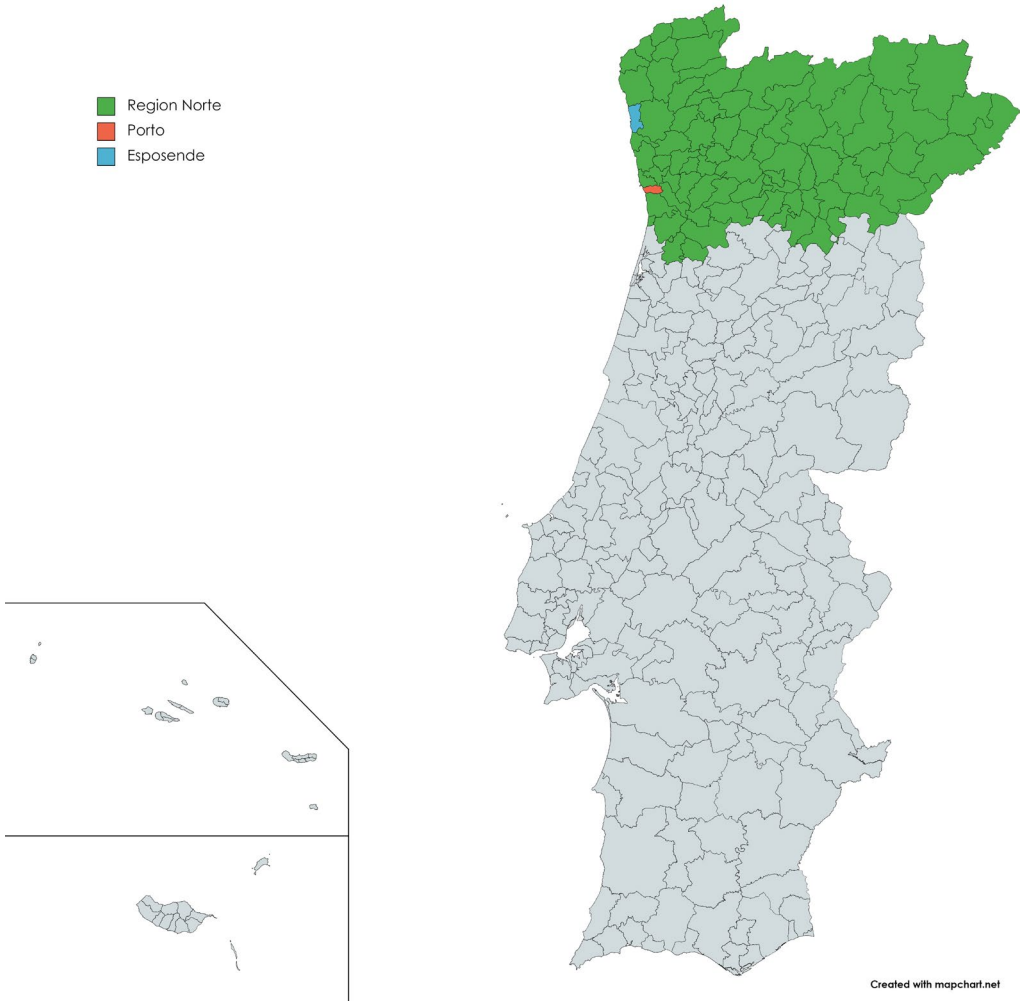
- Policy intelligence, learning and strategic capacity: Supporting municipalities in climate adaptation; using spaces for learning, reflection, and feedback; promoting monitoring tools for tracking long-term impacts; supporting knowledge exchange among all actors.

1 Introduction the case study territory: Norte, Portugal

1.1 Profile of the territory

Located in the north of Portugal, Norte region is one of the seven NUTS II (regions) defined for Portugal. It has 3.6 million inhabitants and concentrates almost 35% of the country's population. However, the region is characterized by a high contrast between low-density high-density areas, from which Porto Metropolitan Area stands out. The region is composed of 86 municipalities and 1,426 parishes. The 86 municipalities are organized into eight Inter-Municipal Communities (CIM) – NUTS III: Alto Minho, Cávado, Ave, Área Metropolitana do Porto, Alto Tâmega, Tâmega e Sousa, Douro and Terras de Trás-os-Montes.

Figure 1 – Geographical location of Norte region



Source: Author's elaboration (mapchart.net)

Portugal has a centralised territorial and administrative structure, despite recent efforts to delegate and decentralise responsibilities from the central to the local level (interview 6). Besides the central government, the municipalities have the largest responsibilities, overseeing the execution of public policies in a various areas, including climate action (Comissão de Coordenação e Desenvolvimiento Regional do Norte, 2021, interview 15). The CIMs serve as intermediaries between the municipalities

amongst themselves and with the national level but have limited responsibilities and budget. Additionally, there are Commissions for Regional Development (CCDR), tasked with managing and implementing guidelines established by the central government in each region. These entities, with limited budget and responsibilities, are in charge of developing the region strategy for smart specialisation, for example.

Norte is also Portugal's third largest region in extension and has protected areas, for example, the Peneda-Gerês National Park offers opportunities for hiking, wildlife viewing, and outdoor activities. As mentioned in the interviews, this park has become an invaluable asset for the sustainable development of the region (interview 5). It is a geographically diverse region, encompassing a wide range of landscapes, including the coastal area along the Atlantic Ocean, the Douro River Valley, mountains and valleys.

Norte's economy mostly derives from services. Retail, finance, and tourism are significant contributors to the regional economy. The region also has a strong manufacturing sector, with industries such as textiles, footwear, furniture, and metalworking. Another key economic sector is agriculture, particularly the production of grapes for Port wine, cereals, vegetables, and fruit (Comissão de Coordenação e Desenvolvimento Regional do Norte, 2023).

1.2 Main climate change risks and vulnerabilities

It is expected that Norte experiences an increase in minimum, average and maximum temperature, as well as an increase in extreme events such as extreme precipitation and intense droughts (Coelho *et al.*, 2020; Ramalho, Ferreira and Jóia Santos, 2022). The consequences of these changes will vary. Norte's territory is heterogeneous, it has seaside, rural mountainous, and urban and dense municipalities, resulting in multiple and varied climate change risks:

Increased temperatures imply more days with very high temperatures (>35ºC) and tropical nights, heatwaves and prolonged periods of high temperatures, which can have adverse effects on public health, agriculture, and energy demand. High temperatures can also exacerbate urban heat islands in cities like Porto and increase the risk of forest fires in rural areas. Changes in precipitation patterns can lead to increased flood and drought risks, affecting water resources, agriculture, and infrastructure. The coastal areas are vulnerable to coastal erosion and sea-level rise (CIM Cávado, no date; Coelho *et al.*, 2020). Lack of preparedness and mitigation for these events can result in health risks, biodiversity loss, social hardships, and economic disruption.

> *Each municipality is very different, so it is important for each of them to be aware of their needs… those on the coast are vulnerable to sea level rise… some others are more susceptible to forest fires… it is important to think about forests, biodiversity, transport, the transition from industrialization, industrial electrification, and agriculture. We have to think about these matters and [prioritise]*" (interview 1).

Table 1. Region profile - summary

Area	21,286 km² - 23% of country
Population	3,5 million inhabitants - 34% of country

Geography	Mountainous. Its peaks Serra do Gerês, Peneda and Marão and Soajo border the 1500 m. Coastal. Costa Verde extends over 140 km over the Atlantic Ocean. Fluvial. 6 rivers flow though the region toward the Atlantic Ocean.
Land use	60% Agri-food and Forestry Production Area
Economy	67% regional GDP services 24% regional GDP manufacturing 7% agriculture, forestry, fishing, construction
Main climate change risks	Coastal erosion Sea level rise Increased extreme precipitation - risk of landslides and floods Increased droughts – risk of forest fires and urban heat islands

Source (Commission, 2018; Coelho et al., 2020; Comissão de Coordenação e Desenvolvimiento Regional do Norte, 2021; Comissão de Coordenação e Desenvolvimento Regional do Norte, 2023)

1.3 State-of-play of CCA and innovation strategies

Climate change adaptation policies and regulations in Norte are primarily set at the national level by the Portuguese government. The Action Plan for Climate Change Adaptation (Conselho de Ministros, 2019) emphasises the urgency of climate action, supported by scientific evidence confirming that climate change is a current phenomenon driven by greenhouse gas emissions from human activities. The plan also provides insights into expected climate alterations, scenarios, and stresses the importance of integrating adaptation measures into sectoral policies, planning processes, and future financing instruments.

Portugal as a country, and some cities and municipalities located in the region are signatories of several European and international strategies, plans and commitments such as the Sendai Framework, the Carbon Neutrality Roadmap 2050, Net Zero Cities, Climate Adaptation Mission Charter and the Covenant of Mayors for Climate and Energy.

At the national level, there is the National Strategy for Preventive Civil Protection (Governo de Portugal, 2021), and the National Strategy for Climate Change Adaptation (ENAAC 2020, Conselho de Ministros, 2015). The ENAAC outlines Portugal's approach to addressing climate change impacts, providing a framework for action and cooperation among various levels of government, including regional and local authorities[2]. The ENAAC defines sectoral priorities such as agriculture, biodiversity, economy, energy, forests, health, safety, transport, coastal areas, and the sea. Each sector has a designated coordinating entity responsible for formulating sector-specific strategies, for example, the National Energy and Climate Plan 2021-2030 (PNEC 2030), coordinated by the Ministerial Commission for Climate Action, and the Carbon Neutrality Roadmap 2050 (RNC 2050).

