European Environment Agency

Social fairness in preparing for climate change: how just resilience can benefit communities across Europe

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Key messages

- As climate change impacts worsen, societal preparedness for climate change in Europe must increase. But efforts to build this resilience must leave no one behind. Socially vulnerable groups, such as older people, children, low-income groups and people with disabilities, are disproportionately affected by the impacts of climate change and do not always benefit fairly from (or are burdened further by) adaptation responses to these impacts.

- While some progress is being made to embed justice considerations into adaptation efforts at the EU, national and subnational levels, their consistent integration into all stages of the adaptation policy cycle — particularly implementation — remains inadequate. This highlights the need for concrete guidance on how to consider justice in adaptation responses.

- Priorities for action include the development of a monitoring framework for assessing progress on just resilience at all governance levels. At the EU level, a dedicated funding mechanism should be established. The EC's European climate adaptation plan, expected in 2026, will be a key opportunity to integrate justice into national adaptation processes, strategies and plans. At the Member State level, priorities include integrating justice into adaptation policies and other relevant policies and laws (e.g. energy and building policies, worker protection legislations, agriculture planning and financing). Subnational authorities should engage vulnerable groups in planning and implementing targeted adaptation measures that address their unique needs and vulnerabilities.

- In the four systems studied in this report, there are many ways in which justice may be integrated into adaptation measures:

    - In the built environment, targeted measures to prevent injustice in adaptation responses include: (i) providing financial support for home improvements to low-income homeowners or tenants; (ii) creating more inclusive governance mechanisms; (iii) protecting outdoor workers from weather extremes; (iv) ensuring inclusive green infrastructure planning to avoid gentrification and displacement.

    - In the agriculture and food system, examples of just adaptation measures include: (i) supporting the planned and autonomous adaptation of agricultural production; (ii) ensuring access for all to finance, insurance and technologies; (iii) protecting outdoor workers from weather extremes; (iv) acknowledging indigenous land stewardship; (v) ensuring equitable access to food.

- In the water system, adaptation measures should prioritise two things: water accessibility for all and incentivising reduced water use while ensuring base level affordability for all. This may involve: (i) providing financial support for water-saving technologies; (ii) implementing policies to guarantee equitable access to water resources; (iii) the integration of green elements into water infrastructure to enhance system resilience.

- In the transport system, adaptation measures that integrate just resilience should focus on: (i) improving the safety, comfort and reliability of infrastructure; (ii) implementing social tariffs; (iii) integrating green elements into infrastructure design; (iv) ensuring that transport systems are designed to meet the needs of vulnerable populations.

Executive summary

There is a clear need to ramp up justice considerations in adaptation. By integrating justice into adaptation efforts and addressing the unique needs and vulnerabilities of different social groups, policymakers can create more resilient and equitable communities that are better prepared to cope with climate-related hazards. This requires a comprehensive approach that enhances the understanding of the uneven burden of climate change and adaptation measures among social groups and prioritises inclusive and participatory decision-making processes. In practice, this needs to involve targeted interventions that recognise the realities and challenges faced by vulnerable populations alongside a strong policy framework with dedicated funding and support mechanisms that help these populations adapt to changing climate conditions.

While there has been progress across all governance levels, the integration of justice at all stages of the adaptation policy cycle – particularly implementation – remains inadequate. There is a clear need for concrete guidance on operationalising just resilience, in order to achieve a resilient and prepared Europe where citizens and communities can thrive in the face of climate change.

Leaving no one behind in climate change adaptation

Europe is the fastest-warming continent on the planet and the EU has embarked on a clear path towards a carbon-neutral economy. However, as changes are happening already and at a faster pace than expected, it is no longer sufficient simply to mitigate CO_2 emissions. Europe must increase its resilience to climate change. While adapting, it must also ensure that no one is left behind.

Socially vulnerable groups, such as older people, children, low-income groups and people with disabilities, are unduly affected by climate change. They are burdened disproportionately by its impacts and they do not always benefit fairly from (or are burdened further by) adaptation responses to those impacts. The *European Climate Risk Assessment* (EUCRA) (2024), the European Commission's (EC) communication on managing climate risks (2024), the EC's *Climate Action Progress Report* (2024) and most recently the EU preparedness union strategy (2025) stress the need for adaptation strategies that prioritise and include these vulnerable populations to ensure that justice is integrated more broadly into efforts towards adaptation and societal preparedness.

Member States and subnational governments are increasingly incorporating justice into their adaptation policymaking and planning but analysis has indicated that such integration, particularly within the implementation phase, is still lagging.

This report presents the latest available evidence on just resilience and addresses its evolving meaning, its current status in policy and planning at the EU, national and subnational levels and the priorities for action. It explores how just resilience is addressed and implemented in four key systems: the built environment, agriculture and food, water and transport. It then offers actionable guidance for policymakers and practitioners. Importantly, the report sheds light on where adaptation measures may inadvertently make existing inequalities worse within these systems, with inspirational examples provided of practical approaches that are being used to ensure that no one is left behind.

Box ES. 1

The concept of just resilience

Just resilience implies that policymakers and practitioners:

- address the **uneven impacts of climate change**;
- make sure that when developing **adaptation responses** to these impacts, individuals or social groups that are already vulnerable benefit fairly from these responses and are not disproportionately burdened ('leaving no one behind').

To enable justice in adaptation efforts, policymakers need to address the **systemic and structural issues** that perpetuate inequalities, focusing on transforming the underlying causes of these injustices.

It is in line with **EU core values and international agreements** to take justice into account and doing so can lead to **more effective adaptation**; **failure to do so may lead to resistance to change** in achieving EU policy objectives.

Just resilience has three key dimensions: *distributional justice* (the fair allocation of resources and burdens from climate impacts and adaptation efforts); *procedural justice* (fair, transparent and inclusive decision-making processes); and *recognitional justice* (respecting and integrating diverse values, cultures and perspectives and addressing deeper causes of inequity).

Key takeaways on the status of just resilience in policymaking and planning at the EU, Member State and subnational levels

In the EU policy landscape, just resilience is becoming a key principle but the concept is currently lacking a common definition, assessment framework and dedicated funding mechanisms. At the Member State level, justice is increasingly integrated into adaptation policymaking and planning but mostly in an indirect manner. Both Member States and subnational authorities place an emphasis on assessing who is unevenly burdened by climate change impacts but they do not assess who benefits from adaptation responses to the same extent. In addition, little attention is paid to engaging socially vulnerable groups — in particular, in the planning and policymaking process — and recognising their diverse perspectives and the systemic barriers they face when adapting to climate change.

At the EU level, there is an increasingly comprehensive policy landscape on just resilience. The European Green Deal (EGD), Climate Law, cohesion policy and EU adaptation strategy all emphasise the importance of fairness, justice and leaving no one behind. Programmes such as the Mission on Adaptation to Climate Change and the EU Covenant of Mayors contribute to developing guidance on operationalising just resilience. However, unlike just transition in mitigation, there are currently no dedicated EU funding mechanisms for just resilience.

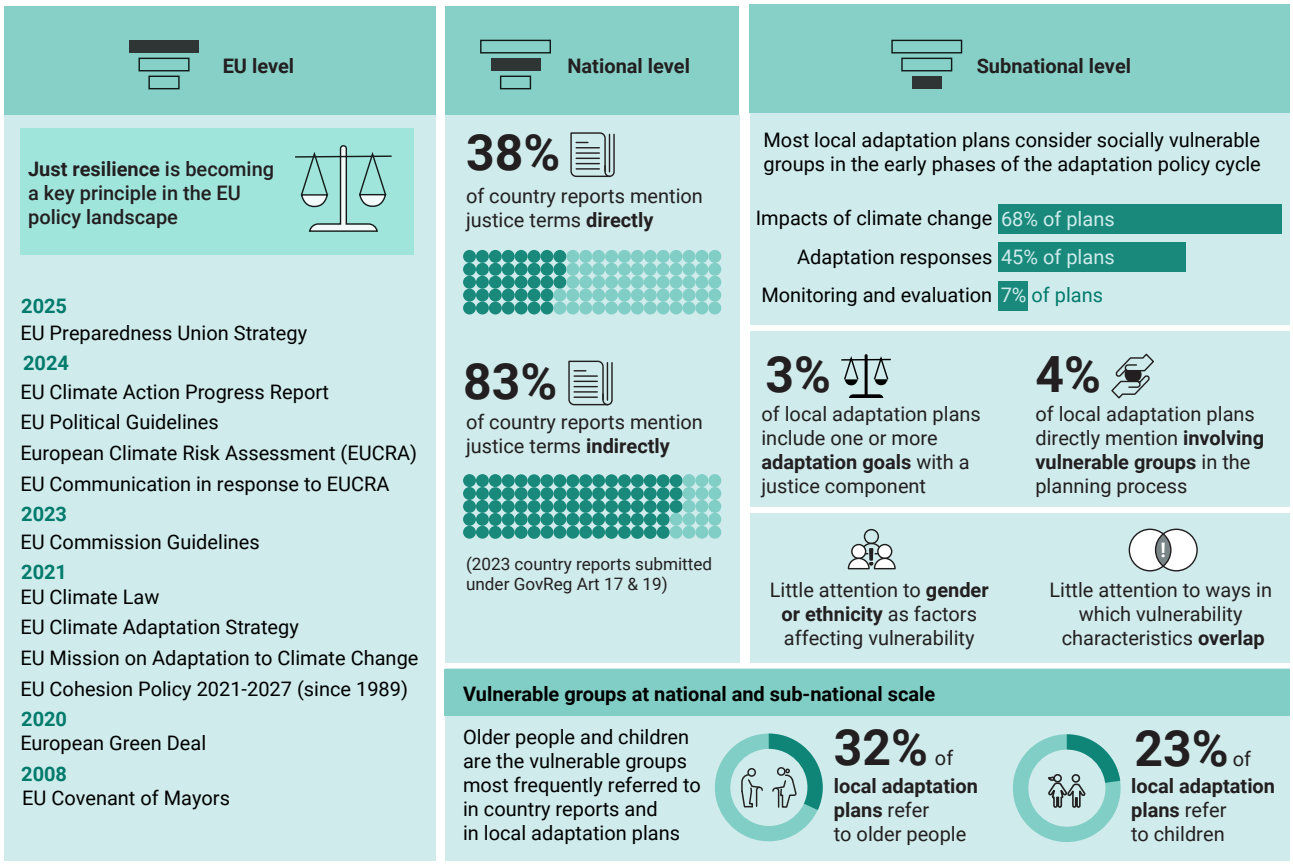
Reports on national adaptation plans and strategies refer to justice but generally indirectly (83% of country reports submitted under the Governance Regulation in 2023 versus 38% of plans mentioning justice-related terms directly); predominantly they focus on who is burdened by climate change impacts and pay little attention to engaging socially vulnerable groups or recognising structural inequities.

Adaptation plans at the subnational level show a similar pattern. Socially vulnerable groups are most often acknowledged during the early stages of the adaptation policy

cycle, particularly in climate impact and risk assessments (68% of local adaptation plans studied). However, at the later stages, fewer plans take socially vulnerable groups into consideration in specific adaptation actions (45% of plans), monitor progress (7% of plans) or directly involve vulnerable groups in the planning process (4% of plans). In addition, only a small percentage of plans studied (3%) includes one or more adaptation goals with a justice component.

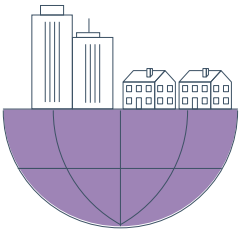
Data sets and methods are increasingly available to provide some indication of justice-related outcomes but there is no common framework or established indicator set to consistently monitor just resilience at the EU, national and subnational levels. Indicators that can assess the distributional dimension of adaptation measures are to some extent available, in addition to certain procedural indicators that give an idea of the extent to which stakeholders have been involved in their development and implementation. However, indicators on recognitional aspects of justice are non-existent to date. There is some consistency around which social groups are viewed as being disproportionately impacted or burdened (particularly older people and children – recognised in 32% and 23% of local adaptation plans, respectively) but there is no clear and comprehensive categorisation of social vulnerability and significant gaps remain (particularly in relation to gender, ethnicity and how different vulnerability characteristics may overlap or change rapidly).

Figure ES.1 **Overview of status of just resilience at the EU, national and subnational levels**



Source: Author's compilation.

Key takeaways on integrating justice considerations into adaptation efforts in four key systems: the built environment, food and agriculture, water and transport



The built environment

The built environment plays a crucial role in shaping the resilience of communities to climate change. However, existing inequalities in housing quality and conditions, the location of infrastructure and access to green spaces can exacerbate the impacts of climate change on vulnerable populations. In addition, social vulnerability characteristics may prevent individuals or groups from benefitting from adaptation measures.

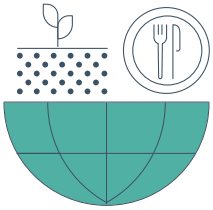
Injustice in the residential sector manifests in old housing stock that is often inhabited by people with low household incomes who lack the financial resources to adjust their dwellings to cope with more extreme weather conditions. Currently 19% of the EU's total population is unable to keep their home comfortably cool in summer. Injustice in the non-residential sector, focusing on health and education infrastructure, is experienced through disproportionate exposure to risks such as overheating or flooding and sub-standard building stock.

Injustices related to natural elements in the built environment (e.g. green spaces, water features) manifest most often in relation to inequitable access to these spaces or resources that offer benefits in terms of physical and mental health, temperature regulation, social cohesion and inclusion. The World Health Organization (WHO) recommends that people should live within 300m of a green space but less than half of Europe's urban population currently does so, with green space less available in lower income urban neighbourhoods than in higher income ones. Furthermore, the creation of new green and blue spaces can also contribute to gentrification and property price increases that may result in community members being displaced.

To address these injustices, targeted measures are needed to improve the resilience of the built environment and the vulnerable communities living within it. This includes providing financial support for home improvements for low-income homeowners or tenants, creating more inclusive governance mechanisms, protecting outdoor workers from weather extremes and ensuring inclusive planning for green infrastructure to avoid gentrification and displacement.

Resilience measures like better building materials, technologies and insurance are often driven by policy or financial incentives. However, low-income groups — especially those that are renting — may be excluded due to barriers such as cost. Resilience measures must be designed specifically with the needs and financial capabilities of lower-income groups in mind, particularly when setting different incentives for homeowners and tenants. Appropriate measures may include low-income or tenant grant or subsidy schemes, public/private partnerships for insurance cost-sharing and access to new technologies such as prefabricated renovation materials.

Likewise, vulnerable groups should be engaged early on when planning and designing measures that place responsibility for protective actions and recovery on individuals, such as flood insurance, flood-related land-use planning or early warning systems, and the individual burdens of these measures should be reduced during implementation and use.

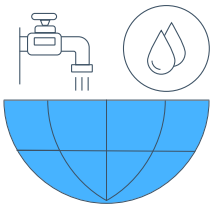


The agriculture and food system

The agriculture and food system is highly vulnerable to the impacts of climate change, with significant implications for the livelihoods of agricultural workers and for food security. Small-scale farmers and outdoor agricultural workers, particularly migrant labourers, are disproportionately affected by climate-related hazards such as droughts, floods and heatwaves. Lower-income consumers will also feel the burden of the increased costs of food production that are passed along the entire food production chain, reducing their access to affordable, sufficient, safe, nutritious and culturally appropriate food. In Europe, around 7% of the population is currently moderately-to-severely food insecure, with evident differences between countries.

Injustice in this system is evident in the unequal distribution of adaptation measures, which often favour larger and more affluent agricultural enterprises. In order to achieve just adaptation, both planned and individual-level adaptation measures that address the unique needs of different agricultural enterprises and workers must be supported. This may include implementing protections for outdoor agricultural workers and ensuring that financial transfers and insurance mechanisms — that have in the past contributed to growing inequities between farming enterprises — are designed differently, with justice in mind.

When designed to meet the needs of vulnerable farmers, different technologies supporting farming and digitalisation and the use of sustainable agricultural practices can reduce unequal burdens. This means the affordability of adopting such tools and practices must be considered upfront, alongside access to knowledge and technical support, and the reliability of fundamental infrastructure such as internet services. Aligning adaptation measures with cultural farming practices and including vulnerable groups in the decision-making processes ensure that indigenous groups, like the Sámi in the Nordic countries, are not left behind.



The water system

Climate change is intensifying water stress across Europe with southern areas facing increasing water scarcity due to prolonged droughts. Water scarcity in Europe is significant; on average, it affects 30% of European territory and 34% of the European population every year. Meanwhile, increasingly heavy precipitation across all regions in Europe is leading to more frequent and more intense flood events. Vulnerable communities, such as low-income households, the Roma people and people living in remote locations are disproportionately exposed to a range of resulting water-related injustices, mainly characterised by diminished access to and affordability of water services.

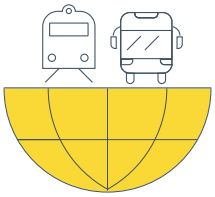
EU legislation requires Member States to improve or maintain access to water intended for human consumption, in particular for vulnerable groups, but in spite of this, numerous countries still lack measures that guarantee affordable access. That said, legislation and policies in an increasing number of countries now explicitly address affordability, access and measures to reduce geographical disparities. Slovenia goes even further, having enshrined the right to water in its constitution in 2016. The EC's European water resilience strategy (WRS) sets as one of its three specific objectives the need to 'ensure clean and affordable water and sanitation for all', taking into account social impacts to ensure a just transition.

Other measures being taken to reduce water-related injustices include:

- increased use of green elements to support stormwater management in recognition of the co-benefits that such solutions can provide for vulnerable community members if sited appropriately and with community engagement;

- water pricing support mechanisms to ensure that full cost recovery imperatives and water conservation goals that shape water tariff design do not ignore the needs and realities of low-income groups;

- actions that incentivise or enable greater water efficiency to reduce water scarcity and keep water services affordable and accessible for all.



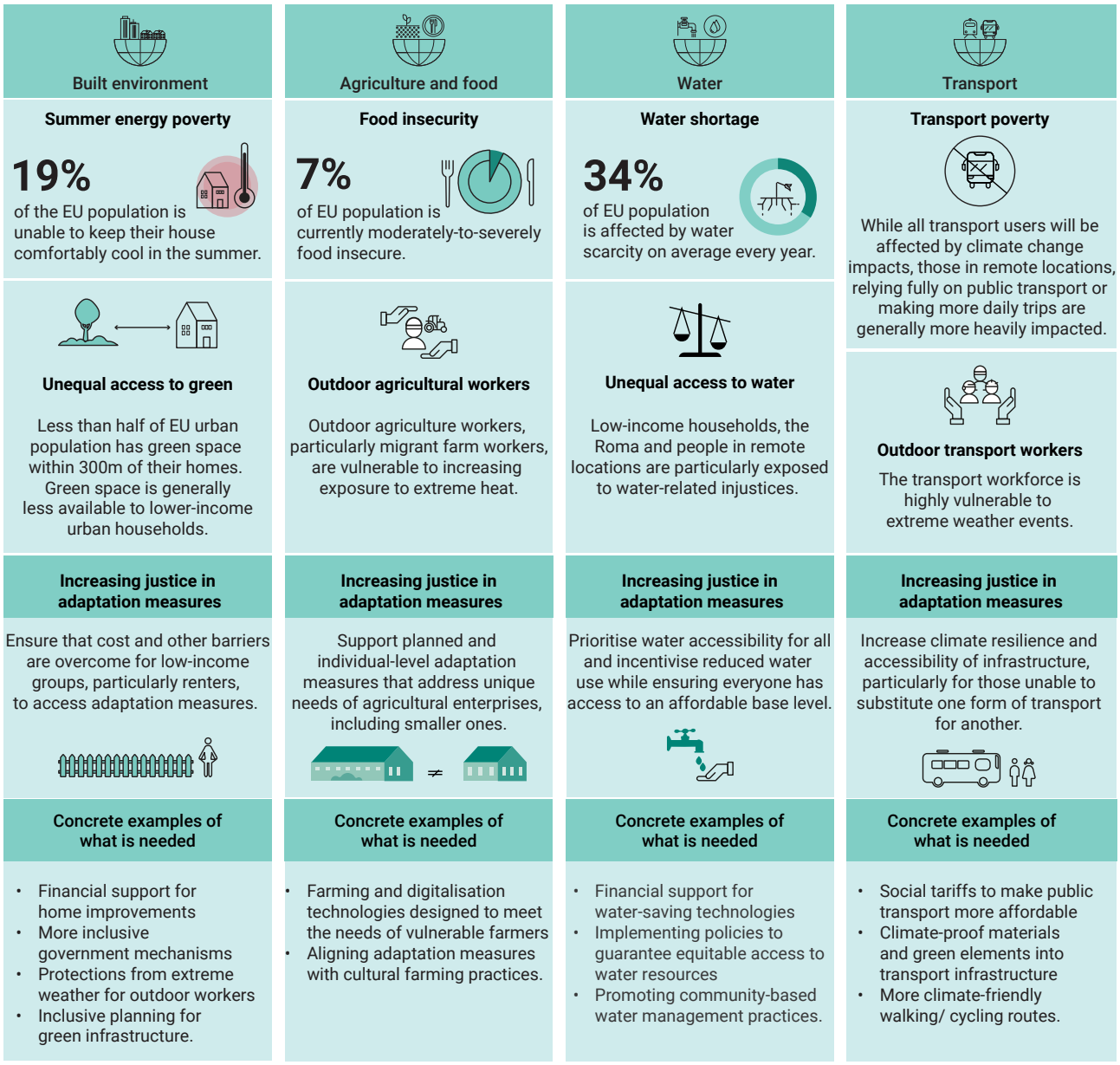
The transport system

The transport system is essential for the functioning of communities and economies, but it is also vulnerable to climate-related hazards. By the end of the century, under a medium-high emissions scenario, European transport infrastructure will experience 28.8 to 34.4 times more heatwaves, 20.0 to 36.4 times more droughts, 20-80% more river floods and 20-230% more wildfires compared to today.

While all transport system users will increasingly be exposed to how these impacts manifest, e.g. interrupted transport services due to rail or road infrastructure damaged by extreme heat or flooding, the emerging concept of transport poverty helps identify the groups that will be most affected, in particular population groups that are less able to substitute one form of transport for another during service or infrastructure disruptions (including women, immigrants and older people). The transport workforce is also highly vulnerable to extreme weather events.

Adaptation measures should focus on improving the safety, comfort and reliability of infrastructure to ensure that it is resilient to climate impacts and accessible to all members of society. Just adaptation measures could include implementing social tariffs to make public transport more affordable, incorporating more climate-proof materials into transport infrastructure, developing and promoting more climate-friendly walking/cycling routes and much greater integration of green elements into transport infrastructure, such as bus stops with green roofs to reduce the effects of extreme heat.

Figure ES.2 Overview of justice considerations in four key systems



Source: Author's compilation.

Priorities for action at the EU, Member State and subnational levels

EU level

The EGD, Climate Law and EU adaptation strategy provide a strong foundation for integrating just resilience but complementary efforts are needed to ensure that the benefits of climate action are shared equitably across society. This includes:

- making available dedicated funding for just resilience or better leveraging existing funding mechanisms to provide support for just resilience;
- gathering comprehensive data from across the EU to enable a better understanding of regions and populations at risk and to allow progress on the implementation of just resilience to be monitored, perhaps in the form of an EU-wide vulnerability dashboard tailored for just resilience;

- developing a common definition and assessment framework to help build a shared understanding of how just resilience is being operationalised across Member States.

The EC's European climate adaptation plan, expected in 2026, could provide the much-needed guidance and tools for enhancing preparedness, competitiveness and resilience. It will be a key opportunity to integrate justice into national adaptation processes, strategies and plans, thus contributing to ensuring fairness and inclusivity.

Member State level

At the national level, there are several ways in which Member States can increase justice considerations in their adaptation plans. These include the following:

- ensure that justice is explicitly integrated in national-level adaptation policies and laws;

- ensure that just resilience is taken into account in all related policies and laws (for example energy and building policies, worker protection legislation, planning and financing for agriculture);

- ensure that resources and support directed by national agencies are distributed in such a way that no group is left behind and that subnational actions are guided by such requirements;

- prioritise the inclusion of vulnerable groups in adaptation planning and ensure that the different social groups have equitable access to adaptation measures. This would require mechanisms to be developed to engage marginalised communities in the decision-making process and ensure that their voices are heard and integrated;

- draw inspiration from EU-level assessment frameworks and invest in the development of national-level monitoring frameworks to assess the progress of adaptation measures and ensure that they are achieving their intended goals. These may include tracking the distribution of benefits and burdens of adaptation measures, assessing the effectiveness of targeted interventions and evaluating the impact of adaptation efforts on vulnerable populations.

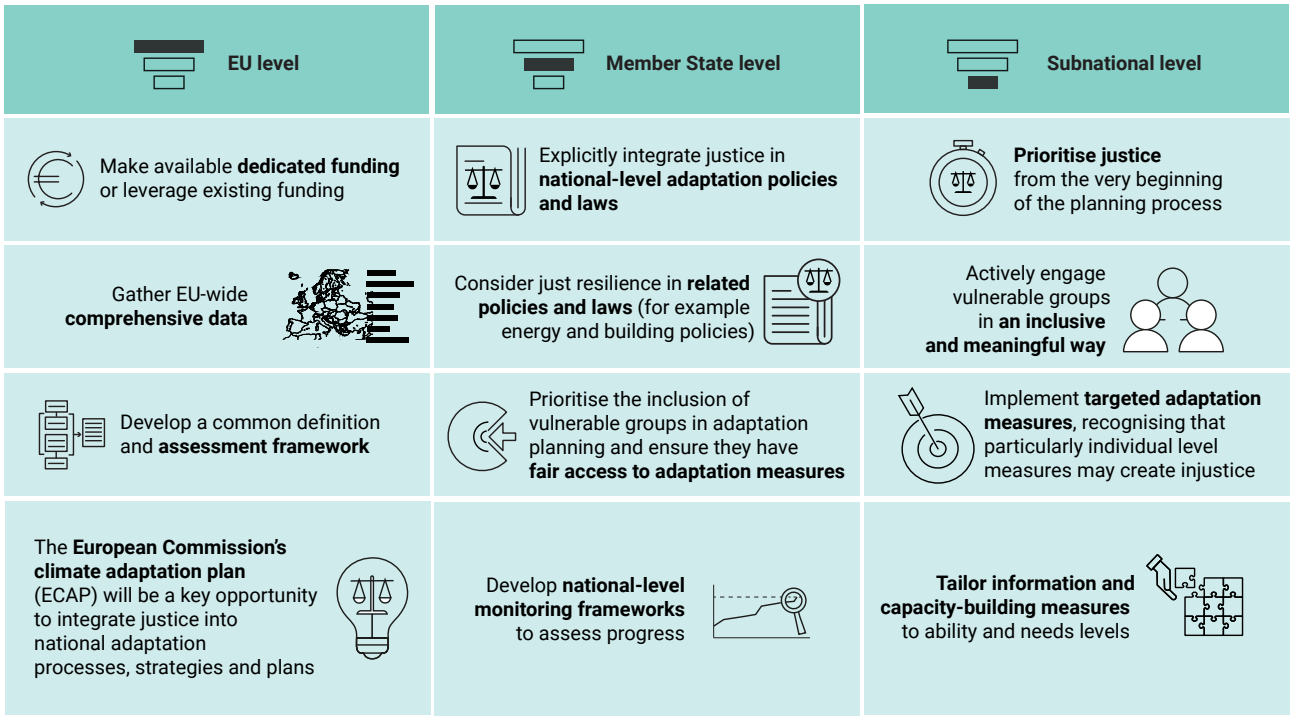
Subnational level

While national governments play an important role in orchestrating the policy framework and related justice mechanisms, the subnational level is central to implementing this guidance in practice through specific actions. Collaboration through multi-level governance is key to ensuring that there are practical ways to implement justice within the adaptation processes.

At the subnational level, justice should be prioritised from the very beginning of the adaptation process, resolving the tension between the urgency of implementing adaptation measures and the time required to integrate justice properly. It is important for local authorities to focus on engaging vulnerable groups in the planning process by developing inclusive and participatory approaches that engage marginalised communities in the decision-making process and ensure that their voices are heard. In addition, some vulnerability characteristics overlap or change rapidly and this should be fully taken into account. Targeted adaptation measures that address the unique needs and vulnerabilities of marginalised communities should be implemented. This includes a recognition that measures introduced at the individual level in particular may result in injustices for low-income households and other vulnerable groups.

Ensuring equitable access to resources and support mechanisms that help vulnerable populations cope with the impacts of climate change may include: providing financial assistance; improving access to information and resources; and enhancing social networks and community resilience. It also requires information and capacity-building measures to be tailored to different capacities and needs.

Figure ES.3 Overview of the priorities for action at the EU, Member State and subnational levels



Source: Author's compilation.

1 Introduction

1.1 At a glance: exploring justice in adaptation responses

Europe is the fastest-warming continent on the planet. As such, there is an increasing urgency to ramp up adaptation efforts. However, social factors — such as age, gender, health, income, socio-economic background or ethnicity — affect how people experience and are vulnerable to climate change, leading to unequal impacts and therefore climate change injustices. In this context, it is increasingly recognised that some people may also face disproportionately negative effects from climate adaptation responses or miss out on the benefits of climate-related investments injustices (Lager et al., 2023; IPCC, 2023; EEA, 2024b; Breil et al., 2021).

This points to the need to make sure no one is left behind as we take the necessary steps towards climate resilience and preparedness (EC, 2024d), as stressed in the European Union (EU) climate adaptation strategy (EC, 2021b), the European Green Deal (EGD) (EC, 2021d), the Climate Law (EU, 2021a) and the European Commission's (EC's) adaptation guidelines (EC, 2023b). In other words, it is essential to strive for just resilience.

Box 1.1

What is just resilience and why is it needed?

Though an exact definition of 'just resilience' has not been agreed upon in the EU policy context, the European Environment Agency (EEA) takes it to mean that policymakers and practitioners:

- address the uneven impacts of climate change;
- make sure that when developing adaptation responses to these impacts, individuals or social groups that are already vulnerable ([1]) benefit fairly ([2]) from these responses and are not disproportionately burdened ('leaving no one behind') ([3]).

As such, it entails addressing underlying systemic inequalities and ensuring fair access to resources and processes. It is necessary to take justice into consideration in adaptation because not doing so may make existing inequalities worse, leading to feelings of discontent and resistance to change, making it harder to achieve EU policy objectives. In addition, incorporating justice in adaptation measures may make them more effective and is in line with EU core values and international agreements.

The concept of justice in resilience versus adaptation

This report uses the terms 'resilience' and 'adaptation'. In line with common use in the policy context (including the 2021 EU adaptation strategy (EC, 2021b)), this report uses the term adaptation to refer to the process by means of which resilience (as a state) can be achieved. As such, the report refers to 'justice in adaptation responses' when it addresses how to consider the distribution of benefits and burdens of concrete actions, measures and policies between individuals or groups. The report uses the term 'just resilience' to refer to the goal or outcome of this process, to ensure socially vulnerable individuals or groups are not unfairly burdened by climate change and benefit fairly from responses to its impacts.

It should be noted that the terminology is evolving. In scientific literature the terms adaptation and resilience have clear and distinct origins in their respective scientific fields; however, in policymaking and practice the use and interpretation of the terms have been changing over time. In addition, the term 'social fairness' has been introduced more recently in the EU policy context, including in the *Political Guidelines for the Next European Commission 2024-2029* (EC, 2024d).

Chapter 2 delves more deeply into the concept of just resilience, its interpretation and why it is needed. A glossary of terms is provided in Annex 1.

([1]) In this report, social vulnerability refers to characteristics that lead to individuals or social groups being disproportionately affected or impacted by climate change. These consist of both internal (e.g. age, health status, ethnicity) and external factors (e.g. access to social networks, education or political power). Together, these factors influence someone's sensitivity to natural hazards and their ability to respond to and recover from their impacts. While the term vulnerability can have negative connotations, it is used here because it is currently the most widely used term in the policy context in which this report is situated.

([2]) Fairness and justice are related concepts. Justice is generally considered to be associated with prioritising the most vulnerable and acknowledging and ddressing the disproportionate impact they are facing. Fairness is generally associated with the distribution of benefits and burdens. Recent policy documents from the EC refer to 'social fairness' (e.g. the *Political Guidelines for the Next European Commission 2024-2029* (EC, 2024d) as well as to justice in relation to the transition to climate neutrality (e.g. the 'just transition'), while the EU adaptation strategy (EC, 2021b) refers to 'just resilience'. This report mostly uses the more general term justice to encompass a broader range of considerations that go beyond the distributional aspects of social concerns.

([3]) There is a relationship between the notions of just resilience and maladaptation. Maladaptation occurs when adaptation efforts unintentionally increase vulnerabilities, inequalities or risks, undermining sustainable development (Juhola et al., 2016). Certain adaptation processes can cause unintended negative impacts (Barnett, 2010; Bertana et al., 2022; Schipper, 2022). However, while maladaptation may lead to injustice in resilience by disproportionately affecting certain groups, not all resilience-related injustices are examples of maladaptation.

Many Member States and subnational governments are only just starting to build justice considerations into their climate adaptation efforts (EC, 2023a, 2024b) (see Chapter 3).

As such, this report aims to support decision- and policymakers in operationalising just resilience in their decision-making processes. More specifically it aims to bring together evidence on justice issues in adaptation responses and examples of how to prevent or overcome such issues.

To achieve this aim, the report has several objectives:

- to provide a better understanding of the concept of just resilience and how to put it into practice (Chapter 2);
- to provide an overview of the current status of justice in adaptation planning and policymaking at the EU, Member State and subnational levels (Chapter 3);
- to identify justice dimensions in adaptation measures for four selected systems (the built environment, the agriculture and food system, the water system and the transport system) to identify who is benefiting or losing out from adaptation responses to climate change impacts in those systems and how adaptation measures can be made more just (Chapters 4-7);
- to identify opportunities for action and address knowledge gaps to obtain a more comprehensive understanding of injustices in adaptation responses and how to best address these (Chapter 8) ([4]);
- to showcase inspiring adaptation actions that are designed to deliver just outcomes (throughout the report).

The report has been developed for governmental decision-makers in Europe at different levels, specifically those working on the operationalisation of just resilience and organisations supporting them; adaptation practitioners; and others working in the field of adaptation to climate change and justice in general.

In line with the *European Climate Risk Assessment* (EUCRA), the report focuses on systems rather than policy sectors. A systems approach allows for a better understanding of the dynamic complexities in each of the areas (e.g. EEA, 2024g) and the justice aspects of adaptation responses within those. The four key systems featured in the report, which are defined and then explored within Chapters 4-7, were chosen because there is at least minimal evidence available demonstrating that they are connected with justice issues. Importantly, while these chapters consider each system somewhat in isolation from other systems, in practice, siloed approaches to adaptation should be avoided because of the strong interrelations between the systems.

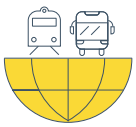
For each system, a number of illustrative adaptation responses are presented (summarised in Table 1.1). The responses have each been clustered into one of five broader categories of responses, referred to as Key Type Measures (KTM). KTMs are used by EU Member States as part of reporting requirements for the Energy Union Governance Regulation; this categorisation supports comparisons across reporting countries.

([4]) Though the report touches upon some institutional barriers, a deep dive into some of these challenges is beyond the scope of this report and will require further analysis.

It is important to note that Table 1.1 and the adaptation responses discussed in the system chapters do not provide a comprehensive listing of all the possible responses available in each system. Rather, the adaptation responses discussed are those for which a clear connection with justice could be identified in the context of this report.

The evidence for the report was derived from data analysis, a literature review, case study analysis and interviews. An overview of the complementary work streams and of related EEA knowledge publications is provided in Annex 2.