[2] Along this report, when the words 'regional level' are used, it should be understood as all the organisations of the government at the regional and local scale. Therefore, for Norte the regional level includes the Intermunicipal Communities (CIM), the Regional Coordination and Development Commission of Norte (CCDR-NORTE I.P.), and the municipalities.

Regarding the regional level, the Climate Law (AML) (Asambleia da República, 2021), consolidates objectives, principles, and obligations for different levels of governance involved in climate action through public policies. It establishes a series of obligations related to the development of new climate policy instruments, notably the Regional Climate Action Plans (PRAC) and the Municipal Climate Action Plans (PMAC). The responsibility for creating the PRAC lies with the CCDR Norte. The responsibility for creating the PMAC lies with individual municipalities.

The PRAC should reflect the region's contribution to national climate policy objectives, aligned with European guidelines and the 2030 Agenda for Sustainable Development. PRACs are expected to address regional objectives and targets, both in terms of reducing greenhouse gas emissions and preparing for and mitigating the impacts of climate change. They also outline the actions to be taken and associated investments. By the time of the interviews, the CCDR was just starting their work in building the plan, hence there were no particular adaptation measures defined yet.

PMACs, on the other hand, serve as localised action plans. The national level recognises that the municipalities are key actors in local climate change adaptation efforts, and they are tasked with designing and implementing actions at the local level, hence each municipality is responsible for developing its own action plan. At the time of the interviews conducted for this report, most municipalities in the region were still in the process of developing their action plans, in coordination with their respective CIMs. The deadline for completing these plans is set for February 2024.

Box 1. Priority domains in Smart Specialisation for Norte region for 2021-2027

S3 priority domains
Creativity, fashion, and habitats
Industrialization and advanced manufacturing systems
Agri-environmental and food systems
Sustainable mobility and energy transition
Health and life sciences
Tourism services and territorial assets
Sea resources and economy
Technologies, state, economy, and society

In relation to innovation, current regional innovation strategies do not explicitly include climate change adaptation as an area of work but as part of the framework that can alter the regional economy and the innovation systems. However, areas such as sustainable mobility and the energy transition, as well as sectors that directly depend on the use of natural resources (agriculture, aquaculture, tourism) are indeed an area of specialisation in the regional Smart Specialisation Strategy (S3) Norte 2027.

The smart specialisation strategy has been developed by CCDR – Norte. It follows three strategic objectives and three transversal objectives, yet none of them refer explicitly to climate change adaptation. The strategic objectives include technological intensification of the regional production base; Valuation of assets and resources intensive in territory; and improvement of the regional

competitive positioning on a global scale. The transversal objectives are increasing qualifications for all segments of the population; vertical and horizontal equity in access to quality public goods and services; and effectiveness and efficiency of the regional governance model (CCDR-NORTE I.P., undated). However, as stated by the representatives of the CCDR- Norte, there is an acknowledgement that a green transition can bring changes to the economy and the regional innovation systems, and these changes could be partially addressed through innovation:

Table 2. Strategies and plans - summary

Strategies / plans	Year of adoption	Level
Sendai Framework	Since 2015	International
Carbon Neutrality Roadmap 2050	2018	International
Net Zero Cities	Since 2020	International with municipal implementation (municipalities sign individually and voluntarily)
Climate Adaptation Mission charter	Since 2021	European with municipal implementation (municipalities sign individually and voluntarily)
Covenant of Mayors for Climate and Energy	Since 2015	European (municipalities sign individually and voluntarily)
Action Plan for Climate Change Adaptation	2019	National
National Strategy for Preventive Civil Protection	2021	National
National Strategy for Climate Change Adaptation ENAAC	2015 - 2020	National
National Energy and Climate Plan 2021-2030	2021	National -sectoral
Climate Law	2021	National for regional and local implementation
Regional Climate Action Plans PRAC	2021	Regional
Municipal Climate Action Plans PMAC	2021	Municipal

Source: author's elaboration

To summarise, Portuguese legislation is structured as follows:

- Climate Law. National level, containing the principles and objectives for climate action.
- Mitigation component:
    - National Energy and Climate Plan 2030 (national level)
    - Roadmap to Carbon Neutrality 2050 (national level)
    - National Hydrogen Plan, approved by Resolution of the Council of Ministers No. 63/2020 (national level)
- Adaptation Component
    - Action Programme for Adaptation to Climate Change (national level)
    - National Strategy for Adaptation to Climate Change (ENAAC 2020) (national level)
    - Coastal Waterfront Programme – Caminha|Espinho (POC-CE) (regional level)
    - Flood Risk Management Plans of the 2nd programming cycle for the Minho and Lima, Cávado, Ave and Leça and Douro river basin districts; (regional level)
    - Action Plan for the Northern Region (with Horizon until 2030) for management of rural fires (regional level)
- Smart specialisation
    - National Strategy for Smart Specialisation 2030 (ENEI 2030)
    - Northern Region Smart Specialisation Strategy 2021 – 2027 (regional level)

2 Analysis against conceptual framework: Transformative Innovation for better Climate Change Adaptation

A related report on this subject for the JRC (European Commission, 2024) defines an analytical framework identifying seven key features of Transformative Innovation as essential conditions for the design and implementation of CCA strategies with high ambition level. These features can be summarised as follows:

1. **Directionality:** defining goals and scope of strategic action, as well as articulating impacts, in a way which reflects societal challenges with wide appeal, formalised through endorsement at highest political level to secure engagement of all relevant authorities and stakeholders.
2. **Articulating instrument portfolios and defining synergies between funding sources:** establishing all-encompassing instrument portfolios addressing the whole innovation cycle and the various aspects of CCA, paired with adequate funding resources.
3. **Ensuring Cross Domain synergies:** favouring whole-of-government approaches to ensure greater horizontal coherence between various thematic policy areas (R&I, agriculture, environment, mobility, health etc.), resulting in coordinated mixes of instruments of different types.
4. **Increasing breadth and depth of stakeholder involvement:** working towards social acceptance of new solutions and shaping of innovative developments, as well as improving public trust, opening up public debates, managing diverse and sometimes conflicting views over alternative pathways.
5. **Setting up effective multi-level governance models:** maximising potential of vertical synergies, recognising complementary roles for various governance levels - local, regional, national and EU;
6. **Making room for experimentation:** providing adequate spaces for risk-taking and creativity - ensuring a risk-tolerant environment to facilitate development of new and/or radical solutions.
7. **Securing high levels of policy intelligence, learning and strategic capacity:** building strong evidence-based policy learning capacities, based on a solid knowledge base and special skills to manage transitions, as necessary companions to the transformative innovation approach.

The analysis below follows this framework. The key characteristics of the territory's approach to CCA strategy development and implementation and their linkages with innovation policies and strategies, as revealed by the case study research, are explored in turn, in relation to the above seven features.

2.1 Directionality: defining goals and expected impacts for society

Box 2. Summary on directionality

Current status

Climate change adaptation and regional innovation policies in Norte have not been explicitly articulated, but the discussion is on the table amongst the local and regional actors. In Portugal, government's centralisation means that local and regional strategies follow a top-down structure, aligned with international commitments but lacking explicit connections between innovation and climate change adaptation. The report cannot provide specific details about the municipalities' goals due to timing issues. However, it highlights challenges in creating local climate change adaptation strategies and emphasises the role of the CCDR-NORTE I.P. and CIMs in promoting collaboration between municipalities and regions. These intermediaries also help addressing disparities in institutional capacities among municipalities and ensure strategic development of climate change adaptation plans, considering overlaps in areas like transport, energy, regional development, and innovation.

Example of good practice

CCDR-Norte I.P. is going through a collective construction of concepts and instruments through defining work teams, acquiring new knowledge, networking with the CIMs, the municipalities, the national agencies, and the respective agencies in the European Union

Recommendations

Create a shared regional vision for climate adaptation with municipalities.
Engage diverse stakeholders in shaping the common vision.
Align with national and international commitments while setting local climate goals.
Improve collaboration among municipalities and national agencies.
Intermediary organisations support municipalities with training and implementation.

The dominance of a centralised system in Portugal implies that local and regional strategies follow a hierarchical, top-down structure. Municipal and regional strategies should be aligned with the ENAAC (2020) and sectoral strategies, which, in turn, adhere to international commitments made by Portugal. In the context of this report, which focuses on the connection between innovation and climate change adaptation, this centralisation means that the goals and objectives will have to adhere to those policy instruments from higher levels. These goals often tend to be generic and do not explicitly link innovation with climate change adaptation. For instance, the ENAAC primarily emphasises protection and risk prevention.

> *'Climate change is not a subject that you have in a stiff box... it is an intersection of topics, an intersection of the objectives... of sustainability. If we can change the policy on sustainability, we are [improving our ability to deal with] climate change, and if we have a policy on climate change, we have benefits on our sustainability'* (Interview 4).