Table 1.1 Illustrative adaptation responses featured within this report (Chapters 4-7)

	 Built environment (Chapter 4)	 Agriculture and food system (Chapter 5)	 Water system (Chapter 6)	 Transport system (Chapter 7)
Key type measure				
Governance and institutional measures	- Energy efficiency policies - Legislation/ regulations for outdoor workers - Land use planning - Integrated planning - Coordination/ governance mechanisms - Regulations to prevent displacement	- Support for planned and autonomous adaptation - Laws to protect workers - Systems and structures to safeguard food access - Acknowledging indigenous rights and stewardship over land	- Policies that guarantee water access for vulnerable groups - Water restriction mandates	- Regulations requiring that climate challenges to the transport system be addressed - Policies for increasing the use of collective transport, active modes and shared-mobility solutions
Economic and finance measures	- Partial or full subsidies, grants or loans for homeowners and tenants - Insurance products	- Financial transfers under the common agricultural policy (CAP) - Insurance	- Water pricing mechanisms - Managing water bill non-payment - Grants/subsidies for water-saving measures - Equitable stormwater fees	- Social tariffs for public transport
Physical and technological measures	- New building materials/ technologies - Energy efficiency technologies - Climate shelters	- New technologies (e.g. precision farming) and digitalisation - Artificial intelligence (AI) platforms - Early warning systems (EWSs)	- Water efficiency technologies and improvement schemes	- New materials, technologies and ventilation systems - Approaches for better adapting cycling and walking infrastructure to extremes
Nature-based solutions (NbS) and ecosystem-based approaches	- Blue and green infrastructure and, roofs	- Sustainable or regenerative agriculture - Urban agriculture	- NbS for more efficient and effective stormwater management	- NbS integrated into transport infrastructure
Knowledge and behavioural change measures	- Information campaigns - Capacity building - EWSs		- Knowledge, behaviour change, information campaigns	

Source: Author's compilation.

2 The meaning of just resilience in concept and practice

Key messages

- The concept of just resilience is based on two approaches: addressing the uneven impacts of climate change on some social groups and leaving no one behind in the development of responses to those impacts.
- If justice is not taken into consideration in adaptation responses, it may lead to less effective adaptation and resistance to change.
- How the term justice is interpreted, or the political decision of what justice entails, will consequently determine what 'just' policies and adaptation measures look like.
- Lessons for operationalising just resilience can be learned from the progress to date in implementing justice in mitigation policies, although the concept of just resilience involves additional complexities.

2.1 Unpacking the notion of just resilience

What does just resilience entail and why should it be strived for?

The EC introduced the term 'just resilience' in the EU adaptation strategy (EC, 2021b), emphasising that climate change adaptation measures must be implemented in a just and fair manner. The strategy states that 'achieving resilience in a just and fair way is essential so that the benefits of climate adaptation are widely and equitably shared' (EC, 2021b).

Similarly, the concept of 'just transition in mitigation' was formalised in the EGD and 'just resilience' is commonly regarded as being the adaptation equivalent of the term (see Chapter 3 for more details on the EU adaptation strategy and the EGD). Though, officially, the term 'just transition' is broader, encompassing both justice in adaptation (i.e. the transition to a climate-resilient society) and in mitigation (i.e. the transition to a carbon-neutral society), it is often used to refer to justice in mitigation only.

Within the EU policy context, just resilience generally refers to two areas, with this report focusing on the second:

- Climate impacts and risk — 'Uneven burdens': this refers to the unequal distribution of climate impact and risk due to unequal exposure to hazard, pre-existing inequalities and differences in adaptive capacities and capabilities (including e.g. socio-economic, historical and intersectional injustice) that result in exacerbated impacts and increased vulnerabilities for certain groups, especially those on the margin of society.

- Adaptation action — 'Leaving no one behind': this refers to the distribution of benefits and burdens of adaptation responses among social groups and encompasses fair and transparent processes including the fair distribution of political power and participation in policymaking, avoiding decision-making which leads to maladaptive outcomes and targeting the underlying causes of pre-existing inequalities.

The need to take just resilience into account in the EU policy context stems from multiple considerations:

- The concept of justice is central to EU core values and international agreements, indicating the need to consider justice as a 'moral imperative'.
- Scientific evidence shows that adaptation measures can be more effective when justice is considered (Breil et al., 2021; IPCC, 2022b).
- Failing to consider justice and the potential result of increased existing inequalities may lead to discontent, cause perceptions of unfair treatment and result in resistance to change, making it much harder to achieve EU policy objectives (EEA, 2024e).
- Member States have legal obligations to ensure non-discrimination based on any ground (Article 21) and to guarantee social protection (Article 34), health care (Article 35) and equal access to services (Article 36) as included in the Charter for Fundamental Rights which is part of the Treaty on the Functioning of the EU (FRA, 2025). Member States have also committed to the Aarhus Convention which requires them to comply with procedural justice in any type of environment-related decision making.

What is 'justice' in the context of adaptation?

Key aspects of justice are understanding who is vulnerable and how injustices may arise; however, this is not enough. It is also vital to determine exactly what 'justice' is. In order to achieve justice in adaptation, underlying systemic inequalities must be addressed and there must be fair access to resources and processes, distinguishing it from mere equality or equity (Nwadiaru, 2021; IPCC, 2022a). The terms 'justice', 'equity' and 'equality' are often used interchangeably; however, the meanings of these concepts differ and this has implications when developing and implementing policy measures.

Equity involves providing equal opportunities tailored to different needs and privileges (Nwadiaru, 2021). It is about ensuring that everyone gets the support they need to have access to resources. Equity addresses fairness in the societal distribution of burdens and benefits, across determinants and outcomes, to reduce disparities for the most disadvantaged (Clark et al., 2022).

Equality refers to a situation where all members of society have the same access to the available resources; however, this does not necessarily result in the same outcomes.

Justice, on the other hand, addresses the systemic and structural issues that perpetuate inequalities, focusing on transforming the underlying causes of these injustices in adaptation efforts. Figure 2.1 visually depicts the differences between these terms in practice.

Figure 2.1 Different terms and their meaning

Source: EEA, 2024.

Recently, the term 'social fairness' has been used in the EC's political guidelines in relation to climate action (EC, 2024d). Though these guidelines do not provide a definition or further elaboration of the exact interpretation of this term, they reference the European Pillar of Social Rights and link climate justice with broader EU social justice objectives. Furthermore, the EC clarifies the term as having close links to reducing social inequality and disparity.

Reviews have concluded that, to date, there is still no common definition or framework within the scientific literature on justice in adaptation (Swanson, 2021; Walker et al., 2024); however, many organisations working on justice issues in climate change identify the following three dimensions as key (in line with (Schlosberg, 2004)):

- Distributional justice ([5]): the fair allocation of resources and burdens from climate impacts and adaptation efforts, ensuring that vulnerable communities are protected and not disproportionately affected (IPCC, 2022a; Breil et al., 2021; EEA, 2024a);

([5]) It is useful to note that though the terms distributive and distributional justice are often used interchangeably, they actually have different connotations in the context of the allocation of resources and opportunities. This report refers to distributional justice in line with the justice framework from the EEA (EEA, 2024a).

- Procedural justice: fair, transparent and inclusive decision-making processes that respect participants' rights and promote meaningful engagement, especially for those with lower levels of political power (Paavola et al., 2002; EEA, 2024a; IPCC, 2022a);

- Recognitional justice: respecting and integrating diverse values, cultures and perspectives in assessing climate impacts and designing adaptation actions in such a way that they address the deeper causes of inequity (Preston and Carr, 2018; IPCC, 2022a; EEA, 2024a).

These three dimensions of justice are relevant to both of the components of just resilience described earlier — the distribution of the burdens of climate change impacts ('uneven burdens') and the distribution of benefits and burdens of the responses to those impacts ('leaving no one behind'). It is important to acknowledge that these dimensions are interlinked and cannot be considered in isolation ([6]). In addition, while these three types of justice are the key dimensions when working on justice in adaptation processes, many additional types of justice are relevant to adaptation, including restorative justice, intergenerational justice, spatial justice, environmental justice and ecological justice (Juhola et al., 2022).

Table 2.1 provides practical examples of how the three dimensions of justice address the two components of just resilience. Apart from climate policy, these three dimensions of justice are also relevant for other policy fields, like health policy, education policy, housing policy and mobility.

([6]) While often referred to in the literature, these dimensions are rarely related to each other (Swanson, 2021; Walker et al., 2024). Nevertheless, Mohtat and Khirfan (2021) suggest that injustice may arise when one or more of these dimensions is absent in adaptation efforts. Procedural justice, for instance, contributes to distributional justice by ensuring that all parties affected by an adaptation response are recognised and included in the decision-making process (Young, 1990; Fraser, 2009). In addition, recognitional justice is considered in some scholarly work as a precondition for distributional and procedural justice, rather than as a distinct dimension (e.g. Miller and Hurley, 2003; Schlosberg, 2004). It is also rather abstract and more challenging to capture in policy terms than the other two dimensions of justice used in this report. Juhola et al. (2022) go one step further and conclude that effective adaptation planning must integrate all justice dimensions to promote equitable climate resilience, including a fourth dimension, namely restorative justice which refers to actions to address and restore past inequities. Other justice approaches exist but are less commonly used, such as Nussbaum (2000) and Sen's (1993) capabilities approach, as well as Gupta's access and allocation framework (Grecksch and Klöck, 2020; Gupta and Lebel, 2010) rooted in the Earth System Governance framework.

Table 2.1 Examples of how different dimensions of justice address unequal burdens and the concept of leaving no one behind

	Unequal burdens (climate impacts and risks)	Leaving no one behind (adaptation actions)
Distributional justice Conceptual description (the link between the two)	**Who is impacted and how?** Climate impacts and risk affect people and places unequally, interacting with existing vulnerabilities in the allocation of burdens and benefits among individuals, nations and generations.	**Who is affected (and how) by adaptation action?** Adaptation action and resilience building can have unequal outcomes, creating 'winners' and 'losers'. They can redistribute, shift, reinforce or create new vulnerabilities and inequities (maladaptation).
Example (the link between the two)	**Unequal distribution of assets' value losses and income losses** Certain groups are disproportionately affected by, for instance, flooding or heat because of geographical location, such as those operating or living in coastal areas and along rivers, farmers and people engaged or employed in the tourism industry, particularly in southern Europe.	**Energy savings in housing require dedicated policies to ensure affordability** Adaptation to extreme heat is particularly relevant for vulnerable populations at risk. This requires dedicated policy packages, which frequently rely on incentives for the private sector. The public policies that incentivise these necessary investments by the private sector are generally reserved for homeowners and tend to exclude tenants, thus creating a high risk of inequity.
Procedural justice Conceptual description (the link between the two)	**Due procedures and meaningful involvement of those affected by climate impacts (directly and indirectly)** The way procedural justice interacts with unequal burdens is through the involvement of marginalised groups or individuals and increased transparency in the assessment of climate impacts and risks, as well as through recognition of rights and values.	**Who is heard and how in the adaptation process?** Addresses the fairness and legitimacy of the decision-making process, including fair and transparent processes, inclusive and meaningful participation and respect for participants' rights.
Example (the link between the two)	**Loss of natural capital and stakeholder participation in evaluating risks and losses** Loss of natural capital and land use change pose a risk to livelihoods and cultures in Europe that are closely linked to ecosystem services and natural land use and cause loss of intrinsic natural values, history, memories and benefits of biodiversity. Procedural justice requires the meaningful participation of the groups affected in the assessment and evaluation of risk and damage from climate change, defining what is at risk and what is valued.	**Participatory planning: recognising and involving vulnerable groups** Citizen participation in choosing and evaluating options can includes measures such as education and champions, as well as collaboration with different departments, agencies and vulnerable groups to help design adaptation policies and actions. Such approaches can ensure a just set-up of participation processes for adaptation planning and managing hazards, through focusing on recognition and active participation and address power inequalities within communities.
Recognitional justice Conceptual description	Basic respect, robust engagement with and fair consideration of diverse needs, cultures and perspectives relevant to the climate impact/risk or adaptation measure. Addresses the underlying causes of distributional and procedural injustices, as it focuses on issues of what is valued and safeguarded.	
Example	**Stakeholder practices and power inequalities** Stakeholder engagement does not automatically guarantee effective and fair adaptation outcomes, even if all those who have 'stakes' in the matter discussed are present. Stakeholder involvement processes often fail to consider diversity and power issues within communities, nor do they investigate how these diversities affect people's possibility to engage in participatory spaces in an egalitarian and meaningful way. The explicit recognition of climate change as a matter of social justice could help address power inequalities in communities.	

Note: Please note that the original table in the European Climate Risk Assessment (EEA, 2024b) refers to 'distributive' rather 'distributional'. To align with the conceptual framework applied in this current report, this has been changed in this version of the table. The difference between the terms is clarified in the footnote of Section 2.1.

Source: EEA, 2024b.

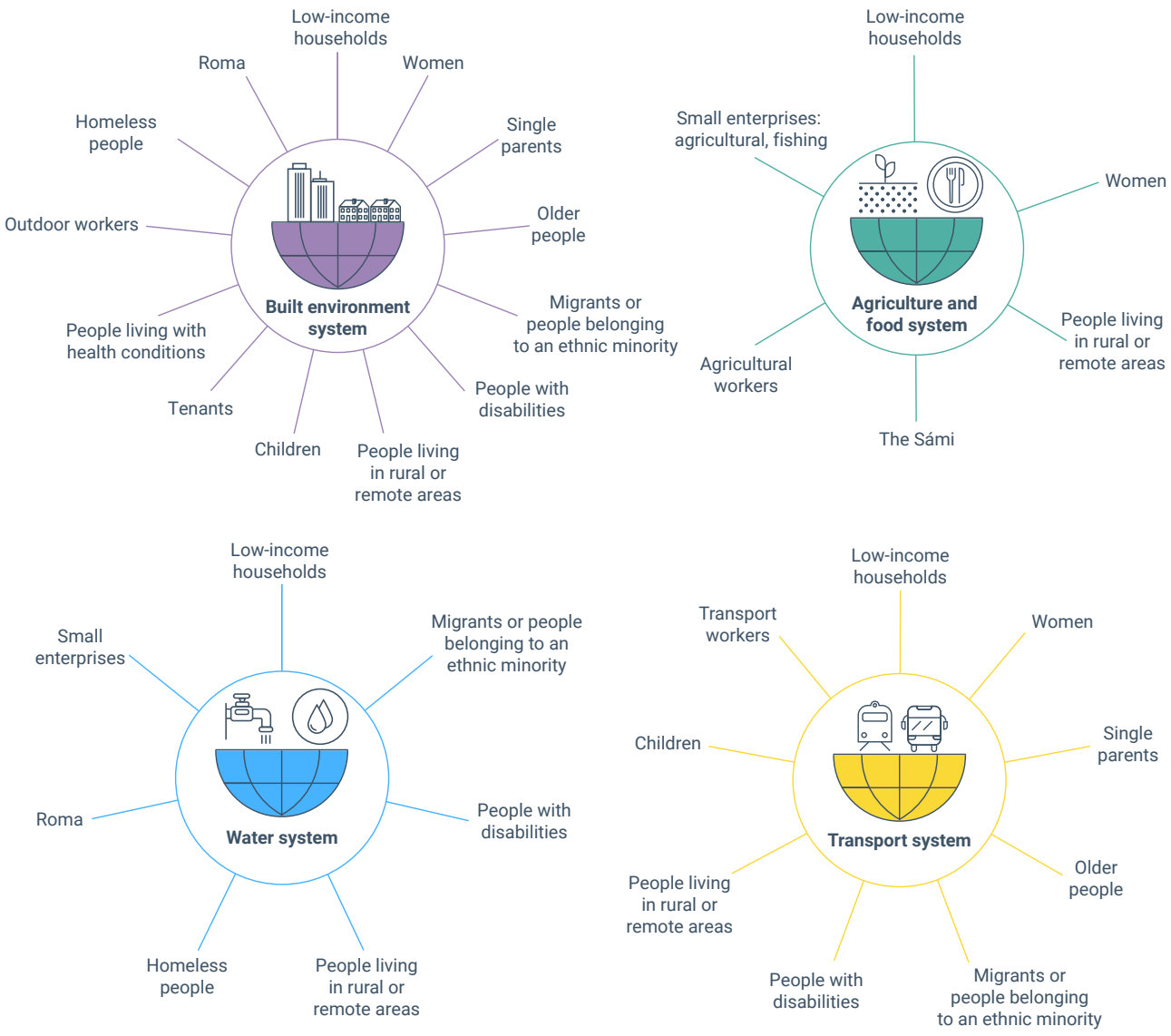
Who may be affected?

In understanding the distribution of both climate impacts and the benefits and burdens of adaptation responses, it is necessary to identify who is likely to be adversely affected. This report has identified various individuals or groups ([7]) as potentially more vulnerable to European climate change impacts within the four systems studied (Figure 2.2). Limited by the current evidence base, this overview does not claim to be comprehensive but provides a high-level overview of various types of vulnerability based on evidence available for each system. The figure aims to provide an initial indication of which stakeholders may need to be specifically considered by decision-makers and practitioners for each system.

It should also be noted that intersectionality should be central to integrating justice into adaptation processes, as individuals may belong to multiple vulnerable groups. These different ways in which someone may be vulnerable (e.g. gender and ethnicity) may overlap to further increase that person's vulnerability or negatively affect someone's adaptive capacity (Amorim-Maia et al., 2022). In addition, it is important for decision-makers and practitioners to realise that social vulnerability is dynamic and may change over time (van den Berg and Keenan, 2019).

([7]) The categories of socially vulnerable individuals or groups are based on terms commonly used in the documents studied. Where multiple terms were used, alignment was sought with terms used by the EC where possible. The selection of categories was based on evidence (and terminology) encountered in the context of this report. It is not a comprehensive overview of all the categories of social vulnerability.