Given the timing of the regional strategy and the municipal action plans in relation to compiling data for this report, it is not possible to provide certain accounts of the goals and directions that the municipalities in Norte will take. However, this process has exposed the challenges encountered when creating local strategies for climate change adaptation. It also provides insight into the questions, arguments, and decision-making processes, especially since most interviews involved the participation of at least two people, aside from the author. For example, the CCDR-Norte I.P. is going through a collective construction of concepts and instruments through defining work teams, acquiring new knowledge, networking with the CIMs, the municipalities, the national agencies, and the respective agencies in the European Union. The CIMs are creating strategies to work in articulation with their municipalities to facilitate coordination between them and the CIM, as well as between the municipalities with the aim of providing help to those municipalities that are lagging behind in their action plans and strategies for sustainable development (this point will be expanded below). The municipalities are working in their action plans, but their level of progress varies greatly (interview 3).

> *'We are just starting to work on the climate change adaptation strategy, as it was not a competency before… we expect to work with several agencies and municipalities now that we have that new competence, but again, we have nothing yet'* (interview 1).

As the quote shows, another consequence of centralisation and of the ongoing efforts to devolve powers to local levels is that, for most municipalities (and certainly for the CCDR), climate change adaptation was not addressed locally until specifically mandated by the national level. There are notable exceptions, however, with some municipalities taking proactive steps, for example:

> *'Perhaps in 2005 we decided that our environmental area was in fact our main asset in Esposende, so we started with our plans, strategic plans in different areas that have environmental aspects for instance, water, sanitation, energy, planning over the coastal area to deal with erosion… erosion has been a big problem for us! In 2013 we had a major conference here in Esposende with international experts, from that conference we decided to have a specific plan that would deal with erosion problems and decided to work with our national entities that have that same responsibility' (interview 5).*

Expectations and visions play a key role in driving environmental policies, especially in areas such as climate change adaptation, where diverse actors and levels of government are involved (Trippl et al, 2019; Hassink et al, 2019). Climate change adaptation policies are place-dependent, yet, the collective expectations and future imaginations of participating actors, ideally firms, policy makers, universities and the government in its multilevel manifestations, influence decision making and policy implementation. Therefore, working towards having shared goals becomes crucial, and this can be achieved by, amongst others, having clear goals and directionality.

2.2 Articulating policy portfolios and defining synergies between funding sources

Box 3. Summary on policy portfolios and funding synergies

Current status

Articulating climate change adaptation instruments and actors in Norte involves a complex interplay between national and regional levels of governance. The national government establishes the primary framework for adaptation through various initiatives and strategies, while municipalities are tasked with developing their action plans with support from the CIMs. This coordination primarily occurs across government organisations, with limited involvement from local industries and civil society. There is an evident link between innovation and climate adaptation in some municipalities' sustainable development efforts, and potential in the tourism sector. International collaboration varies among regional entities, with some leveraging EU funding for green projects. Connecting climate adaptation with regional development, innovation, and international collaboration is crucial to address economic disruptions, promote sustainable growth, and ensure a just transition. It can also unlock potential sources of funding, helping to expand the financial resources available, especially for municipalities with lower resources.

Example of good practice

Participatory approach to build the Euro-city Cervera-Tomiño's agenda, done through focus groups to address ideas around circular economy and urban-rural relationship; territorial development and dynamisation of endogenous resources; connectivity and digital transition and citizenship and equality. In each of the events, the main potentialities and needs associated with each topic were considered.

Recommendations

Identify and streamline overlapping objectives for more efficient policy coordination.
Foster collaboration and knowledge sharing among government agencies, local industries, civil society, and regional actors for holistic climate change solutions.
Expand international collaborations, particularly those leveraging EU funding for green projects.
Embrace innovation as a problem-solving tool for climate change and sustainable regional development.
Encourage a shift in perspective for adapting to change and creating sustainable economic opportunities, such as in tourism.

2.2.1 Articulating instruments and actors for climate change adaptation

As previously discussed, climate change adaptation policies and regulations in Norte operate across two key levels of government, with intermediary levels playing a coordinating role. At the national level, the Portuguese government establishes the primary framework for climate change adaptation through initiatives such as the National Action Plan, the National Strategy for Preventive Civil Protection, and the National Strategy for Climate Change Adaptation. These strategies are complemented by documents like the National Energy and Climate Plan and the Carbon Neutrality

Roadmap 2050. On the regional level, municipalities are mandated to develop their own action plans PMAC, with the support of the CIMs (each CIM supporting the municipalities affiliated to them). The CCDR are responsible for creating a regional plan that harmonise national objectives and targets with local climate challenges.

> *We tried to articulate our plans and activities but it's difficult because we have a lot of agencies and most of all we have a lot of plans. We have the first plan, which is the strategic framework for climate policy... it stablishes the vision and the objectives of national climate policy to 20-30, but then this plan also encompasses the national energy Efficiency Action Plan, which is now outdated... then we have the national climate change adaptation strategy, then we have the National Low Carbon Road map. We have a lot of plans. Most of them go towards the same objective and some of the same measures, but this should be simpler for us to start making some practical progress (interview 4)*

This intricate network of policies, strategies, regulations, and plans is coordinated regionally by the CCDRs and the CIMs within their affiliated municipalities. The CIMs are especially close to their municipalities, which are recognised as crucial actors in climate change adaptation. They not only facilitate cooperation among actors with varying expertise but also provide support to those with limited resources. In contrast, the CCDR can offer a broader regional perspective, encompassing the entire region. This collaborative framework can help the effective articulation of policy portfolios.

> *'The participation of social and economic agents – both territorial and sectoral – is necessary to achieve a shared vision, which supports the necessary consensus of citizens on the proposals, while at the same time making it possible to give greater credibility to the process... we have carried out a series of activities to encourage community participation... a total of four focus groups were held to address ideas around circular economy and urban-rural relationship; territorial development and dynamisation of endogenous resources; connectivity and digital transition and Citizenship and equality. In each of the events, the main potentialities and needs associated with each topic under discussion were discussed, as well as the priorities on which this Urban Agenda should focus and, finally, the selection of actions or projects to be developed by Eurocidade Cerveira-Tomiño. Altogether, these sessions were attended by 48 entities and 123 people' (interview 7).*

The process of articulation doesn't solely involve government entities. As demonstrated by the Cerveira-Tomiño experience, climate change adaptation work spans multiple scales, engaging a diverse range of actors. Thus, it goes beyond aligning various policy domains; it requires active participation from actors beyond the government. Therefore, it is anticipated that both PMAC and PRAC should not only include actions addressing risks and vulnerabilities but also strategies and approaches to encourage private sector involvement. However, currently, most of these coordination efforts are primarily taking place at the government level, with limited active participation from local industries and civil society, despite a few notable exceptions.

Box 4. Climate adaptation as a political priority

> *"We have seen what has happened with the climate, we have seen dams with no water, something that has never happened before because we have a very green region with lots of water. But last year, for instance, we had a dam that was completely empty, so much that we could see the ancient villages that were flooded when they constructed the dam... I think that this kind of climate events, extreme climate events unfortunately, will make climate change a priority in the agenda of the politicians."*
>
> *(Interview 5).*

Lastly, it's important to highlight the connection between innovation, regional development and climate change adaptation. Although this link isn't formally documented in policy papers or the regional strategy for smart specialisation, it is evident across various experiences of municipalities leading the way in sustainable development, for example:

> *'We started to fund our projects with EU grants and national projects in Portugal 20-30, to find new strategies to preserve our oceans. We have a very interesting project that identifies discarded fishing nets. The project is to recover those nets and substitute them with others made with biodegradable material. We have already tested it with our fishers' community and the results are extraordinary, now we have to go to phase two, which is a phase of mass production so that we can substitute all fishing nets' (interview 5)*

As shown in the quote, strategies that are directed to addressing climate change adaptation and mitigation can have a positive effect in the local development of the affected communities. Providing biodegradable fishing nets not only serves to address a specific local pollution problem, but also shows governmental support to the fishing communities. This kind of strategies foster innovation and can indeed have positive effects on local and regional development while addressing concerns over climate change. Another potential advantage of articulating these agendas is that it can help unlocking further resources. Funding sources addressed to regional development, such as those coming from the European Union, can contribute to finance climate change adaptation if the agendas are well articulated, and vice versa. Likewise, funds for innovation coming from international or private sources, such as research grants, donations from cluster organisations, or funds for innovation districts, can potentially address concerns over local development and climate change adaptation.

2.2.2 Articulating the international dimension

Besides the international commitments acquired by Portugal, an international dimension is not really a relevant part of the current strategies, also because most of the municipalities are in the process of building their plans. However, there are instances of international collaboration worth noting. For instance, CIM Cávado is a partner in the NBRACER project (Nature-Based Solution for Atlantic Regional Climate Resilience), funded through Horizon Europe Research and Innovation initiatives. This partnership aims to introduce innovative methods for tackling climate change issues using nature-based solutions. It is anticipated that this collaboration will not only enhance community involvement but also broaden the concept of innovation, shifting from high-tech solutions to include community-based knowledge and actions.

The extent of collaboration with international actors varies among regional entities. Some municipalities have leveraged European Union funding for specific projects. Programmes encouraging a green transition have motivated several municipalities to intensify their efforts in this domain, as indicated in the quotes above. Nevertheless, an international dimension is considered vital but challenging to implement. From a critical standpoint, there is recognition that climate change issues extend beyond the local level:

> *'They are multi-level, local, regional, national, European, it does not work to face one small area, or one small problem, because they are all interconnected. We have to explain that clearly to other stakeholders and other departments, municipalities, because mainly they are only worried about their territories and their population' (interview 1).*

There is an important exception worth highlighting. The partnership between Cerveira (Portugal) and Tomiño (Spain) is a case of cross-border collaboration dedicated to advancing regional development. This partnership combines policies aimed at safeguarding natural resources, fostering sustainable economic growth, and promoting social cohesion (Eurocity Cerveira-Tomiño, undated). These two cities have a longstanding tradition of working together, and through the Eurocity initiative, they have set their aims on collectively addressing the Sustainable Development Goals for 2030 and European priorities for 2021-2027. Therefore, their focus is set on the circular economy, sustainability, energy efficiency, support for the local economy, and the preservation of cultural heritage (interview 7). When it comes to tackling climate change, they are committed to fostering cross-border institutional cooperation and implementing a shared strategy to enhance climate resilience. Additionally, they are taking practical steps like encouraging the adoption of organic farming practices.

2.2.3 Expanding climate change adaptation towards innovation and regional development

A key concern when referring to climate change adaptation, after the social implications, are the economic disruptions. Consequently, establishing a more evident connection between climate change adaptation efforts and innovation is increasingly seen as a necessary step. The quotes above underscore the potential ramifications on the regional economy resulting from both climate change and shifts in the economic landscape. Recognising these disruptions is crucial to facilitate a fair transition for all local stakeholders, as well as to encourage innovation.

> *'We have some regional products that can only be produced in very specific conditions, wine for example, port wine. Everyone knows that we must have those specific conditions of humidity and warmth, soil characteristics in order to be a good product, and everyone wants to keep it like that, I think. Global warming can destroy that value!' (interview 1)*

> *'We are aware that a change in the economic base of the region, either by virtue of the alteration of the productive systems or by the extinction of some activities, will imply the extinction of jobs and will lack a strategy that provides for the form of retraining of the existing workforce to adapt to a new reality, [we have seen it with] the decommissioning of the Matosinhos refinery, where a plan for the just transition to a low-carbon economy has been contracted' (interview 6).*

Innovation serves the dual purpose of adapting production to evolving climatic and policy conditions and exploring new avenues that can support jobs and well-being in the face of these changes. A specific economic sector that is both influenced by climate change and has the potential to thrive while promoting nature conservation is sustainable tourism. Notably, sustainable tourism is pivotal not only for Norte but also for Portugal as a whole.

> *'A very close association between climate change adaptation and a more equal world is needed, because these municipalities felt themselves very forgotten. They think that the world is unfair, the politics are always for the same goals that are not necessarily the goals of these little municipalities and they have particular problems, they don't have people. So maybe sustainable tourism is a way to involve municipalities, make an effort to persuade them that this is a solution... because while they have low population and low income per capital, their natural capital is very rich' (interview 2).*

Connecting climate change with regional development and innovation is crucial for creating fresh opportunities for municipalities with limited resources, as well as for acknowledging the efforts of other municipalities. The critical shift here lies in broadening our perspective on innovation, viewing it as a problem-solving tool rather than just a wealth-generating one. This shift can also transform how regional actors engage with their natural environment, moving away from treating it solely as a resource for generating income to recognising it as an integral part of the territory that can generate jobs and well-being. Simultaneously, it can contribute to climate change mitigation and serve as a protective barrier against its impacts.

> *'Esposende is a small municipal, It's very beautiful. We have two rivers. One of them is the most pristine in Portugal... our biodiversity is very specific, we find here species that we don't have in many places in Portugal, the fact that we have a protected area has gained some importance for us, because in the past it's about 30 years ago when I came here to the municipality to work in the environmental area, the protected area was seen just as a problem because we couldn't do anything... all the citizens started to think that this protected area was just a problem, not a potential asset like it is seen today' (interview 5).*

2.3 Ensuring cross domain synergies

Box 5. Summary on domain synergies

Current status
To ensure synergies in climate change adaptation efforts, several strategies are employed. With the support of the CIMs, municipalities align their plans with regional and national strategies and collaborate with each other to foster knowledge exchange and support, especially among those municipalities ahead in climate adaptation. The CCDR-NORTE I.P. evaluates local instruments and their alignment with regional policies. It aims to become an entity to implement a regional policy that integrates existing knowledge and supports collaborative actions. Monitoring, financing, and stakeholder engagement are recognised as challenges that require synergies for effective climate adaptation efforts.

Example of good practice
Signing and committing to climate action networks such as Net Zero Cities (Porto), and joining forces with neighbouring municipalities to develop shared projects and apply for funding (Cervera – Tomiño)

Recommendations
Identify policy synergies through local multi-actor decision-making.
Foster ongoing collaboration and knowledge sharing among municipalities, regardless of political differences.
Facilitate agreements among neighbouring municipalities to address shared climate challenges collaboratively.
Increase collaborations with national entities to support action plans in municipalities with fewer resources.

2.3.1 Strategies to ensure synergies across municipalities with higher governance levels

Policy synergy can be defined as the *'combined effects of interactions between different policy elements (e.g. ideas, tools, actors, relationships, skills) leading to greater outcomes and impact that could not otherwise be achieved from policy domains working in isolation'* (Carmen et al., 2023:2). To solve complex challenges such as climate change adaptation, requires of new ways to work across sectors, it requires of interdisciplinary approaches that allow unfolding the complexity of the issues and accounts for all the nuances that potential solutions may present. A common example is the intersection between climate change and health. Increased temperatures create health issues, hence coordinated efforts of urban planning and primary prevention are needed.

> *'Further articulations are needed... last Friday we were introduced to a plan for regional planning.... that includes everything, from where to build bridges, trainlines, what is needed in mobility, etcetera. One of the things that we were told was that all those decisions have to be made according to climate change. But the municipal*

climate adaptation plans that are being made may not have the same appreciations… the regional level has to be aware of this problem, this can create conflicts' (interview 5).

Cross domain synergies can be achieved with the coordination of the regional level. In Portugal, climate change adaptation's work is mostly organised around the levels of government, with an emphasis on municipalities. Therefore, and despite the centralisation and the limited functions and budgets allocated to the regional entities, namely the CIMs and the CCDR, their role in creating synergies for climate change adaptation work is essential (within their territorial boundaries).

While the municipalities complete their action plans (due in February 2024), the CIMs work to articulate these plans with the government framework. After the municipal plans are finalised, they expect to review the plans seeking ways to incorporate their measures and articulate the work across the municipalities (interview 4). This work of coordination facilitates the sharing of resources, expertise, and technical assistance among municipalities, for example, sharing tools, data, and successful strategies to address common challenges. This work is limited, however, by the financial limitations of the CIMs.

Synergies across these levels are also needed to monitor progress. Monitoring is a significant challenge and is crucial for planning and assessing the impact of actions. Effective monitoring helps determine whether ongoing efforts should continue or not, as well as showing the areas that need more resources, taking care of not duplicating efforts. For example:

'We've found that sometimes everybody is doing the same thing. Sometimes the universities are doing awareness, the municipalities are doing awareness, the government is doing awareness, everyone's doing everything but let's please put all our efforts together' (interview 3).

2.3.2 Strategies to create synergies amongst municipalities

Besides coordinating across municipalities and other levels of government, synergies between municipalities are essential for two reasons. First, it facilitates that neighbouring municipalities can find agreements to deal with shared problems (interview 5). Second, because the municipalities have such a different level of capacities, sharing knowledge, exchanging examples and handing expertise can become an important instrument to level up the municipalities.

'People share knowledge, share best practices and experiences. We are very fortunate at that level, we may have different political parties ruling our municipalities, but at least once a month they come together and discuss the overall strategy. There is a big cooperation between them… So despite 1 municipality being ahead of the others, they support each other to try to take them to the next level' (interview 3)

Besides developing a regional climate action plan and articulating efforts across municipalities with the support of the CIMs, some other strategies are used by some municipalities that can ensure synergies amongst and across municipalities and domains, as it has been suggested in the previous point. Signing and committing to climate action networks such as Net Zero Cities (Porto), and joining forces with neighbouring municipalities to develop shared projects and apply for funding (Cervera – Tomiño), are examples of actions that help breaking a silo approach between several strategies employed and supports collaborative actions.

Synergies can also be achieved through actions that were not as strongly articulated as the examples above but are occurring at different levels and across actors distinct from the local government, as mentioned by the interviewees. Firstly, collaborating on educational campaigns to raise awareness about climate change and sustainable practices is crucial to building commitment among residents and businesses. Secondly, conducting research projects that involve various national, regional, and local actors can highlight the most pressing needs for knowledge and intervention. Further strategies could also include data sharing and monitoring, creating inter-municipal working groups outside the jurisdiction of the CIMs, participating in potential regional initiatives led by the CCDR-NORTE I.P., incentivising collaboration by recognising outstanding efforts or regional awards for sustainable practices, and establishing regular communication channels to keep all stakeholders informed about ongoing initiatives, challenges, and opportunities.