Figure 2.2 **Individuals or groups potentially most vulnerable to climate impacts in each system**

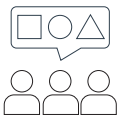
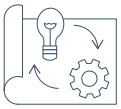
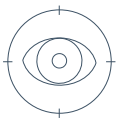


Source: Author's compilation.

2.2 (In)justice in adaptation policymaking and planning processes

Current adaptation processes often result in injustice across the stages of the adaptation policy cycle — risk assessment, planning, implementation and monitoring — each presenting unique challenges that must be tackled (Coninx et al., 2022). Table 2.3, though not exhaustive, outlines some ways in which injustices may occur. Each stage given corresponds to a different step in the Urban and Regional Adaptation Support Tools.

Table 2.3 Injustices at different stages of the adaptation policy cycle

Adaptation policy cycle step	Examples of potential injustice
Preparing the ground and assessing risks (Steps 1 and 2) 	Climate risk assessments often focus on exposure, overlooking social characteristics that define vulnerability. For example, Graham et al. (2018) demonstrated that risk assessment without considering social characteristics would lead to relocating socially connected, low-income communities without preserving their social networks, which can increase vulnerability and marginalise them further, impacting their engagement in decision-making processes. This underscores the need for assessments to incorporate socio-economic contexts alongside physical risks (Shi et al., 2016).
Identifying, assessing and selecting adaptation measures (Steps 3 and 4) 	Planning often excludes vulnerable groups unintentionally, favouring wealthier communities better equipped to advocate for green infrastructure and adaptation resources (Heynen et al., 2006). Wealthier areas also benefit more due to the applied cost-benefit analyses (CBAs). Using CBAs — often promoted as objective — often leads to areas with high real estate value being prioritised for investment as they make the best business case in financial terms. As a result, low-income communities can be neglected. CBAs also fail to account for non-financial costs like the loss of social networks during relocations (Siders, 2019; Martinich et al., 2013; Tate et al., 2016). A failure to address power dynamics and marginalisation in planning also perpetuates injustice and limits procedural justice for disadvantaged populations (Dow, 1992; Adger, 2006; Pelling, 2003). When participation is tokenised or neglected, it may even increase the risk of injustice (Olazabal and Ruiz De Gopegui, 2021; Reckien et al., 2023). In addition, the selection of adaptation measures may also have injustice embedded into it.
Implementing measures (Step 5) 	Implementation of adaptation measures may reinforce inequalities as smaller authorities or private actors may lack time, staff or skills to access adaptation funding or a technical knowledge base (Shi et al., 2016). In addition, implementation in one area may negatively impact social groups in or transfer risk to another area. Equally, measures that are implemented at the national level, such as large-scale adaptation projects, may result in injustices at the local level (Shi et al., 2016).
Monitoring and evaluation (Step 6) 	The concept of justice in monitoring adaptation measures is underdeveloped, with few frameworks to assess the long-term impacts or enable reflexive learning (Brink and Wamsler, 2018; EEA, 2020). The lack of robust justice indicators perpetuates inequality, as marginalised groups often do not benefit from adaptation measures in meaningful ways and this situation will continue unless there are effective ways to measure justice or monitor progress and improvements.

Source: Author's compilation based on Coninx et al., 2022.

Justice principles determine what a 'just' policy or measure will look like

What a just policy or measure looks like significantly changes based on the interpretation of what is considered 'just'. A recent survey on priorities for climate change adaptation by the European Investment Bank (EIB) showed a lack of consensus on whose needs should be prioritised in adaptation efforts with knock-on implications for what a just outcome of the adaptation response would look like (EIB, 2024). The EIB survey asked 24,148 respondents aged 15 and older from the 27 EU Member States who should receive support first; the results are given below:

- 38% believed that everyone should benefit equally.
- 28% thought that older people should be prioritised.
- 23% said that people living in high-risk areas should be the first to receive support.

In contextualising the response, it is important to acknowledge that across society, all groups will be affected by climate change to different extents — not just the most socially vulnerable individuals or households. In addition, future generations will be affected by decisions taken now.

The principles which are chosen to specify what justice actually means in practice will shape the processes and results of adaptation efforts, potentially leading to substantially different outcomes. These principles are not exclusive and can be applied jointly. Ideally, stakeholders should work together to determine the choice of one or more justice principles. However, experience suggests that such decisions are often shaped by political considerations (Shapiro, 2001). Table 2.4 provides a hypothetical example of how different possible justice principles could shape decisions around funding for flood risk reduction measures. It serves to illustrate how choosing justice principles is political and will have an impact on the outcomes.

Table 2.4 Example: flood risk reduction investments in the built environment

Possible justice principle	Possible outcome in terms of flood risk reduction prioritisation
Egalitarian principle 'everyone gets the same' (Fiack et al., 2021, p. 2; Grasso, 2007, p. 11)	Flood risk reduction funding is divided equally across urban territories. All urban areas have equal access to flood risk reduction measures, regardless of socio-economic status or geographic location. Flood management policies ensure that no community bears a disproportionate share of flood risks or environmental hazards.
Need-based principle 'needs of the most vulnerable are prioritised' (Barrett, 2013, p. 2; Ciplet et al., 2013, p. 6)	Flood risk reduction funding goes, for instance, to the most deprived neighbourhoods, as these populations often lack access to insurance or relocation options; or it is spent on neighbourhoods with the highest proportion of older residents who are less able to take themselves to safety in case of a flood event.
Maximising welfare (Joshi et al., 2021)	Flood risk reduction funding goes to those areas with the highest physical risk levels or highest vulnerability, for example critical infrastructure.
Inclusivity principle (Cabannes and Lipietz, 2015)	Cities adopt a participatory budgeting approach to decide where flood risk reduction measures are implemented, ensuring that marginalised communities have a say in decision-making.
Rights-based (Nurhidayah and McIlgorm, 2019, p. 12; Beauregard et al., 2021, p. 563)	Flood risk reduction strategies safeguard the rights of individuals to live in safe and secure environments. This includes ensuring that flood-prone urban areas are provided with equitable access to adaptation measures such as levees or sustainable drainage systems, ensuring that a common threshold of rights is achieved for all individuals and groups.
Capabilities principle (Alves and Mariano, 2018, p. 361; Buse and Patrick, 2020, p. 869)	Flood management plans empower communities to take ownership of their adaptation strategies. For example, urban flood resilience programmes provide training and resources to local groups to maintain green infrastructure, enhancing both environmental and social well-being.
Corrective justice principle (Boston and Lawrence, 2018, p. 45)	Using the 'polluter pays principle', developers who contribute to increased flood risks (e.g., through deforestation or urban sprawl), for example, fund flood risk reduction projects in affected areas. This could involve a tax on developers to finance the construction of flood retention basins or upgrades to drainage systems in high-risk urban zones.

Source: Author's compilation adapted from Walker et al., 2024.

Box 2.1

Learning from justice in climate mitigation

Although justice considerations may differ between adaptation and mitigation efforts, work on justice in the transition to a carbon-neutral economy is more mature and lessons learnt from its operationalisation may provide helpful insights for adaptation practices (UN, 1992, 2015; EC, 2021d). Some of these lessons are given below:

- **The need to consider all three dimensions of justice (distributional, procedural and recognitional):** Although just transition in mitigation is primarily about redistributing financial burdens amongst social groups, the other two dimensions are also considered. However, the concept of just resilience involves additional complexities. For example, justice needs to be considered in relation to people's exposure to climate risks, their levels of vulnerability and the ways people benefit from or are burdened by adaptation responses. Vulnerability to climate change impacts also depends on the types of climate hazard considered and can change over time.

- **The use of EU-wide data to identify at-risk regions:** The EU just transition policy began with an extensive analysis to identify coal-dependent regions and social groups at risk of being left behind economically due to mitigation policies. This provided the basis for allocating funds efficiently (Alves Dias et al., 2018). While such a comprehensive assessment for just resilience would be challenging, it would be equally valuable from an adaptation perspective to identify regions most at risk of being left behind due to climate change impacts. Currently, the 9th cohesion report already includes mapping and analysis of regions exposed to or impacted by climate change (EC, 2024c). The Joint Research Centre's (JRC's) Vulnerability Dashboard provides one of the most advanced databases for such mapping efforts.

- **The need to integrate just resilience into existing just transition funding instruments:** Low-income groups are at risk of facing a double burden: the financial strain of mitigation policies and the limited resources available to them to adapt to or recover from extreme events induced by climate change. Existing just transition funding could be expanded so that it also addresses just resilience.

- **The need to monitor progress on the transition process:** The EC has provided the EU regions with a toolkit to measure and monitor just transitions as part of progress in the Just Transition Fund (JTF) (EC, 2023c). The toolkit gives an overview of methods used to measure justice in transition. A similar tool(kit) would be useful for the just resilience context.

3 The current status of justice in EU, national and subnational adaptation policy and planning

Key messages

- At EU level, a dedicated funding mechanism for just resilience is lacking despite an increasingly comprehensive policy landscape. In addition, although data sets and methods are available to develop just resilience indicators, there is currently no common framework to monitor just resilience at the EU or national levels.
- In recent years, EEA countries have given greater attention to socially vulnerable groups in national and subnational climate adaptation strategies and plans. But the focus has been primarily on how the burdens of climate change are distributed, and much less on justice in the adaptation process or recognition of underlying structural inequalities or differences in world views, values and perspectives. In addition, justice issues are mostly discussed indirectly (e.g. 83% of country reports submitted under the Governance Regulation in 2023 report on justice issues indirectly, versus 38% that reference justice directly).
- Socially vulnerable groups are most often acknowledged during the early stages of the adaptation policy cycle, particularly in climate impact and risk assessments (68% of local adaptation plans studied). However, fewer plans take socially vulnerable groups into consideration in specific adaptation actions (45% of local adaptation plans), in monitoring progress (7% of local adaptation plans) or involve vulnerable groups directly in the planning process (4% of local adaptation plans). In addition, only 3% of adaptation plans include one or more adaptation goals with a justice component.
- Older people and children are the vulnerable groups most reported on in climate risk assessments for national and subnational adaptation plans. They are also the most targeted with adaptation actions. Additionally, low-income households and individuals with health problems consistently emerge as high-priority groups across multiple data sets. At the national scale, workers in specific sectors such as agriculture and tourism are reported as being particularly vulnerable to extreme weather events.
- Nevertheless, groups vulnerable due to gender, ethnicity and other socio-economic factors receive limited attention. In addition, the ways in which vulnerability characteristics may overlap or change rapidly do not receive much attention.

3.1 Introduction

All governance levels ([8]) — EU, national and subnational — have a responsibility to ensure justice in adaptation efforts. However, their specific roles vary (Climate Chance Observatory, 2024). The EU sets the overall framework and guidelines for adaptation policies and needs to ensure that these are aligned with general EU values and principles, including justice and equity. It may also provide financial support for implementing adaptation actions at the national and subnational levels.

Generally, the national level is assumed to be responsible for the development and implementation of national adaptation strategies and plans in addition to funding them. To achieve just resilience, Member States need to ensure that their strategies and plans are tailored to the needs and vulnerabilities of their own populations and that the benefits and burdens are distributed fairly across regions and population groups.

At the subnational level actions involve, amongst others, developing local adaptation plans and funding and implementing the identified measures. Like national actors, subnational actors need to make sure that they meet the needs of local populations and that the benefits and burdens of these measures are distributed fairly.

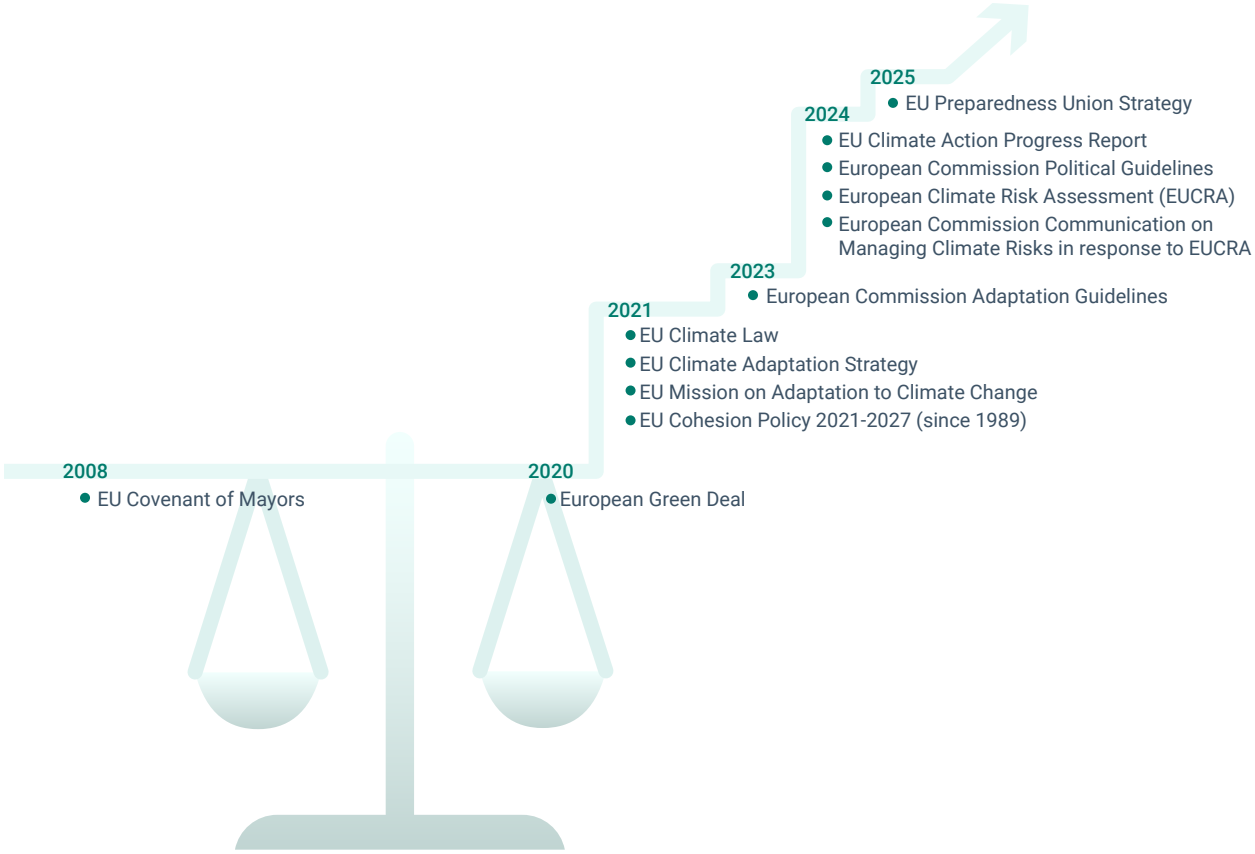
3.2 Key EU-level policies and funding

At the EU level, justice is becoming a key principle and there is an increasingly comprehensive policy landscape; however, dedicated funding mechanisms for just resilience are currently lacking.

Justice has become increasingly central to EU climate adaptation frameworks, particularly through the evolution of the concept of 'just resilience' (Lager et al., 2023), as shown in Figure 3.1 delineating the key policies and programmes.

([8]) At the international level, notions of justice and equity are embraced as key principles in international agreements and programmes for adaptation (UN, 2024). These include relevant frameworks such as the Sustainable Development Goals (SDGs) and the United Nations Framework Convention on Climate Change (UNFCCC). However, this report is limited in scope and, as such, it does not elaborate on the specific justice considerations in these international frameworks.

Figure 3.1 **Timeline of key policy documents with justice relevance**



Source: Author's compilation.

European Green Deal (2020)

The EGD is key in achieving Europe's target to become climate-neutral by 2050, with an intermediate goal of a 55% reduction in emissions by 2030, compared with 1990 levels, as stated in the Fit for 55 package. The EGD aims to 'leave no one behind' in this transition, thereby enshrining justice as a key principle underlying the transition within the EU.

The central instruments for supporting this are the Just Transition Mechanism (notably the Just Transition Fund (JTF)) and the Social Climate Fund (SCF). These funds can be accessed by Member States through the Just Transition Platform and Social Climate Plans (EC, 2024e). The 2024 EEA report on justice in sustainability transitions provides a multidimensional analysis of how justice in sustainability transitions is addressed in key EU-level and sectoral policies, including the EGD and related initiatives.

One of the key deliverables of the EGD, the Zero pollution action plan, states that the fight against pollution is a fight for fairness and equality. It points to the fact that the most harmful health impacts of pollution usually affect those social groups that are already the most vulnerable — such as children, people with medical conditions, older people, people with disabilities and those living in poorer socio-economic conditions.

European Climate Law (2021)

The goals on climate change in the EGD are set out in the European Climate Law. At the heart of this law is the aim to achieve a climate-resilient Europe which ensures that communities are equipped to deal with the unavoidable impacts of climate change (EU, 2021a). The law, adopted in June 2021, establishes a legally binding framework for the EU's climate action, including obligations to make continuous progress in enhancing adaptive capacity, strengthening resilience and reducing vulnerability (Article 5.1).

This commitment explicitly supports a fair and just transition, ensuring that vulnerable populations are protected from the most severe impacts of climate change. The European Climate Law also refers to the need to engage with all parts of society to enable and empower them to take action towards a just and socially fair transition to a climate-neutral and climate-resilient society.

EU climate adaptation strategy (2021)

The EU's 2021 climate adaptation strategy has been pivotal in terms of positioning 'just resilience' in adaptation policymaking and planning. It states that 'Achieving resilience in a just and fair way is essential so that the benefits of climate adaptation are widely and equitably shared'. However, in its elaboration it predominantly focuses on the impact of climate change on workers and working conditions, aiming to address the distributional effects of climate change on various sectors. The strategy highlights the need for job reskilling and new employment opportunities, supported through initiatives like the European Skills Agenda, the Youth Guarantee, the European Social Fund Plus (ESF+) and the Recovery and Resilience Facility.

More recent EU guidelines and strategies demonstrate the broader evolution of the notion of just resilience, including concepts such as maladaptation and social fairness.

- July 2023 EC *Guidelines on Member States' adaptation strategies and plans*: These guidelines, designed to support Member States in crafting their national adaptation plans, explicitly include the principle of just resilience, defined as 'preventing uneven burdens and leaving no one behind'. The guidelines emphasise maladaptation, which is directly linked to justice issues, urging Member States to prioritise socially equitable adaptation measures.

- July 2024 *Political guidelines for the next European Commission 2024-2029*: These guidelines stress the importance of social fairness more broadly, referencing the European Pillar of Social Rights, as well as the need for a just transition. The document frames climate change as one of the greatest security risks faced by Europe and calls for climate resilience and preparedness to be stepped up.

In reference to the EU adaptation strategy, in its opinion NAT/815, the European Economic and Social Committee (EESC) highlights the need for specific adaptation guidelines, targets and monitoring tools, benchmarks and indicators to help provide transparency around resource allocation. It also emphasises the key role that civil society organisations play in implementing adaptation measures in a successful and just way, specifically in relation to the workforce.

EU cohesion policy 2021-2027 (policy in place since 1989)

The EU cohesion policy aims to reduce economic and social disparities among regions within the EU by financing infrastructure, employment, education and innovation. By reducing these regional disparities, supporting social inclusion and fostering community engagement, the cohesion policy contributes to furthering just resilience across the Member States. For the 2021-2027 period, the legislation governing the cohesion policy focuses on 'a more social and inclusive Europe' as one of its five policy objectives, thereby contributing to the implementation of the European Pillar of Social Rights.

For the 2021-2027 period, the EU cohesion policy has EUR 531 billion allocated in EU funds (both EU share and national co-financing) covering actions across policy areas, one of which is adaptation. These EU funds include the Cohesion Fund (CF), the JTF, the European Regional Development Fund (ERDF), and the EFS+. The CF specifically promotes justice in climate adaptation by supporting equitable development across EU regions, particularly targeting Member States with a gross national income per capita below 90% of the EU average. However, there are still challenges related to fully addressing the needs of marginalised groups and ensuring that there is adequate administrative capacity for project implementation (European Parliament, 2024).

Understanding the strategic allocation of funding is challenging because it is guided by each Member State's partnership agreement with the EC, which outlines priority areas for investment but does not state how the funds are to be distributed within different regions. The EU cohesion policy defines the following categories of regions:

- **Less developed regions** have a gross domestic product (GDP) per inhabitant that is less than 75% of the EU average.
- **Transition regions** have a GDP per inhabitant that is between 75% and 100% of the EU average.
- **More developed regions** have a GDP per inhabitant that is above 100% of the EU average.

The Common Provisions Regulation (CPR) (Regulation (EU) 2021/1060 of the European Parliament and of the Council) sets out objectives that guide how funds are spent. In addition to the overarching policy objective aspiring for a more social and inclusive Europe, each fund has fund-specific regulations. The regulations of the CF include a requirement to eliminate inequalities, to promote social inclusion and combat poverty, particularly among marginalised communities (with specific reference to Roma communities) (see also the 2023 European Union Agency for Fundamental Rights (FRA) report on ensuring compliance of EU funds with fundamental rights). The aim of tackling energy poverty is also included but in specific reference to climate neutrality, i.e. mitigation efforts.

European Climate Risk Assessment (2024)

The 2024 EUCRA features a chapter on social justice that explores how climate risks disproportionately impact vulnerable groups, such as low-income households, migrants and people with disabilities. The assessment emphasises the need for adaptation strategies that prioritise these populations and recommends engaging them in planning processes to ensure justice. Furthermore, it highlights that existing European policies and plans pay limited attention to justice. Though the assessment finds that adaptation takes into account distributional justice to some extent, the integration of procedural and particularly of recognitional justice remains somewhat lacking.

EU preparedness union strategy (2025)

In March 2025, the EC launched the EU preparedness union strategy, with a detailed action plan and 30 key actions to support EU Member States and increase the capability of the EU to prevent and respond to various emerging threats. It highlights inequality as a risk factor for preparedness and stresses the need to target particularly vulnerable populations, to increase their resilience and to 'address root causes of fragility' (EC, 2025). Though the strategy addresses threats beyond those from extreme events induced by climate change, it highlights the human, social and economic costs of climate change and the strong interlinkage between climate, environment and security.

Upcoming policies

There is also a justice focus in a number of other upcoming policy documents. The EC's European WRS, for instance, specifies as one of its three explicit objectives the need to 'ensure clean and affordable water and sanitation for all', taking into account social impacts to ensure a just transition.

EU Mission on Adaptation to Climate Change (2021)

The EU Mission on Adaptation to Climate Change integrates just resilience into operationalising its objectives in different ways. It aims to support at least 150 regions to become climate resilient by 2030. Its Mission Platform has been set up to provide support tools, which are being developed via several projects. Maladaptation and justice are central concepts for these projects, including REGILIENCE, NBRACER, DESIRMED and ARCADIA which all address just resilience explicitly by ensuring adaptation efforts benefit vulnerable communities. These projects aim to promote nature-based solutions (NbS), equitable resource distribution and transformative governance. Regions4Climate, Pathways2Resilience and CLIMAAX are also working to develop just adaptation frameworks that prioritise vulnerable regions and social groups most impacted by climate change. Meanwhile, the AGORA project focuses specifically on social vulnerability to heat ([9]).

([9]) Insights from interviews conducted as part of this research project will be used to inform the City of Malmö's work on assessing social vulnerability to heatwaves.

EU Covenant of Mayors (2008)

The EU Covenant of Mayors (the Covenant), established in 2008, has 11,000 signatories. It recognises the increasing need for these signatories to incorporate issues of equity and justice within their climate solutions. A 2023 guidance note 'Embedding Equity Considerations in Sustainable Energy and Climate Action Planning (SECAP), Implementation and Monitoring Processes' identifies opportunities within planning, implementation and monitoring for signatories to address different dimensions of justice within both mitigation and adaptation actions. In addition, the Covenant's 2022-2023 Policy Support Facility Pilot programme, dedicated to supporting the adaptation efforts of signatories, chose just resilience as one of its four key programme themes, with the final report emphasising that a lack of justice can result in maladaptation.

EU funding and just resilience

The Climate-ADAPT platform provides a comprehensive overview of general adaptation funding. More specifically, funds available for addressing the negative impacts of climate policies were explored in a 2024 study requested by the European Parliament's Committee on Employment and Social Affairs. The study assessed the extent to which policy frameworks at the EU and national levels are equipped to tackle the socio-economic impacts associated with climate action policies; it also included an analysis of funding mechanisms (European Parliament, 2024).

The funding instruments reviewed in the report were the Just Transition Mechanism (JTM) – specifically Pillars 1 (Just Transition Fund), 2 (InvestEU Just Transition Scheme) and 3 (Public Sector Loan Facility) (EC, 2021e); the SCF; the European Globalisation Adjustment Fund (EGF) for Displaced Workers; the Recovery and Resilience Facility; REACT-EU; the ESF+; the ERDF; Erasmus+; Life and Horizon Europe. The EU CF was not reviewed specifically as part of their analysis; nevertheless, it should be acknowledged for its role in promoting just resilience (see above).

The analysis indicated that only a few funds, such as the JTM, SCF and EGF for Displaced Workers, explicitly aim to mitigate the negative impacts of climate policies. The vast majority of the 12 assessed funds, however, do address the socio-economic consequences of climate action policies indirectly.

Each fund focuses on a different group of recipients, though other recipients may potentially be reached indirectly. It can therefore be concluded that most of these funds may provide some level of support to just resilience efforts. However, a dedicated just resilience fund is currently lacking.

A 2025 report by the FRA looks at the extent to which fundamental rights ([10]) are reflected in the EGD. It highlights the need to align EU funding and policies with fundamental rights to ensure equitable and fair adaptation to climate change; additionally, it considers how the subsequent implementation and monitoring of EU funds can respect and promote fundamental rights.

([10]) Fundamental rights define minimum standards to ensure everyone is treated with dignity, such as the right to be free from discrimination on the basis of age, disability or ethnic background (see also FRA.europa.eu).

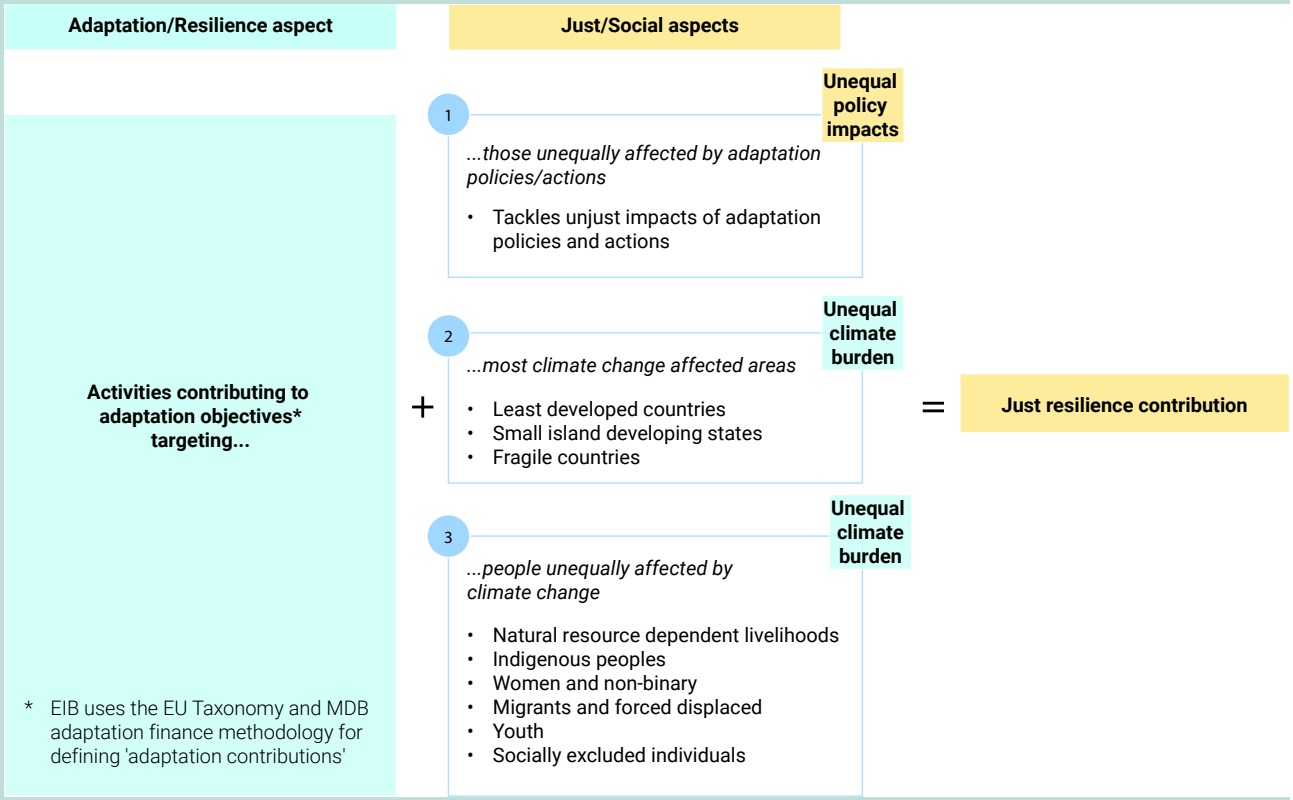
Box 3.1

Case study: the EIB's just resilience investment approach

The EIB is the first international financial institution to develop and apply a comprehensive approach to support just resilience, as well as a just transition in mitigation, globally (EIB, 2023). The EIB already has standards in place to ensure that climate adaptation actions financed by the bank do not contribute to further increasing existing inequalities: the EIB Environmental and Social Standards Overview.

The EIB's just resilience framework classifies just resilience finance, including projects and technical advisory services, according to three areas of climate adaptation intervention in support of just resilience. These are (as shown in Figure 3.2): (1) the unequal impacts of climate adaptation policies and responses; (2) the unequal burdens of climate change borne by specific countries; (3) the unequal burdens of climate change borne by specific people.

Figure 3.2 Overview of the EIB's global just resilience approach



Source: EIB, 2023.

3.3 Integration of justice in national adaptation strategies and plans

Reports on national adaptation plans and strategies refer to justice but generally indirectly, mostly focusing on distributional dimensions of justice and particularly distributional dimensions as they relate to the uneven burdens of climate change impacts.

Member States are increasingly considering justice in their reporting on national adaptation strategies and plans but mostly in an indirect or implicit way. An analysis of information reported in 2023 under the Governance Regulation (EU) 2018/1999 ([11]) shows that explicit use of the term 'justice' or related terms ([12]) remains limited in reports on Member States' adaptation plans.

In the country reports on national climate change adaptation plans and strategies, only 38% of countries (11 out of 29) ([13]) mention justice, equity or fairness explicitly. More specifically, they use the terms explicitly in relation to the uneven burden of climate change impacts between different populations or regions, the distribution of costs/benefits, inclusion of justice in adaptation measures and actions, differential levels of adaptive capacity in relation to socio-economic characteristics and mainstreaming of justice and adaptation into society through the inclusion of (underrepresented) stakeholders in climate adaptation planning. In the NECPRs, no country explicitly mentions matters related to justice in an adaptation context.

However, many more countries report indirectly on justice concerns. In the reports on national climate change adaptation planning and strategies, most countries (83% or 25 countries out of 29) ([14]) include indirect references. Meanwhile, 50% (12 countries out of 24) ([15]) of NECPRs refer indirectly to justice in relation to adaptation (Map 3.1).

([11]) Every two years, Member States are required to submit national energy and climate progress reports (NECPRs) (Article 17) and reports on their national climate change adaptation planning and strategies (Article 19). In addition, some non-EU EEA member countries report voluntarily. Both sets of reports were part of the study.

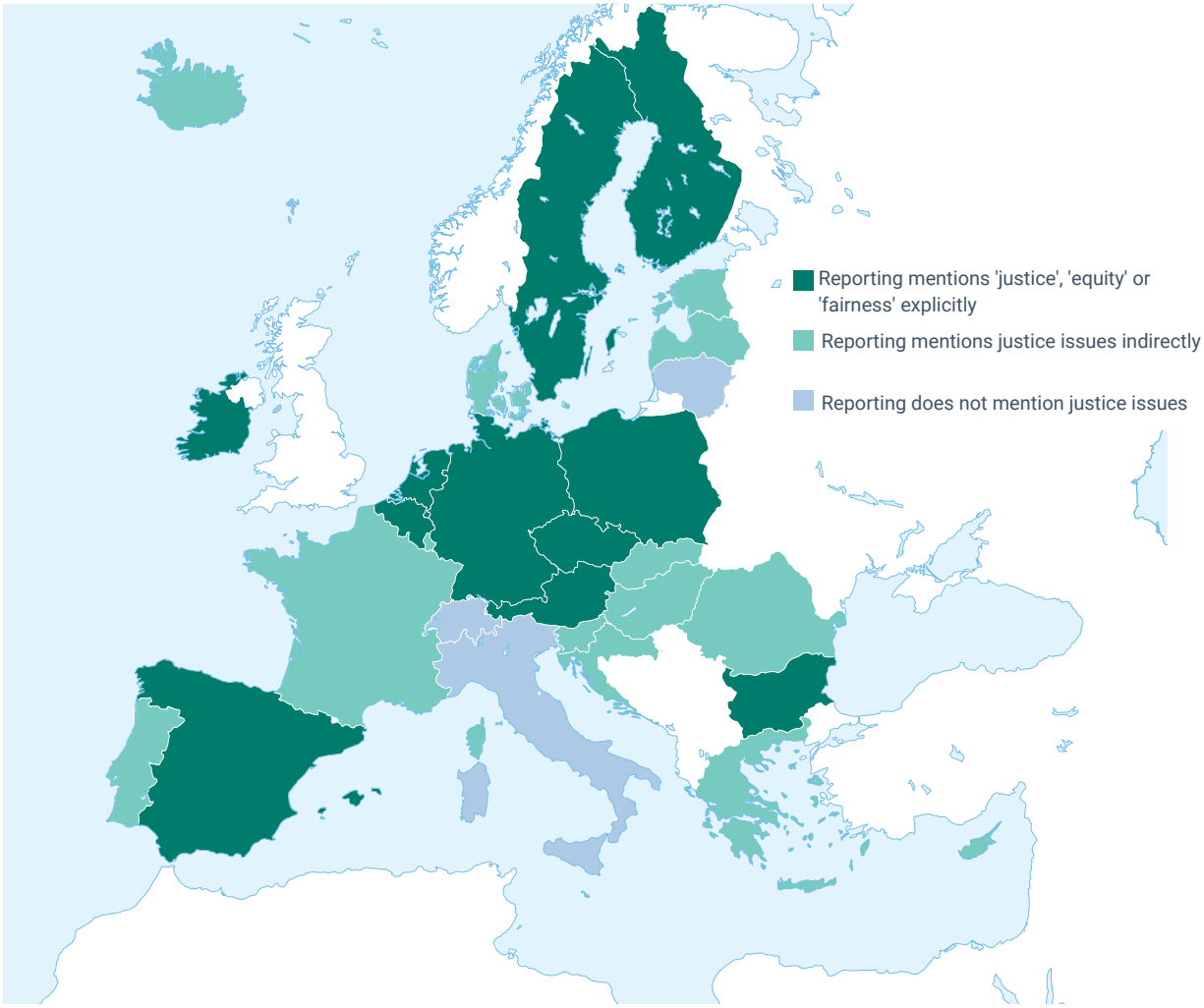
([12]) The analysis looked at three key justice-related terms: 'justice', 'equity' and 'fairness' (including derivatives of these terms, such as adjectives) in relation to adaptation. In the first part of the analysis, the term 'equality' was excluded from the key terms, in line with the conceptualisation of just resilience in Chapter 2 according to which striving for equality does not necessarily make adaptation 'just'. However, notions of (in)equality were included in the second part of the analysis, which looked at more indirect, contextual justice references — since, for instance, unequal levels of adaptive capacity have a justice dimension.