2.4 Increasing breadth and depth of stakeholder involvement

Box 6. Summary on stakeholder involvement

Current status

Effective climate change adaptation demands a multi-actor approach involving various stakeholders from the public sector, regional and national agencies, private sector, industry, and civil society. The level of involvement from these actors depends on each municipality's capacity and progress in climate change work. Collaborative efforts with local communities, civil society, and researchers are crucial, as shown by the CLICTOUR project focusing on nature tourism's impact on climate change. Engaging the private sector can be challenging due to time constraints and changing organisational representation. Esposende can be seen as an example. Its approach involved early engagement of citizens, companies and associations, fostering commitment through a clear common vision, proactive strategies, and personalised communication.

Example of good practice

Research project CLICTOUR, led by researchers of University of Minho in collaboration with local citizens and the Institute for Conservation of Nature and Forests ICNF.

Recommendations

Promote collaborations between universities, research centres and municipalities.
Understand which are the local-specific challenges that prevent stakeholder engagement.
Ensure that engagement efforts are inclusive and consider the interests and concerns of all stakeholders and include all the diverse perspectives and voices in climate adaptation discussions.
Encourage community-based and nature-based solutions.

2.4.1 Multi-level, multi-sector and multi-actor

Up to this point, it has become evident that effective climate change adaptation requires a multi-level, multi-sector approach. This section underscores the importance of also adopting a multi-actor approach, especially if the goal is to establish a connection with regional development and innovation.

When asked about the participants involved in creating the climate change adaptation plans, most interviewees referred to organisations from the public sector, the regional government and national agencies. However, they acknowledged that increased involvement from the private sector, industry, and civil society is essential.

The involvement of less or more actors outside the governments depends on each municipality's capacities and how far ahead are they in their climate change work. Cities with larger progress such as Esposende, and the partnership Cerveira-Tomiño, have mentioned their collaboration with local communities and civil society (interviews 5 and 16). Similarly, the Climate Change Adaptation Strategy of Porto (Município Porto, 2016) acknowledges that key actors in climate change adaptation efforts include the national government, regional and local authorities, economic stakeholders, professional associations, civil society organisations, educational institutions, and community leaders. These municipalities have ensured the involvement of stakeholders by creating participatory spaces in the decision-making process. Another example is the EU funded project DISTENDER, where the municipality of Guimaraes participates. This project aims to create a methodological framework to

respond to the impacts and risks of climate change using a participatory process. The participatory process involves scientists, businesses, governments, policymakers, and citizens, integrating both climate change adaptation and mitigation actions (Distender, undated).

A key actor are the universities and research centres. Their involvement with municipalities largely depends on having common projects and the capacities of each municipality to be involved in those. One collaboration worth highlighting is the project CLICTOUR, led by researchers of University of Minho, who in collaboration with local citizens and the Institute for Conservation of Nature and Forests ICNF, have explored the impact of tourism in response to the climate emergency. Focused on protected areas, nature tourism has been used as a strategy to promote conservation and sustainable development within local communities.

The CLICTOUR research project emerged from the interest and expertise of the researchers, and the availability of funding addressed to investigate climate change action (interview 2). Acknowledging that the tourism industry plays a highly relevant role in the national and regional economy, and that there are strong tensions between developing tourism and environmental protection and conservation, the research set out to identify mechanisms that allow the development of a resilient and adaptive tourism sector capable of supporting the imminent impacts of climate change. The research conducted focused on three protected areas: the Peneda-Gerês National Park (PNPG), the Alvão Natural Park (PNA), and the Northern Littoral Natural Park (PNLN). A main outcome of this project is the creation of a roadmap. The roadmap includes a series of guidelines for the development of climate-resilient nature tourism, considering the high vulnerability of the tourism sector to the effects of climate change and the importance of tourism for the national and regional economy (Sousa *et al.*, 2023).

A key component of the CLICTOUR research project was a series of workshops with stakeholders. According to the interviewees, these workshops served not only to gather data but also to get to understand the concerns, needs and priorities of the local actors and gain credibility for a future implementation of results. The partnership between the researchers and the ICNF was essential to grant the project with legitimacy across the municipal actors participating:

> *'The connections [the ICNF] established with the focal points in each national park were absolutely critical for data collection and participation in the workshops. The five workshops were very important because they... promoted the involvement of different stakeholders, from the management areas, from the municipalities. They responded much better to the institute than to the university because they are closer and connected' (interview 2).*

2.4.2 Engaging the private sector

The quote below exemplifies all the challenges when it comes to involve the private sector, and this includes as much as firms as citizens and organisation from the civil society. People will have limited time to participate or may not find the adequate incentives to do so if they feel their interests are not represented, plus challenges arise in long-term processes, where organisational representation may change.

> *'At the municipal level it is fairly easy [to collaborate], well, at least easier... than when you're talking about engaging the private sector. For instance, we have a lot of small companies with one or two employees. They don't have the time to discuss climate action... Usually they delegate their voice in their associations... so sometimes what happens is that people don't have the time to attend everything*

and to contribute to everything... We had some difficulties when we were trying to get the Intermunicipal plan, the public sector participated but for instance the tourist sector didn't [because the discussion did not include things they were most concerned with] ... another challenge is that these processes are long, you may have the same organisation participating but represented by different people, so it is like starting from scratch every time' (interview 3).

Esposende has had a relatively positive experience engaging the private sector. They have focused both on the citizens and the companies. For the citizens, the have involved residents in all levels, including the parishes, through a personalised strategy. The companies, small and big, and the associations, have been engaged from the very beginning of their work for the sustainable development of the city, appealing to place attachment and the natural richness of their territory, and making sure that all expectations and concerns were heard and understood. The interviewees believe that this participatory process has been successful because of several key factors (interview 4). Firstly, the municipality has adopted an inclusive approach by involving not only citizens but also companies of varying sizes and associations from the very initiation of their sustainable development efforts. This inclusivity is crucial as it appeals to a broad spectrum of stakeholders, recognising the importance of both individual residents and the business community in shaping the city's future. One notable aspect of their strategy is the emphasis on engaging large companies early in the process. By securing commitment from major companies, including one with over 300 employees, the municipality ensured a significant and lasting dedication to their sustainability initiatives. This not only brings substantial resources and influence but also sets an example for other businesses.

Secondly, the municipality's success is attributed to having a clear and shared vision. This shared vision provides a unified direction for all stakeholders, fostering collaboration and preventing conflicting interests. When all involved parties understand and align with the overarching goals, it can create a more cohesive and effective approach to sustainable development and climate change action.

Thirdly, the municipality's proactive approach has played a pivotal role. By directly reaching out to the people, particularly at the local parish level, the municipality has employed a close and personalised strategy. This allows for effective communication of their vision, ensuring that residents have sense of ownership and connection to the sustainability initiatives and making the process more responsive to local needs.

The transition to a sustainable society requires challenge-driven innovations that can be achieved through enhancing collaborations among a more diverse set of stakeholders. Environmental issues are complex and vary across geographies. Therefore, bringing diverse stakeholders and interest groups in policy-making processes can contribute to better policy making. Nonetheless, if the participatory process is poorly managed, it may lead to disillusionment among different groups as they perceive their claims and concerns go unfulfilled (Grundel and Dahlström, 2016).

2.5 Setting up effective multi-level governance models

Box 7. Summary on multi-level governance

Current status

Acknowledging the crucial role of municipalities in addressing climate change adaptation, it is now a task for all municipalities to create action plans. To mitigate issues of 'silo thinking' and encourage collaboration between sectors and municipalities, the CCDR-NORTE I.P. and the CIMs act as intermediaries. They facilitate coordination, gather regional knowledge and promote collaborations among local entities to ensure cohesiveness in action planning. Moreover, these organisations can help address disparities in institutional capacities among municipalities, ensuring a systemic approach that aligns regional development, innovation, and climate change adaptation policies.

Example of good practice

CIMs efforts to help each municipality to build their action plans, to later collect them and find similarities and opportunities for collaboration (ongoing).

Recommendations

Set up regional forums for municipalities to discuss climate adaptation.
Support municipalities with limited capacities through resources, training, and partnerships.
Consider the regional context in climate adaptation.

Multilevel governance is crucial to address climate change adaptation. Climate change is a complex and multifaceted challenge that requires coordinated efforts across different levels, requiring the integration of various perspectives, expertise, and resources from local, regional, national, and international levels, while recognising that local and regional authorities will have a profound understanding of their territories, their vulnerabilities, risks, and opportunities. Multilevel governance also allows for coordinated policy implementation and coordination across municipalities and regions that share common challenges but belong to different jurisdictions. This is especially relevant in the Portuguese approach to climate change adaption, which is rooted in a predominantly centralised form of government but with ongoing efforts to decentralise powers, determining the extent with which governance systems are created to advance climate change and innovation work.

Given their proximity to local actors and their first hand understanding of the challenges and needs, municipalities play a key role in addressing climate change adaptation. Mandating the elaboration of municipal action plans is a response to this acknowledgment. It also reflects the understanding that climate change adaptation risks and actions vary across regions and require localised approaches. This marks an important step forward in recognising the holistic nature of climate change adaptation. However, it also presents additional challenges for local actors when their strategies need to be articulated with several other actors from the public sector.