([13]) Austria, Belgium, Bulgaria, Czechia, Finland, Germany, Ireland, the Netherlands, Poland, Spain and Sweden.

([14]) Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

([15]) Austria, Belgium, Croatia, Czechia, Denmark, Greece, Hungary, Latvia, Luxembourg, Romania, Slovakia and Spain.

Map 3.1 **Use of justice-related terms in country reports under the Governance Regulation 2023, Articles 17 and 19 combined**



Source: Author's compilation based on reporting under Governance Regulation 2023, Articles 17 and 19.

Indirect justice considerations are apparent in a number of areas in the national reporting. They are mentioned in relation to:

- certain population groups being disproportionately burdened by climate hazards (distributional justice);
- consideration of the distribution of benefits and burdens (distributional justice);
- differential levels of adaptive capacity in relation to socio-economic characteristics (distributional justice and possibly recognitional justice);
- the ways in which vulnerable groups are included in the decision-making process (procedural justice and possibly recognitional).

In addition, many countries acknowledge the need to consider the social dimension of adaptation planning and implementation more generally. Table 3.1 provides an overview of these implicit mentions in both the NECPRs and the reports on national climate change adaptation planning and strategies.

Table 3.1 The context in which countries indirectly mentioned justice issues in their country reports under both Articles 17 and 19 combined

Context	Number of countries	Countries	Example
Mention of certain population groups being disproportionately burdened by climate hazards (link with distributional justice)	23	Austria, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden	Austria: 'It can be assumed that the following Austrian population groups will be particularly affected by climate change and by potential adaptation measures due to their location and/or socio-economic situation… [list of vulnerable groups].'
Mention of consideration for the distribution of benefits and burdens (link with distributional justice)	4	Estonia, Romania, Croatia, Slovakia	Slovakia: 'The National Adaptation Plan (NAP) contains a proposal for a vulnerability monitoring system, a proposal for a system of mid-term evaluation of the adaptation process in Slovakia, including tracking the links between costs and benefits.'
Mention of ways in which vulnerable or marginalised populations are included in the decision-making process (link with procedural justice and possibly recognitional justice)	6	Finland, France, Greece, Iceland, Ireland, Slovenia	Finland: 'During the preparation of NAP2030, consultations with a broad range of stakeholder representatives, including vulnerable groups such as the youth, the elderly, disabled and the indigenous Sami people were held.'
Mention of differential levels of adaptive capacity in relation to socio-economic characteristics (link with distributional justice and possibly recognitional justice)	14	Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Hungary, Ireland, Latvia, the Netherlands, Romania, Slovakia, Slovenia, Spain	Spain: 'Certain social groups will be largely affected due to their lower capacity for preparation, coping and recovery from impacts [in reference to the effects of climate change on the urban environment (increases in temperatures and heatwaves)].'

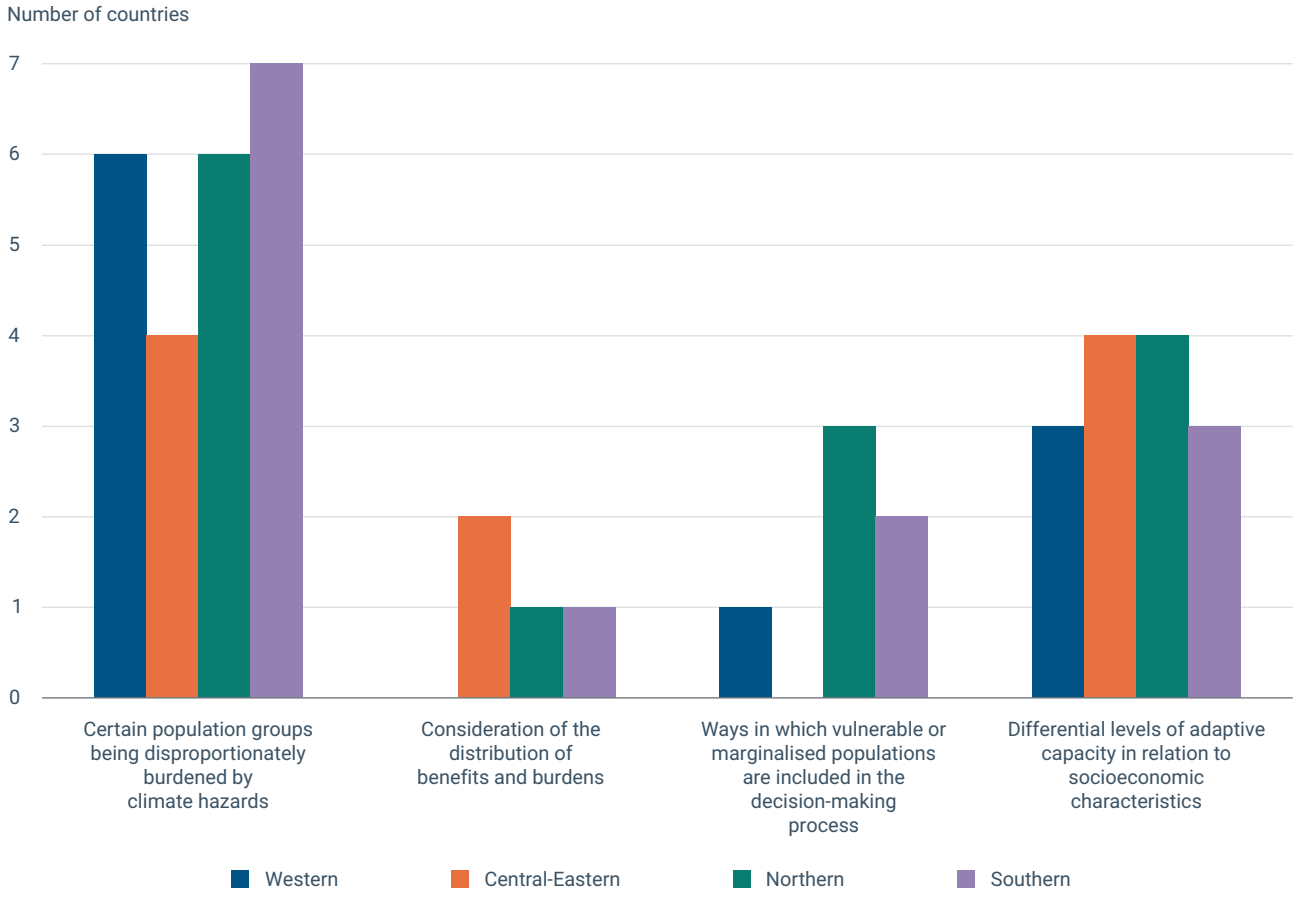
Source: Author's analysis based on country reports submitted under Articles 17 and 19 of the GovReg, 2023.

The analysis demonstrates that EU countries are starting to acknowledge and address the unequal impacts of climate change on vulnerable groups, aiming for equitable adaptation measures. However, the fact that explicit references to just resilience are absent from several Member States' strategies may highlight a gap in integrating justice considerations or suggest differing levels of awareness or prioritisation of justice in climate policies.

Regional patterns: the way in which (indirect) mentions of justice are used is rather similar across European regions, though most indirect mentions are in reports on northern and southern plans (30% and 28% respectively).

EUCRA classifies land in Europe according to four sub-continental regions: northern, southern, western and central-eastern. There is not much difference between the regions in terms of *how* they use indirect justice-related terms (see Figure 3.3) — though most mentions are in reports on the northern (30%) and southern plans (28%), with fewer in the western and central-eastern plans (both 21%).

Figure 3.3 Regional distribution of indirect mentions of justice-related terms



Source: Author's analysis based on country reports submitted under Articles 17 and 19 of the GovReg, 2023.

Nearly all countries recognise specific groups as being disproportionately affected by climate risks, mostly in relation to heat (69%) and flooding (45%); gender considerations, however, remain limited.

Overall, 90% of countries recognise specific groups as being disproportionately affected by climate risks. This demonstrates an increasing awareness that adaptation action should have particular consideration for those who are most vulnerable to climate change.

A total of 20 out of 29 countries (69%) mention heat-related hazards in relation to their impacts on vulnerable groups — particularly older people, children and individuals in poor health. This has increased since the 2021 reporting round. This could be due to the extreme wildfire and heatwave events that occurred across Europe in 2022, as echoed in the 2023 EEA briefing on the status of national adaptation actions. The second most cited climate hazard was flooding (45%), followed by drought/water scarcity (14%), temperature fluctuations (14%), climate change-related diseases (7%) and air pollution (7%).

The groups most commonly cited as vulnerable to extreme weather events were workers in specific sectors such as agriculture, forestry and tourism (31%), older people (17%), individuals with poor health (14%) and residents in specific areas, such as coastal or flood-prone regions (14%). In 41% of the strategies, countries specifically pointed out that people living in coastal areas or floodplains are vulnerable to flooding. Two country reports (Sweden and Finland) included references to the specific vulnerability of indigenous Sámi populations in their countries.

The 2021 assessment of that year's reporting round (Breil et al., 2021) highlighted the importance of considering gender in relation to climate change vulnerability. However, in the 2023 data set, only three countries — Belgium, Romania and Spain — explicitly identified women and girls as vulnerable groups in their national reporting and the broader issue of gender was absent from most adaptation plans.

While the specific vulnerabilities of women continue to be overlooked, a positive development is that four countries (Cyprus, France, Spain and Sweden) acknowledged the risks posed by climate hazards for pregnant women and pregnancy, particularly in relation to heatwaves. Despite this recognition, there is still a significant gap in terms of gender-sensitive climate adaptation strategies ([16]).

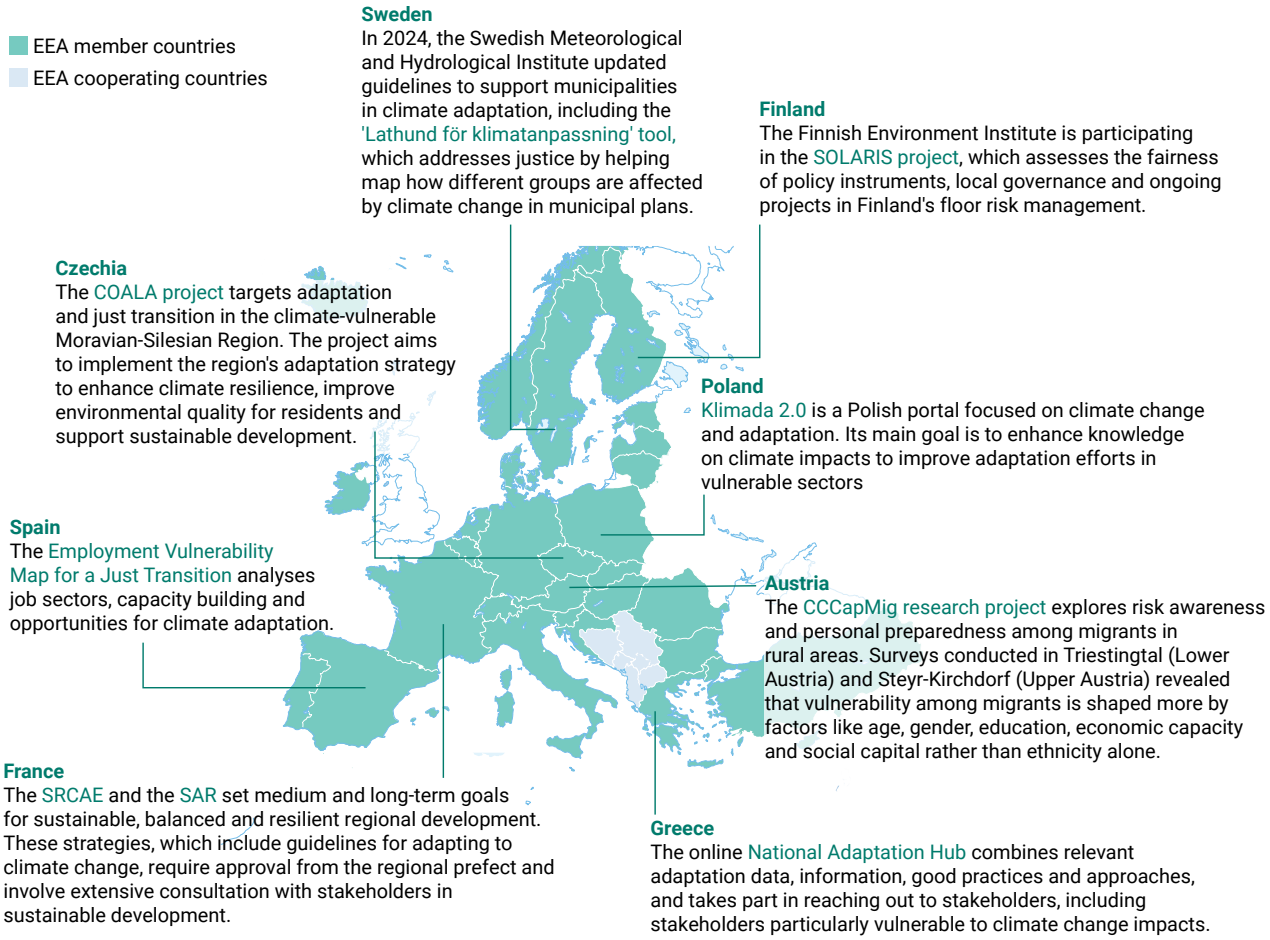
In addition, there was no mention in any of the reports on the particular climate change-related vulnerabilities that LGBTQ+ populations may be confronted with. Nor was there evidence of an intersectional approach that would consider how characteristics such as gender, race, class, age, disability and sexual orientation interact to aggravate vulnerability and increase potential marginalisation (e.g. Amorim-Maia et al., 2022).

([16]) The European Institute for Gender Equality (EIGE) has been working on addressing gender impacts in climate policy, including through a Gender-responsive evaluation for a sustainable future for all.

Several tools and frameworks that enable justice considerations are available at both the national and subnational level.

Various tools, frameworks and projects ([17]) are available to Member States, at both the national and subnational level. They support governments to incorporate justice aspects of adaptation policies or to consider the needs of stakeholders who are particularly vulnerable to climate change impacts. Map 3.2 highlights some examples, which include a wide range of measures — from participatory processes to more comprehensive frameworks — designed to ensure equitable adaptation outcomes.

Map 3.2 **Examples of various tools/frameworks and projects in adaptation policy that reference justice**



Note: This map does not give an exhaustive overview of tools/frameworks and projects.

Source: Author's analysis based on country reports submitted under Articles 17 and 19 of the GovReg, 2023.

([17]) It is important to note that the depth and specificity of the reported measures, both in terms of the tools/frameworks mentioned above and the engagement strategies, varied significantly across regions. In many instances, the examples provided were limited to brief mentions or general descriptions, lacking the necessary detail to fully assess their effectiveness or the extent of stakeholder involvement.

Most countries emphasise justice in relation to the uneven burdens of climate change impacts; fewer emphasise justice in relation to the responses to those impacts.

Overall, countries tend to place the greatest emphasis on recognising the uneven burden of climate change impacts on different vulnerable groups. In comparison vulnerable groups are considered far less frequently in the responses to those impacts.

This observation is in line with the findings of the 2023 European Topic Centre on Climate change adaptation and land use, land-use change and forestry (ETC CA) technical report *Just Resilience for Europe: Towards measuring justice in climate change adaptation* (Lager et al., 2023). The report details how local action is mentioned in only a few cases with regard to measures identified to address uneven burdens. A welcome finding in this current analysis is the relatively frequent mention of tools, frameworks or projects related to just resilience at the local or regional scale as identified from country reports.

There are some recent notable examples at national level that because of their publication date were not part of the analysis above, as the analysis is based on reports on national adaptation plans submitted in 2023. The German strategy for adaptation to climate change 2024 (adopted in December 2024, also referenced in Chapter 4) for instance has a sub-chapter dedicated to social justice issues. In Spain, a document has recently been published as part of the national climate adaptation plan on how to integrate social factors into climate change adaptation. This document includes a concrete checklist to assess whether social factors are being taken into account in the design and development of adaptation initiatives.

3.4 Integration of justice in subnational adaptation plans

At the local level — defined as the 'bedrock of adaptation' ([18]) in the EU adaptation strategy (EC, 2021b) — there is also a considerable focus on justice issues. For this report, the status of just resilience considerations at the subnational level within EU Member States is analysed using three data sets ([19]):

- the **EURO-LCP adaptation data set** which contains information on the characteristics of the local climate adaptation plans (LCAPs) of 327 medium- and large-sized cities across the EU-28 Member States ([20]), collected by online questionnaire (Reckien et al., 2022);
- the **Global Covenant of Mayors (GCoM) data set** which includes information from the cities which are signatories to the GCoM initiative and their plans and reports (a total of 7,966 plans and 23,029 adaptation actions) ([21]) (Baldo et al., 2024);
- the **Carbon Disclosure Project (CDP) 2022 Cities Questionnaire data set** which contains information on mitigation and adaptation risks, plans, actions and impacts at the city level, collected via an online questionnaire (CDP, 2024). Data used for this analysis come from the responses of 124 cities located in EEA countries.

([18]) In many countries, local adaptation remains a largely non-binding policy field, supported by voluntary, soft, bottom-up initiatives (EEA, 2023b). However, an increasing number of municipalities and regions are developing local adaptation strategies and plans and reporting on these as signatories of the Global Covenant of Mayors initiative or the Mission on Adaptation (EEA, 2023b).

([19]) These three data sets were selected because they were publicly accessible. Data were collected in early 2024, using the most recent data sets available at that point in time. These data sets are not considered to be representative of all cities across the EU.