> *'Sometimes we are pulling in one direction, the regional commission is pulling on the other one, and the national agencies in another one. We have had problems with the Institute for conservation of forest and nature, for example... sometimes we need to implement changes for helping the climate and they don't compromise... it is important to keep a regional view in all of this, to have regional stakeholders who know the territory, that know the problems' (interview 5).*

To break down problems related to 'silo thinking' and address climate change adaptation from broader perspectives, bridging the gaps between areas of responsibility that often lack collaboration between sectors, municipalities, and regions, the work of the CCDR-NORTE I.P. and the CIMs is crucial. They serve as intermediaries between different levels and agencies, coordinate within their

municipalities, gather regional knowledge, and promote meaningful collaborations among local entities:

> *'For instance, one municipality might consider drought to be an issue, so they might prepare a drought plan, and others might think that the problem will be floods. If you have villages in the middle there is a discontinuity... [that is what we] try to avoid, because the municipalities aren't doing these plans by themselves, some hired a third party, like a service supplier to get support in building these types of plans. We try to make municipalities talk to each other in order to make sure that there is some cohesiveness in terms of the action that they are planning now' (interview 3).*

Furthermore, achieving those synergies, as it has been mentioned along this report, can also help enhancing governance for climate change adaptation. Responsibilities for climate change adaptation are well specified within each municipality area of jurisdiction, which can facilitate the work locally, but can prevent collaborations and multilevel governance. The role of the CCDR – Norte and the CIMs is therefore crucial to ensure that multilevel governance will be achieved, as well as to level-up the significant differences in institutional capacities among the municipalities. Each entity decides how to promote the collaborations and ensure the coordination. The CIMs interviewed, for example, are helping each municipality individually and plan to collect all their action plans (due in February 2024) to work on finding similarities and opportunities for collaboration. Given the timing of the interviews, there are no further details on the logistics of this work.

While Porto and Esponsende are frontrunners in their climate change adaptation and mitigation plans, having several strategies covering various sectors, some others will have only one person working on these issues. As a representative of a CIM explained, municipalities need to be strategic in addressing climate change adaptation, which should be achievable since most areas overlap, *'especially in the small municipalities where only one person is in charge... the responsibilities increase but the salary doesn't'* (interview 3). This systemic approach applies not only to addressing transport policies in conjunction with energy policies, for example, but also to regional development and innovation policies in conjunction with climate change adaptation.

Multilevel governance can also be enhanced by participating in European Union programmes or similar initiatives. By participating in these initiatives, regions can bridge gaps between areas of responsibility where they may lack knowledge or where may lack collaboration. It is important, however, that local and regional differences are always acknowledged. Climate change risks and adaptation actions vary and require tailored strategies that account for specific vulnerabilities and strengths.

The significant differences in institutional capacities among municipalities can be addressed through participation in such initiatives, although it is true that certain capacities are indeed required to participate. Nevertheless, making an effort to join collaborative projects can help municipalities and regions to access resources, expertise, and best practices, contributing to level the playground. Finally, an alignment with broader regional development and innovation goals contributes to build a systemic approach that considers the interconnected nature of policies related to, for example, transport and energy, regional development and innovation in conjunction with climate change adaptation.

2.6 Making room for experimentation

Box 8. Summary on experimentation

Current status

Norte's experience reveals that introducing innovative public-sector ideas is constrained by factors like organisational autonomy and institutional capacity. However, these limitations can be mitigated through place-based innovation, multiactor collaborations, and participatory processes with shared visions and projects. For instance, the cross-border cooperation between Cerveira and Tomiño demonstrates the power of joint efforts to promote sustainable agriculture and inclusive tourism. Esposende's case highlights long term sustainability efforts achieved through private sector collaboration, emphasising the importance of involving various sectors in experimentation. This process depends not only on specialised knowledge from research centres but also on locally generated knowledge. However, municipalities in Norte are concerned about the increasing responsibilities placed on them without receiving the appropriate support.

Example of good practice

The agenda 2030 for the partnership Cervera-Tomiño.

Recommendations

Promote research on climate change's socio-economic impacts, informing effective policies.
View experimentation as a process, fostering ongoing reflection and collaboration.
Shift the perspective on innovation to emphasise problem-solving, encouraging more experimentation.

2.6.1 Ways of experimenting

Introducing a new idea, practice, or process from the public sector can be limited by how much autonomy is granted to the organisation, as well as by its institutional capacity. However, Norte has demonstrated that these constraints can be mitigated through a place-based innovation approach, multi-actor collaborations, and participatory processes that result in shared visions and collectively prioritised areas. One example is the cross-border cooperation between Cerveira and Tomiño. By joining efforts, these two cities are promoting sustainable agricultural practices, a sector that has the potential to contribute to mitigating climate change and adapting the local economy to changing conditions.

The agenda 2030 for the partnership Cervera-Tomiño (Eurocidade Cerveira—Tomiño 2030), emphasises the need to promote shorter and localised production and consumption chains, citing benefits such as increased economic autonomy, reduced environmental impact, and decreased costs associated with importing products. It highlights the agricultural potential of Cerveira and Tomiño, proposing the primary sector as a strategic sector for the Eurocity's future. The plan involves asserting the quality of local products, investing in their transformation and marketing (including online platforms), and encouraging the agricultural use of land. Specific actions include the creation of joint programmes, physical and online markets, gastronomy initiatives, and information/training campaigns to promote local consumption.

> *'The highway that was built nearby was impermeabilised, meaning that all the water was coming directly here to our city... plus having the river on the other side... we needed to channel all of the exterior of the city... This was going to be very*

expensive, but we decided to work with nature-based solutions instead… and we also built a cycling and pedestrians path along, from north to south… This is inserted in our mobility plan, which led us to experimenting some new ideas for mobility' (interview 5).

Esposende provides another example of a sustained commitment to sustainability, achieved through collaboration with the private sector. The municipality has undertaken various projects, including the replacement of fishing nets with biodegradable alternatives (as discussed earlier), along with the construction of the cycle and pedestrians lanes -*ciclovia*- mentioned in the previous quote. With 2.8 kilometres length along the Cávado River, the Ciclovia was described as a good example of urban development that serves the residents and tourist sector, while serving as a buffer area for potential floods (interview 5). This example emphasises the importance of involving various sectors for experimentation. While the initial project focused on managing rainwater, it became evident that there were additional advantages related to mobility that could be harnessed.

2.6.2 Knowledge base

Experimentation also requires a base of knowledge. In general, this would refer to specialised and technical knowledge, typically held at universities, research centres and larger firms with strong research and development departments. The public sector's role in this type of knowledge is to promote exchange, provide infrastructure and services, and often give grants to incentive more research. However, in terms of public sector experimentation, this base also includes knowledge available amongst other sectors of the society, as well as the ability to create and leverage new knowledge on new forms to engage locally.

'There are not many studies on people's health and the economy, or the impact on the balance between climate change actions and the benefits… I think we lack a lot of knowledge in that area' (interview 1).

'One thing that we felt was that municipalities lacked information on the economic side… to know the impacts in labour, in economic growth, what are the advantages of having protected natural sites' (interview 2).

'We have the Environmental Education Centre… there we receive all of our schools to work around the implementation of several projects on environmental sensibilisation, how to save energy, how to save water, how to use natural based solutions' (interview 5).

As the quotes show, local actors in Norte are concerned by the lack of knowledge available regarding the socio-economic impacts of climate change. This highlights that the knowledge base referred above also requires expanding towards research on the social sciences as much as the more technical areas, as it was done with the CLICLTOUR research project, for example. This will be expanded in the recommendations section.

2.6.3 Limits

Norte's experience also highlights limits of experimentation, mainly at the municipal level. A key concern is the increasing multiplicity of roles and tasks that are now expected from municipalities. This, however, is not interpreted as a critique to the efforts of decentralisation but rather, as a call for increasing local capacities alongside the responsibilities:

> *'Municipalities have already lots to do. How do you think they could cope? Are these like more responsibilities or can they be combined? Do they need more resources? They have the people, they have the knowledge, but all the issues that they have to arrange, it will take lots of time. It is not only a financial problem, it's also a structural organisational problem' (interview 4, participant 2).*

> *'Just recently Birmingham City Council declared bankruptcy! because of what? Because they have a lot of stress in social issues, feeding the young, giving subsidies, etc. This is the reality that most of the municipalities here are seeing too. We are seeing that a lot of social responsibilities are coming from the state to the local authority. So, I think you realise that for us, climate is on top of our priority but unfortunately the smallest local administrations have other issues' (interview 5, participant 3).*

Experimentation is key for climate change adaptation. Despite the effort to model future scenarios, climate change effects have a degree of uncertainty. Experimentation allows for the testing of different adaptation strategies to determine what works best under varying conditions. This enhances learning, innovation, and tailoring solutions to the specificities of each region and municipality. Experimentation does not only belong to universities, neither it occurs solely in sophisticated laboratories. Experimentation can also include exploring ways to communicate with stakeholders, developing community-based solutions collaboratively, or exploring new synergies across policy domains, such as innovation and climate change. Research has shown that a lack of successful coordination with other spatial levels can hinder the ability of regional policy actors to embark on innovative experiments. Sustained support from higher policy tiers is essential to nurture and sustain the development of these efforts (Moodysson et al., 2017).

2.7 Securing high levels of policy intelligence, learning and strategic capacity

Box 9. Summary on policy intelligence, learning and strategic capacity

Current status

One key indicator of policy intelligence and learning in the Norte region is the experimentation carried out by individual municipalities, particularly in cases frequently cited like Esposende, Cerveira, and Porto. However, the capacity for improvement is not limited to municipalities with greater resources. Collaborative efforts among municipalities, facilitated by CIMs and CCDR-NORTE I.P., play a crucial role in bridging gaps and fostering policy mobility and learning. Another vital aspect of policy learning involves implementing monitoring measures to assess the impact of climate change actions. These tools are essential because climate change initiatives often lack sustained, long-term local assessment. Establishing monitoring tools becomes crucial for evaluating the effectiveness of strategies, enabling necessary adjustments, and promoting learning.

Example of good practice

Esposende's efforts for building a sustainable development agenda (explained across the document)

Recommendations

Encourage CIMs to create opportunities for mutual support among municipalities in climate adaptation.

Build capacity within the organization through methodologies and spaces for learning, reflection, and feedback.

Promote the development of monitoring tools for tracking the long-term impact of climate strategies.

Support knowledge exchange among municipalities, CIMs, higher-level agencies, and international partners to enrich regional understanding of climate adaptation.

> *'From our municipalities, some have more population, more activity, more income, and are better prepared. For example, Esposende on the Atlantic Coast, they have a lot of plans considering the rise of the water levels, they have a plan, they made studies even previous to our study, and an idea on how to impose those plans... for example, they have learned that some actions cannot be done if not with regulation, for restaurants on the coastline for example, there will be no more coastline in 30 years, and they know that there is no easy way to put it... For other municipalities the risks are perhaps less evident, although they suffer from wildfires and droughts, I think they have more difficulty in passing this on to the population. But we have other municipalities, they only have an idea on what to do, but nothing very specific, and others don't even have an idea' (interview 2)*

One key evidence of policy intelligence and learning comes from the experimentation that individual municipalities in Norte have done, specifically the cases that are brought up more frequently, Esposende, Cerveira and Porto. However, as it has been said along the document, the differences across the municipalities in Norte are reflected in their progress with climate change adaptation work,

as it does in their capacity for experimentation and learning. Even though if all municipalities have the mandate to create and implement action plans, there will be gaps in how those plans progress and are monitored. This does not mean that these processes are restricted to municipalities with larger capabilities. In these cases, the CIMs and the CCDR can play a significant role. One way that some CIMs have found to reduce these gaps is to create spaces for municipalities to help each other, *'try to choose two or three municipalities that are ahead to pull the ones that are lying behind'* (interview 5). These kinds of strategies are examples of policy mobility and learning. These initiatives are repeated across the other CIMs.

One important aspect of policy learning is to have measures of monitoring in place, as expressed by the representative of the CIM Alto Minho and Ave (interviews 3 and 4). One example of a potential strategy was the use of remote sensors to quantify the impact of the climate change actions. Implementing these actions is relevant because even though there could be specific targets in, for example, percentages of carbon reduction, climate change actions are long-term measures that often lack sustained, long-term assessment locally. Creating tools to monitor progress could prove instrumental in assessing the impact of the strategies, allowing for adjustments and learning. However, there is little progress in this regard in the region.

Policy learning can materialise in adjustments to current strategies, the search of new forms of collaborations and strategic coordination with private actors, the civil society and with actors outside the region. A key aspect of policy learning is the establishment of monitoring measures. Existing examples include the use of remote sensors to quantitatively assess the impacts of climate change actions, however, more efforts are required in this regard.

Box 10. Best practices

For experimentation, policy learning, directionality and involving stakeholders.

Esposende's biodegradable fishing nets project
Esposende's Ciclovia
Esposende's long-term exercise of working close to the residents and the companies to build a common vision of sustainable development for the municipality.
CLICTOUR research project

For synergies, multilevel governance, and articulation of portfolios.

Eurocidade Cervera-Tomiño
Porto's involvement in European and international initiatives

3 Conclusions and recommendations

3.1 Goals and directionality

It is worth reminding that the research for this report was done while the municipal and regional plans were still in the process of discussion and writing, therefore, it is difficult to comment on their goals and directionality. However, some lessons can be drawn from the process of building these plans. First, Norte's municipal and regional plans must align with national-level commitments and strategies such as the ENAAC, which tends to emphasise on protection and risk prevention but lacks explicit linkage between innovation and climate change adaptation. This centralised approach can limit the flexibility of local goals and objectives, and will necessitate a more proactive approach from the municipalities and regional actors to avoid such inflexibility.

Recommendations

- Continue working towards a common vision on climate change adaptation work at the regional level but agreed with the municipalities. Part of this common vision can include recognising the interconnected nature of climate change adaptation, innovation and regional development. This common narrative can later be translated into common agendas that will facilitate cooperation.
- Engage a diverse range of stakeholders, including local communities, civil society, researchers, and the private sector, in the development the common vision.
- While aligning with national and international commitments is crucial, as well as the common visions discussed above, this should not overlook the need for place-specific climate adaptation goals and targets.
- Enhance collaboration between municipalities, regional entities, and national agencies to help filling the gaps created by uneven institutional capacities.
- Within the limits of their competences, intermediary type of organisations can continue to support municipalities and regional entities with training and capacity building to develop and implement the municipal climate adaptation plans. This may involve financial support, technical assistance and knowledge sharing.

3.2 Articulating policy portfolios

The complexity of addressing climate change adaptation calls for a multi-sectoral, multi-level and multi-actor articulation, including all levels of government, civil society, universities and research centres and the private sector. The effectiveness of this articulation not only depends on putting diverse policies into conversation. It also requires carefully reviewing the legal framework that allows those policies to be implemented and articulated, as often conflicting positions appear, for example, the need to implement economic growth policies that involves the use of natural resources in protected areas.

Climate change adaptation and innovation policies in Norte involve a complex interplay between national and regional levels of governance. The national government establishes the primary framework for adaptation, while municipalities develop their action plans with regional support. There is an ongoing process of coordination and articulation amongst municipalities and CIMs, yet the CCDR

is only starting to get hold in this process. With few exceptions, other largely absent actors are the local industries and civil society.

Recommendations

- Identify overlaps in objectives and streamline them to make the coordination of policies more efficient.
- Encourage collaboration and knowledge sharing amongst government agencies, local industries, civil society, and regional actors. These conversations can help building holistic solutions for climate change adaptation and innovation.
- Continue and expand international collaborations, especially those that leverage EU funding for green projects.
- Encourage a shift in perspective, viewing innovation as a problem-solving tool for addressing climate change and promoting sustainable regional development. Innovation can help to adapt to changing conditions and create sustainable economic opportunities, for example sustainable tourism.

3.3 Ensuring cross domain synergies

Norte is creating synergies and coordination across municipalities, and for this the CIMs are accomplishing a critical role. While municipalities are actively working on their climate adaptation plans, the regional level plays a crucial role in aligning these plans with the broader framework. However, synergies across domains beyond the local actors are not prevalent in the work carried out so far. The financial limitations of the CIMs are a notable challenge, as well as monitoring progress.

Recommendations

- Identify policy synergies through multi-actor decision making at the local level. This can be done utilising the spaces of community participation that are being used to build the current municipal action plans.
- Continue encouraging municipalities to collaborate and share knowledge, best practices, and experiences, while promoting a culture of knowledge sharing and expertise exchange regardless of political differences
- Facilitate agreements among neighbouring municipalities to address shared climate-related challenges. These agreements should focus on collaborative solutions that benefit the entire region, considering the uneven capacities of municipalities.
- Engage in more collaborations with national entities in charge of specific sectors, this could enhance knowledge and support the design and implementation of action plans in municipalities with fewer resources.

3.4 Increasing breadth and depth of stakeholder involvement

Climate change adaptation work requires of a multi-actor approach. There is a need for a broad range of stakeholders, including public sector organisations, regional and national government entities, industry, civil society, educational institutions, and community leaders, to be actively involved. Norte's experience in involving diverse actors differs across municipalities. For example, Esposende has large experience in engaging the private sector, it involved companies, both large and small, from the early stages of their sustainable development efforts. Having a clear and common vision, a proactive outreach to the community, and building a sense of place attachment emphasising the natural richness of the region helped to achieve those collaborations.

Other key actors are the universities and research centres. Their involvement in climate change adaptation work can help the region to advance its climate adaptation initiatives by providing new knowledge, data and tailored recommendations. Also, universities and research centres can play a pivotal role in establishing more robust connections between climate change adaptation and regional development and innovation, as the project CLICTOUR has demonstrated.

Recommendations

- Promote collaborations between universities, research centres and municipalities.
- Understand which are the local-specific challenges that prevent industry, civil society, educational institutions, and community leaders to participate in the design, implementation and monitoring of the climate change adaptation plans.
- Ensure that engagement efforts are inclusive and consider the interests and concerns of all stakeholders, and include all the diverse perspectives and voices in climate adaptation discussions.
- Encourage community-based and nature-based solutions.