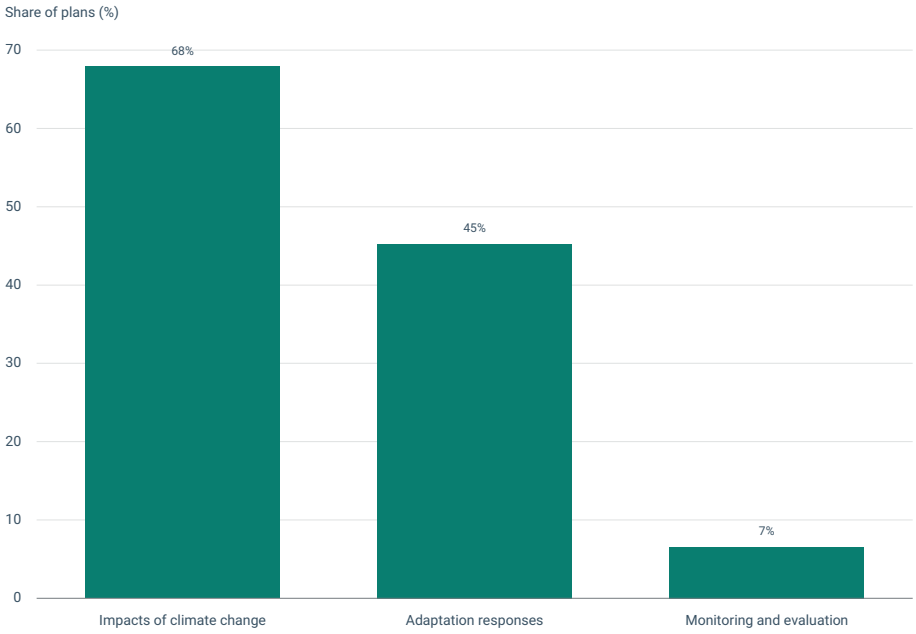
([20]) Though data were collected for cities in the United Kingdom, these cities were excluded from the analysis.

([21]) The data set contains a small number of non-EEA cities. These were retained to ensure consistency with a 2022 assessment of the data set used by the JRC (2022) to allow for a limited comparison over time. Furthermore, the data set provides information about local action plans and monitoring reports for both climate adaptation and mitigation. Where possible, information which is focused specifically on adaptation has been considered.

Vulnerable groups and the adaptation policy cycle

The EURO-LCP adaptation data set on the LCAPs shows that the most vulnerable populations across cities in EU Member States are considered in relation to the impacts of climate change in 68% of plans. Almost half of local adaptation plans (45%) consider vulnerable populations in relation to adaptation responses and only 7% in relation to monitoring and evaluation (Reckien et al., 2022) (Figure 3.4).

Figure 3.4 **Percentages of plans that take into consideration socially vulnerable groups in different phases of the adaptation policy cycle**

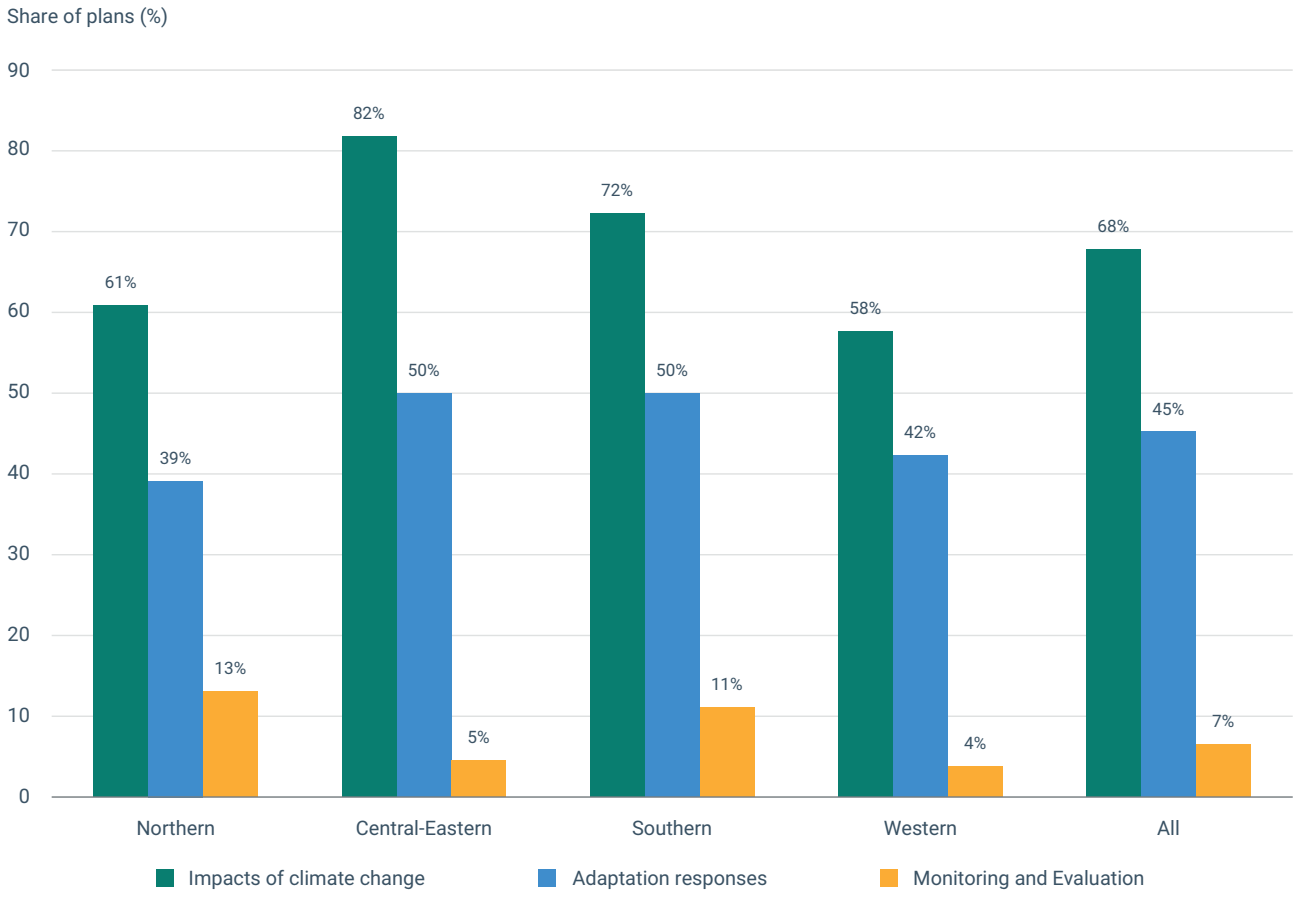


Source: Author's compilation based on Reckien et al., 2022.

Regional patterns: the EURO-LCP adaptation data set shows that central-eastern and southern European local adaptation plans show somewhat greater consideration of vulnerable groups in relation to climate change impacts (82% and 72% of plans respectively) and adaptation measures (50% of plans in both cases) than northern or western European plans.

At the same time, in relation to monitoring and evaluation, central-eastern European local adaptation plans show less consideration for vulnerable groups (5% of plans) compared to, for instance, northern European plans (13% of plans). For both impact assessment and monitoring and evaluation, consideration for vulnerable groups is least common in LCAPs from western regions (58% and 4% respectively). However, regional differences are small overall (Figure 3.5).

Figure 3.5 **Regional comparison of the extent to which vulnerable groups are taken into consideration in adaptation policy cycles**



Source: Author's compilation based on Reckien et al., 2022.

Social vulnerability and justice in relation to adaptation measures and goals

Only a few action plans define adaptation goals that include aspects of social justice. In the GCoM data set, 3% of action plans have one or more adaptation goals with a social justice component.

While a significant number of action plans include general adaptation goals, only a small fraction explicitly addresses just resilience concerns, such as vulnerable groups, equitable distribution or decreasing inequalities.

In total, 1,623 action plans detailed in the GcoM data set define at least one general adaptation goal. Of these, 53 different action plans (3% in total) report on a total of 96 adaptation goals that include aspects of social justice. These goals are either related to a specific vulnerable population group or refer to certain actions beneficial for vulnerable groups more generally, for instance 'Ensure warnings to vulnerable groups'.

A significant number of local adaptation plans specifically take into consideration vulnerable groups in relation to adaptation measures. In the EURO-LCP adaptation data set, 45% of plans take vulnerable groups into consideration in relation to adaptation measures. The vulnerable groups most commonly mentioned are older people, infants and young children, and sick people, similar to the GCoM dataset.

In the EURO-LCP adaptation data set, the most commonly mentioned vulnerable group in relation to adaptation measures is 'Older people' (32%), followed by 'Infants, kids, young people' (23%) and 'Sick people and those in hospitals/care institutions' (17%) (Figure 3.7). Most other groups — e.g. 'Women', 'Lone parents', 'Ethnic communities' and 'Migrants' — are rarely mentioned (in less than 1% of plans) in relation to adaptation measures.

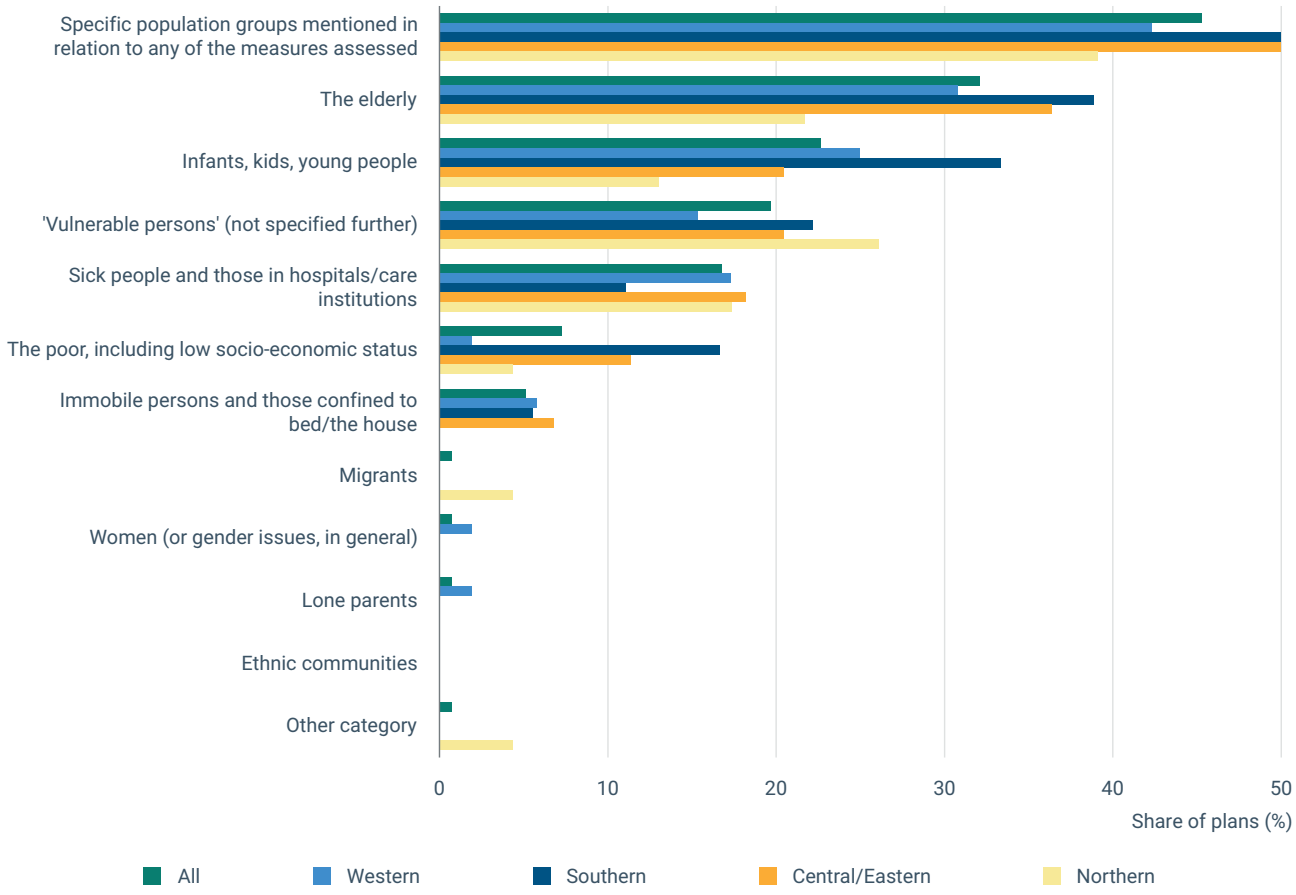
The ranking of vulnerable groups targeted most frequently by adaptation actions based on the EURO-LCP adaptation data set is consistent with the GCoM data set. In the GCoM data set, 27% of adaptation measures specify the vulnerable group(s) they are targeting. In comparison with 2021 GcoM reporting, this demonstrates a considerable increase in absolute terms in the number of adaptation actions targeting vulnerable groups: from 3,557 adaptation actions in 2021 to 6,132 actions in 2024 (JRC (EC), 2022). However, in relative terms, there is only a slight increase from 24% (3,557 out of 14,985 actions in 2021) to 27% (6,132 out of 23,029 actions in 2024). In addition, the distribution between different vulnerable groups remains similar.

Regional patterns: though there are only small differences in which vulnerable groups are mentioned in relation to adaptation measures, southern plans mention older people and young children more frequently than the other regions. In addition, southern and central-eastern European plans mention low-income groups more often than western and northern plans (17% (S) and 11% (CE) versus 2% (W) and 4% (N) respectively).

In relation to adaptation measures, the southern LCAPs mention 'Older people' (in 39% of plans) and 'Infants, kids, young people' (in 33% of plans) more often than the other regions. It is apparent that age is considered the most relevant criterion for climate vulnerability in this region. This may be explained by the high number of heatwaves and the relevance of their impacts in this region in particular.

Furthermore, the greatest difference between regions can be noted for people with low socio-economic status. LCAPs in southern and central-eastern Europe have a greater focus on people with low incomes in their plans. People living in poverty are mentioned in 17% (S) and 11% (CE) of adaptation measures. In comparison, people with low incomes are mentioned in only 2% of western LCAPs and 4% of northern LCAPs (Figure 3.6).

Figure 3.6 **Population groups specifically mentioned in relation to adaptation measures**



Source: Author's compilation based on Reckien et al., 2022.

Very few local adaptation plans mention the actual participation of vulnerable groups in the adaptation process (4% of plans).

Although vulnerable groups are considered in relation to adaptation measures in almost half of the plans, the EURO-LCP adaptation data set analysis revealed that only 4% of all plans (6 out of 137) directly mentioned the actual participation of vulnerable groups themselves in the development of adaptation policy or measures. In contrast, 81% of local adaptation plans identified general stakeholders involved in the process. Among these general categories, stakeholders with some relevance to the representation of vulnerable groups or addressing just transition issues, such as 'Community and neighbourhood groups' and 'NGOs [non-governmental organisations]' were the least included. They participated in the development of adaptation measures in only 20% and 31% of LCAPs respectively.

Similarly to the national level, most emphasis in local adaptation plans appears to be on the distributive aspects of justice with much less focus on procedural and recognitional dimensions.

The analysis above demonstrates that there is considerable attention paid to how vulnerable groups are disproportionately affected by climate change impacts or should be considered in relation to adaptation measures taken. However, in spite of the fact that many plans acknowledge the vulnerabilities, far fewer plans report that they have actually included vulnerable stakeholders in the planning process or address how structural barriers may prevent these groups from participating meaningfully. Neither is there much evidence that the plans recognise or incorporate differing values or world views which would indicate a consideration of recognitional justice. In other words, while distributional justice receives a reasonable amount of attention, the acknowledgement of procedural and recognitional dimensions of justice is still in its infancy.

3.5 Monitoring just resilience

Although data sets and methods are available to develop just resilience indicators, there is no common framework to monitor just resilience at the EU or national level.

Across the world, there is a call for metrics and indicators to evaluate progress in achieving justice in the context of climate adaptation (e.g. Chu and Cannon, 2021). However, it is complicated trying to monitor adaptation in terms of justice since it is hard to quantify the outcomes and structural issues (Bertana et al., 2022). In addition, there is currently a lack of consensus on the conceptualisation of justice. Mixed monitoring approaches are recommended with quantitative indicators documenting trends at multiple scales and across economic sectors, agencies and research initiatives, alongside qualitative indicators that contextualise these trends (Araos et al., 2021).

At EU and national level, data analysis indicates that there is so far no common framework to monitor just resilience. At the EU level, Lager et al. (2023) concluded that data sets and methods already exist as a starting point to develop just resilience indicators. This includes vulnerability indicators that can be linked to policies and targets. Indicators that can assess the distributional dimension of adaptation measures are to some extent available, in addition to certain procedural indicators which give an idea of the extent to which stakeholders have been involved in their development and implementation. However, indicators on recognitional aspects of justice are non-existent to date.

Although existing indicators show potential, particularly at the national level, they need to be modified and adjusted to match policy needs and local contexts if they are to be successful in monitoring just resilience in Europe. They also need to be widely and publicly available. At the national and subnational levels, there is a lack of comprehensive frameworks which can effectively monitor vulnerable groups or justice in adaptation.