3.5 Setting up effective multi-level governance models

Governance refers to the structures, processes, rules and traditions that determine how people in societies make decisions and share power, exercise responsibility and ensure accountability (Folke et al, 2005). When it comes to environmental policies and green transitions, the discussion about governance steers towards its role in creating the conditions that allow transitions and governing the transformation processes (Patterson et al, 2017). Therefore, governance for complex environmental challenges, such as climate change adaptation, is not limited to how current institutions, organisations and societies take and implement decisions (past and present-looking), but also how those decisions are going to be governed, managed, and monitored (future-looking). Therefore, it is not uncommon to find that alongside the new policies and strategies come new organisations and monitoring systems.

The Portuguese approach to climate change adaptation reflects a predominantly centralised form of government, mostly focused on allowing climate change adaptation work. There are ongoing efforts to decentralise the work on climate change adaptation, which can be read as a recognition of the critical role that municipalities play in addressing climate change adaptation. However, it also brings challenges as local strategies need to be coordinated with various actors from the public sector. Furthermore, it increases the responsibilities of the local authorities without specific plans to also increase their capabilities.

To address these challenges, the CCDR-NORTE I.P. and the CIMs are crucial. These entities act as intermediaries, bridging the gaps between different levels of government and agencies, fostering collaboration among municipalities, and promoting a regional view of climate adaptation. These 'intermediaries' are instrumental in addressing disparities in institutional capacities among municipalities.

Recommendations

- Establish regional networks or forums that bring together municipalities outside their respective CIMs, to discuss climate adaptation and share best practices.
- Develop strategies to support municipalities with limited institutional capacities. This could include providing resources, training, or facilitating partnerships between municipalities with varying levels of expertise.
- Highlight the importance of considering the regional context in climate adaptation work.

3.6 Making room for experimentation

As it occurs with other elements of this framework, the region's experience with experimentation vary greatly according to the municipalities. Some have demonstrated that experimentation and innovation in climate change adaptation are feasible. A place-based innovation approach, multi-actor collaborations, and participatory processes have been instrumental in mitigating these constraints. For example, the cross-border cooperation between Cerveira and Tomiño, emphasising on sustainable agricultural practices and inclusive tourism, show the potential of having shared visions and joint efforts. On the other hand, Esposende shows that a comprehensive work on sustainable development and climate change adaptation is a long-term commitment that involves other areas like mobility, urban planning and local economies.

Experimentation also relies on a robust knowledge base that encompasses both technical expertise from universities and research centres and practical insights from local actors and community members. There is room for growth in this area, particularly in understanding the socio-economic impacts of climate change and potential solutions.

Recommendations

- Promote research on the socio-economic impacts of climate change, including effects on health, labour, and economic growth. This expanded knowledge base will help inform policies and strategies, facilitating effective climate adaptation and innovation.
- Understand experimentation as process rather than a result. As such, it requires continued reflection from actors in the public sector and continued collaboration of private actors and research institutions or universities.
- Broadening the perspective on innovation, from wealth generation to problem-solving, can transform how regional actors engage with their natural environment and open perspectives for more experimentation.

3.7 Securing high levels of policy intelligence, learning and strategic capacity

Norte demonstrate policy intelligence and learning through individual examples such as Esposende and Cerveira, but also in the region, by the efforts to articulate the municipalities. All municipalities are mandated to create and implement action plans, yet disparities exist in the progress and monitoring of these plans. These differences offer opportunities for mutual support among municipalities, facilitated by the CIMs. Collaborative strategies within the CIMs and similar initiatives are illustrative of policy mobility and learning, contributing to a more coherent regional response to climate change. The CIMs interviewed work in sharing the good experiences and knowledge across their municipalities. The CCDR-NORTE I.P. plans to do a similar work in the future (their involvement in climate change adaptation has just recently started).

Recommendations

- Encourage CIMs to continue creating opportunities for municipalities to support one another in climate change adaptation efforts.
- Continue building capacity for learning within the organisation by creating methodologies and spaces for safe interaction, collective reflection and constructive feedback.
- Promote the development and deployment of monitoring tools and assessment mechanisms. These tools will be essential for tracking the progress and impact of climate change strategies over the long term.
- Support the exchange of knowledge and expertise not only among municipalities but also with CIMs, higher-level agencies, and international partners. This collaborative approach can enrich the region's collective understanding of climate change adaptation.

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List of abbreviations and definitions

Abbreviations	Definitions
AML	Climate Law
CCA	Climate Change Adaptation
CCDR	Commissions for Regional Development
CCDR-N	Commission for Regional Development of Norte Region
CIM	Inter-Municipal Communities
CLICTOUR	Climate Change Resilient Tourism in Protected Areas of Northern Portugal
DG CLIMA	Directorate-General for Climate Action
DG RTD	Directorate-General for Research and Innovation
DISTENDER	Equilibrium for Climate Change Project
ENAAC	National Strategy for Climate Change Adaptation
ENEI	National Strategy for Smart Specialisation
ICNF	Institute for Conservation of Nature and Forests
JRC	Joint Research Centre
NUTS	Nomenclature of territorial units for statistics
PMAC	Municipal Climate Action Plans
PNA	Alvão Natural Park
PNEC	National Energy and Climate Plan
PNLN	Northern Littoral Natural Park
PNPG	Peneda-Gerês National Park
POC-CE	Coastal Waterfront Programme – Caminha|Espinho

Abbreviations	Definitions
PRAC	Regional Climate Action Plans
R&I	Research and innovation
RNC	Carbon Neutrality Roadmap
S3	Smart Specialisation Strategy
TI	Transformative Innovation

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Annexes

Annex 1. List of interviews

Table 3. Interviewees

Identifier	Interviewee	Date
Interview 1	Joana Freitas CCDR-NORTE I.P., technical team (DSAS/DSA)	July 2023
	Liliana Cunha CCDR-NORTE I.P., technical team (DSAS/DSA)	
	Manuela Novais CCDR-NORTE I.P., technical team (DSAS/DSA)	
Interview 2	Rita Mafalda Dionísio Sousa, Alto Minho University	July 2023
	António Avelino Batista Vieira, Alto Minho University	
	Isabel Freitas, Institute for Conservation of Nature and Forests ICNF	
Interview 3	Sandra Estevens, CIM Alto Minho	August 2023
Interview 4	Andre Coutinho, CIM Ave	August 2023
	Tiago Vale, CIM Ave	
Interview 5	Ana Carvalho, CIM Cávado 1	August 2023
	Rafaela Morim, CIM Cávado 2	
	Cecilia Marques, CIM Cávado 3	
	Alexandra Roeger, City Councillor	
Interview 6	CCDR-NORTE I.P. written questionnaire	September 2023
Interview 7	Villa Nova de Cerveira written questionnaire	September 2023

Annex 2. List of case studies

Case studies have been carried out to analyse to what extent and how enabling factors towards 'Transformative Climate Change Adaptation' strategies, as identified in the conceptual report (European Commission, 2024), are at play in reality, and what can be done to overcome barriers in various territorial contexts. The methodological framework described in the conceptual report essentially acts as a practical guide for undertaking cases studies on CCA strategies in different territories, in a uniform way. These case studies are listed below:

Table 4: "Transformative innovation for better climate change adaptation" – Case studies

Country	Territory	URL (*)	DOI	JRC number
Belgium	Leuven	https://publications.jrc.ec.europa.eu/repository/handle/JRC137313	10.2760/58125	JRC137313
Finland	Espoo	https://publications.jrc.ec.europa.eu/repository/handle/JRC137316	10.2760/177322	JRC137316
Finland	Turku - Southwest Finland	https://publications.jrc.ec.europa.eu/repository/handle/JRC137315	10.2760/211155	JRC137315
France	Provence-Alpes-Côte d'Azur	https://publications.jrc.ec.europa.eu/repository/handle/JRC137314	10.2760/46893	JRC137314
Greece	Attica and North Aegean regions	https://publications.jrc.ec.europa.eu/repository/handle/JRC137322	10.2760/493562	JRC137322
Iceland		https://publications.jrc.ec.europa.eu/repository/handle/JRC137291	10.2760/305796	JRC137291
Italia	Emilia-Romagna	https://publications.jrc.ec.europa.eu/repository/handle/JRC137319	10.2760/790200	JRC137319
Netherlands	Northern Netherlands	https://publications.jrc.ec.europa.eu/repository/handle/JRC137312	10.2760/10862	JRC137312
Poland	Mazovia - Stare Babice	https://publications.jrc.ec.europa.eu/repository/handle/JRC137323	10.2760/58125	JRC137323
Portugal	Norte	https://publications.jrc.ec.europa.eu/repository/handle/JRC137321	10.2760/399394	JRC137321
Romania	Nord Vest - Cluj	https://publications.jrc.ec.europa.eu/repository/handle/JRC137317	10.2760/923916	JRC137317
Slovenia	Gorenjska	https://publications.jrc.ec.europa.eu/repository/handle/JRC137320	10.2760/502482	JRC137320
Spain	Andalucia - Granada	https://publications.jrc.ec.europa.eu/repository/handle/JRC137324	10.2760/104672	JRC137324.
Sweden	Blekinge and Värmland	https://publications.jrc.ec.europa.eu/repository/handle/JRC137318	10.2760/249067	JRC137318

(*) Links may give error message for those studies still under publication

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