4 (In)Justice in adaptation responses in the built environment

Key messages

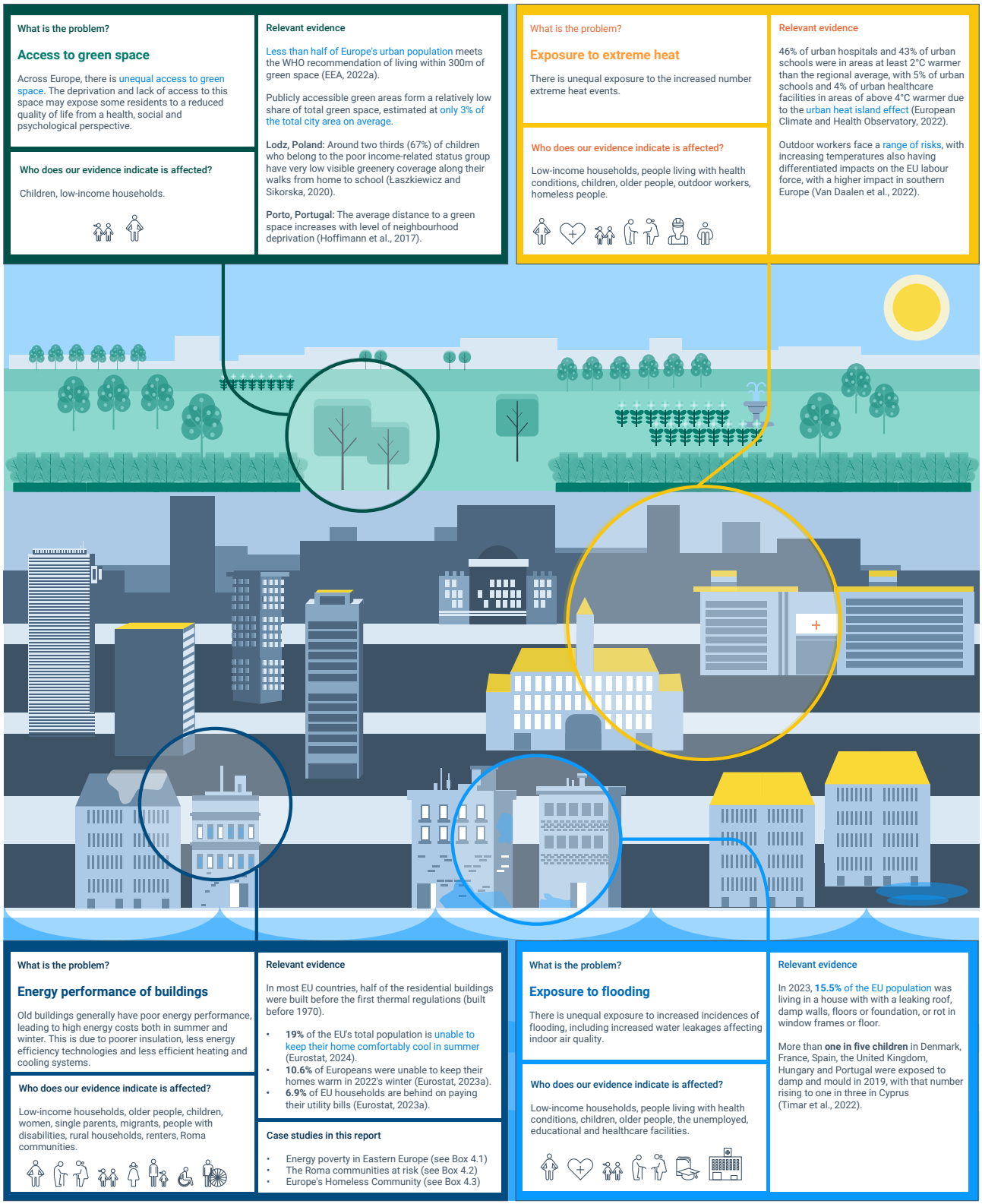
- Injustice in the residential sector manifests in old housing stock that is often inhabited by people with low household incomes who lack financial resources to adjust their dwellings to cope with more extreme weather conditions. For example, 19% of the EU's total population is unable to keep their home comfortably cool in summer.
- Injustice in the non-residential sector — particularly in relation to health and education infrastructure — is experienced through disproportionate exposure to risks such as overheating or flooding, also because of sub-standard building stock.
- Outdoor workers and the homeless community are increasingly exposed and vulnerable to extreme weather, with very few legislative protections at the EU, national or subnational levels.
- Injustices related to natural elements in the built environment (e.g. green spaces, water features) manifest most often in relation to inequitable access to these spaces or resources that offer benefits in terms of physical and mental health, temperature regulation, social cohesion and inclusion. Less than half of Europe's urban population meets the WHO recommendation of living within 300m of green space; however, simply creating new green and blue spaces can contribute to gentrification and property price increases that can result in the displacement of community members.
- Adaptation measures, like better building materials, technologies and insurance, are often driven by policy or financial incentives; however, low-income groups — especially when tenants — may be excluded due to cost barriers. To ensure greater access, they must be designed specifically with needs and financial capabilities in mind. Appropriate measures may include low-income or tenant grant or subsidy schemes, public/private partnerships for insurance cost-sharing and access to new technologies such as prefabricated renovation materials.
- Likewise, measures requiring the individual to take responsibility for protective actions and recovery, such as flood insurance, flood-related land-use planning or early warning systems, should engage vulnerable groups early on in their planning and design and must reduce individual burdens during implementation and use.

4.1 Introduction

This chapter analyses justice aspects of climate change impacts and related adaptation measures within the built environment. Within this report, the built environment refers to residential and non-residential buildings including education and healthcare infrastructure. It also includes the blue and green natural spaces and infrastructure that sit within, between and around such buildings.

4.2 How does injustice manifest within the built environment?

Figure 4.1 How injustice manifests within the built environment



Source: Author's compilation.

Box 4.1

Case study: energy poverty in eastern Europe

In many parts of eastern Europe, state-owned apartments were given away or sold cheaply to the residing tenants. In Croatia, apartments that were originally owned by the state were sold at 10% of the market price (Bouzarovski et al., 2023). In Czechia, privatisation of socialist housing stock led to an 80% private homeownership rate (Institute for Human Rights and Business, 2024). In both cases, apartments were often in buildings with very low energy efficiency. The result is that, today, many people, particularly older people, are living in apartments they cannot afford to maintain or keep warm (Bouzarovski et al., 2023). They are also exposed to associated dampness, mould and poor air quality. These factors can negatively affect the health of already vulnerable occupants via heatstroke, dehydration, aggravation of chronic and respiratory diseases and even death (EEA, 2024b).

Box 4.2

Case study: the Roma communities at risk

The Roma communities in eastern and southern Europe are significantly exposed to social exclusion, segregation and racial discrimination (Filčák, 2012). As a result of historical and structural marginalisation, Roma communities often live in polluted and marginal locations, leading to greater exposure to climate-related hazards such as flood risk (Harper et al., 2009). The future potential impacts of climate change, such as water shortages and extreme weather will disproportionately affect Roma communities and worsen the inequalities already faced by them (Heidegger and Wiese, 2020; Antal, 2018).

However, Roma people also face significantly higher housing deprivation. Housing deprivation is defined as people living in accommodation which is either too dark, has problems with humidity, has no inside shower/bathroom or has no indoor toilet. The EU Agency for Fundamental Rights (FRA) conducted a survey in 2021 on the Roma population across 10 EU countries ([22]) and found that more than half of Roma households (52%) are classified as experiencing housing deprivation (FRA, 2023). This is a slight decrease from 2016 (61%) but is still approximately three times higher than among the general EU population (17%).

The state of people's housing is an important factor affecting their ability to cope with the current and future impacts of climate change. People living in housing that is inadequately heated and ventilated and does not provide basic amenities are more vulnerable to climate impacts such as heatwaves, water scarcity and flooding.

Poor housing conditions are also strongly linked to energy poverty. Roma populations are at increased risk of energy poverty compared to the general population (EEA, 2024a; FRA, 2023). In order to reduce this uneven burden on Roma communities it is essential to recognise and address the systemic inequalities they face. The EU Roma strategic framework for equality, inclusion and participation, published in 2020, calls on Member States to reduce the gap in housing deprivation by at least one third and to ensure that by 2030 the majority of Roma do not face housing deprivation. It also aims to address broader socio-economic inclusion and increase meaningful participation by Roma communities. As such, this framework can be regarded as a policy that is in line with both recognitional justice (EEA, 2024a) and procedural justice. In 2021 a Council Recommendation was adopted on Roma equality, inclusion and participation that aims to increase equality and reduce exclusion. However, neither the strategic framework nor the Council Recommendation specifically addresses (in)equality in relation to climate change or adaptation.

([22]) Bulgaria, Croatia, Czechia, Greece, Hungary, Italy, Portugal, Romania, Slovakia and Spain.

Box 4.3

Case study: Europe's homeless community

Climate-related injustices are disproportionately experienced by Europe's homeless community, whose numbers are rising (Fondation Abbé Pierre and FEANTSA, 2024). A 2023 European parliament commissioned study identified several bi-directional relationships between climate change impacts, energy poverty and homelessness (European Parliament, 2023):

- There is an increased risk of homelessness for people who are vulnerably housed and populations in lower socio-economic positions due to energy insecurity and climate-related hazards.
- Homeless/vulnerably-housed populations are disproportionately exposed to climatic events such as temperature extremes and natural disasters.
- The physical and mental health of homeless/vulnerably-housed populations are impacted by weather extremes and climate change.

During the extreme heat events in 2023, European charities raised the alarm regarding homeless people's exposure to life-threatening illnesses due to their reduced means to find shelter and their reduced means to protect themselves through access to clean cold drinking water or sunscreen (Askew, 2023).

4.3 How might injustice manifest within adaptation approaches used in the built environment – and how to address it

4.3.1 Nature-based solutions

NbS and ecosystem-based measures include the creation of new or improved green or blue infrastructure. It also includes management of natural and/or semi-natural land use, water or marine area management. NbS and ecosystem-based measures provide many ecosystem services that can play an important role in reducing climate-related risks such as flooding and extreme heat. A 2022 EEA report looking at the relationship between health and heat indicates that vegetation in cities uses evapotranspiration, shading and lower heat absorption to reduce temperatures and related heat stress (EEA, 2022d). Consistent with this, a 2023 study in *The Lancet* demonstrates the effectiveness of increased tree coverage for reducing heat and therefore health impacts (Lungman et al., 2023).

What injustices might emerge out of the implementation of NbS?

While NbS offer a range of promising approaches, they can also contribute to unjust outcomes. For example, where blue and green infrastructure is sited within a landscape can affect equitable access. Siting affects the level of accessibility to them, and who benefits from or misses out on the positive ecosystem services it provides. This is backed up by evidence that only limited NbS co-benefits are accessed by most of Europe's health and education facilities which host children, older people and the infirm. An analysis of urban green space cover — which included nearly 82,000 educational facilities in 740 cities across the EU-27 (excluding Latvia and Malta), Norway and Switzerland — revealed that within a 300m straight line distance from the educational facilities, an average of only just over 10% of the area was green (EEA, 2022a). Similar patterns were found for average urban tree cover within 300m of educational facilities (EEA, 2022c) and on average, under 16% of

urban green space was located within 300m of healthcare facilities, with significant variation between countries (EEA, 2022b).

NbS may also lead to gentrification or displacement, as discussed briefly in Box 4.4 on Barcelona's superblock programme. In some cases, the NbS is not the primary factor driving gentrification (Anguelovski et al., 2022). However, an increasing number of studies reveal some causal relationships between green infrastructure and increasing property values. One study of 28 cities across North America and Europe discovered a strong correlation between urban greening efforts from 1990 to 2000 and subsequent gentrification trends from 2000 to 2016 in 17 of those cities (Anguelovski et al., 2022).

What approaches should be considered to make NbS more just?

There are many approaches to embedding NbS into Europe's landscape that are proving effective in providing a range of important ecosystem service that contribute to improved health and quality of life of different groups of people. However, in recognition of the gentrification and displacement risks posed by NbS, the Barcelona Laboratory for Urban Environmental Justice and Sustainability is showcasing over 50 policies and tools designed to prevent such unwanted effects while enhancing the inclusivity and accessibility of urban green spaces (Barcelona Laboratory for Urban Environmental Justice and Sustainability and ICLEI Local Governments for Sustainability, 2021).

For example, Nantes in France is focusing on enhancing affordable housing options and enacting housing rights policies. Municipal guidelines have been put in place that require 56% of new housing stock to be designated as public and social housing, ensuring that less affluent community members have equal access to new, desirable developments or can afford to remain in upgraded neighbourhoods. The city has also established clear guidelines around community participation in all development projects. This combination of measures means that equitable regreening and greening can be undertaken while significantly reducing the risk of affordability-related displacements (Barcelona Laboratory for Urban Environmental Justice and Sustainability and ICLEI Local Governments for Sustainability, 2021).

Barcelona's superblock programme has also integrated strategies to reduce potential displacement. Box 4.4 discusses the measures taken, which included the creation of social housing, a rent index, property taxes, as well as new rules limiting the creation of tourist apartments. A specific plan and supporting regulations aimed at protecting neighbourhood shops and economic activities was also put in place.

Box 4.4

Updated Climate-ADAPT case study: Barcelona superblocks (Superilla)

The Barcelona superblock (Superilla) programme illustrates how the lack of green spaces in dense Mediterranean cities can be addressed through the use of urban transformation measures to address climate adaptation and the involvement of stakeholders, creating benefits for all groups including those who are socially disadvantaged. The programme represents part of the city's efforts to adapt to climate change and aims to improve liveability, transforming public spaces in the city's dense urban areas to ensure that citizens have access to green space.

The Eixample neighbourhood, home to more than 250,000 people and characterised by low green density, was one of the locations where the programme was implemented. In this area, 'superblocks' were created and pedestrians have been given priority on the internal streets and crossroads. At the same time, streets around the superblock have been transformed into green axes featuring larger pedestrian zones and green spaces, while also providing transport connections across the city.

One goal of the superblock programme was to create an additional 33.4 hectares of pedestrian space and 6.6ha of urban green space across the Eixample district, ensuring residents can access a green area within 200m of their homes. Through implementation of the programme, shadow cover was also calculated to increase from 60% to 80% of the Eixample urban surface.

The superblock programme aims to build fairness and equality among citizens. It incorporates the city's Gender Justice Plan to address street security, particularly for women. It also promotes diverse usage of public spaces connected to the daily lives of all inhabitants. Designs to enhance street safety also benefit groups such as children, older people and people with disabilities.

Vulnerable or hard-to-reach stakeholder groups, often insufficiently represented within decision-making processes and in public participation mechanisms, were identified by the municipality and included in the established participation mechanisms. Associations representing different groups were proactively invited to participate in the lead local stakeholder group.

Additionally, a concerted effort has been made to protect less affluent residents and local businesses from increases in property values and potential displacement because of the 'improvement' measures. This effort has included the creation of social housing, a rent index, as well as new rules limiting the creation of tourist apartments. A specific plan and supporting regulations aimed at protecting neighbourhood shops and economic activities has also been put in place.

Zona de Joc Infantil, Barcelona.
Source: © Ajuntament de Barcelona.

Finally, the city council has also developed a monitoring plan to assess the benefits of the programme over time. The monitoring plan takes into account the extent to which different groups participated in project planning, socio-economic indicators for the residential population (age, foreign population, income) as well as indicators for gentrification such as the density of street-level shops and housing prices.

Since 2023, the superblock programme has evolved towards a new Green Axes model, aiming for a more homogeneous distribution of benefits across the city (Amorim-Maia et al., 2023; Magrinyà et al., 2023). Rather than focusing on particular neighbourhoods, it is now becoming a city-wide programme; the aim is to ensure that all neighbourhoods have accessible green spaces. A complementary strategy called the Local and Interior Spaces Programme (PEPI) is part of these evolving implementation efforts, with the goal of renewing unused spaces in all the city's neighbourhoods to add greenery and benefit local people's health.

The full case study can be found here: Enhancing social justice in actions to adapt to climate change in the city of Barcelona

4.3.2 Coordination and cooperation measures

Coordination and cooperation measures can include multi-level governance arrangements, networks and collaborative mechanisms. They can create supportive governance frameworks that are necessary for city governments to ensure coordinated and coherent action from multiple actors involved in policy development and implementation for local adaptation (EEA, 2020).

What injustices might emerge out of the implementation of coordination and cooperation measures?

Evidence suggests that elite interests can be favoured by climate adaptation measures that continue to be managed via more traditional, mainstream governance processes (European Parliament, 2024). This is because many of the traditional approaches — such as cost-benefit analysis (CBA), scenario planning and vulnerability assessments — require particular technical expertise that often leads to a certain kind of top-down approach with little room for the involvement of marginalised communities or individuals (Malloy and Ashcraft, 2020). In terms of procedural justice, this can exacerbate power inequities in decision-making and thus reinforce existing system injustices.

What approaches should be considered to make coordination and cooperation measures more just?

New models for cooperative governance mechanisms are being established including examples of cooperation mechanisms that engage stakeholders, citizens and vulnerable groups in decision-making and implementation.

One such example is the City of Barcelona's interdisciplinary department — the Centre for Climate Change Resilience Policy and Planning. A 2023 study explored how this structure aims to support the fairer redistribution of the benefits of climate-resilient infrastructure and ensure more meaningful participatory processes (Amorim-Maia et al., 2023). The department's governance and decision-making tactics include:

- experimenting with disruptive planning strategies;
- cross-sectoral modes of working (both across agencies as well as across different actors) to embed climate justice into all aspects of operation over time;
- making the concept of care-based approaches central to urban planning;
- implementing place-based approaches to tackle the intersecting vulnerabilities of frontline residents.

The Barcelona superblocks case study in Box 4.4 demonstrates how these four tactics are applied in practice.

Another example is Rotterdam's Resilient BoTu 2028 programme. Launched in April 2019, the programme aims to make the adjoining neighbourhoods of Bospolder and Tussendijken ('BoTu') Rotterdam's first 'resilient district', addressing the social, economic and climate challenges faced by residents. The programme is piloting an innovative participatory governance model that ensures BoTu residents play a central role in the decision-making processes and in implementing the programme (Muzzini et al., 2022). To date, the programme is directly supporting approximately

1,500 community members (around 10% of all residents) to help them reduce debt, address social isolation, access educational opportunities and find work (Resilient Rotterdam, 2024).

4.3.3 Targeted measures to support energy efficiency and building improvements

In a recent critical step change, building legislation in Europe has been adjusted to focus on improving the energy performance of buildings to reduce the large greenhouse gas footprint of the built environment. The key EU strategies and legislation in this area include the decarbonisation strategy, the 2020 Renovation Wave strategy, the 2023 Energy Efficiency Directive and the 2024 Energy Performance of Buildings Directive (EPBD).

These strategies and legislation have been designed primarily to address climate change mitigation objectives; however, they can also support climate change adaptation objectives as they 'address increased energy demand and constrained supply due to regional weather shifts and greater temperature volatility' (Goldman et al., 2012, p. 1). An important funding mechanism enabling the legislation to be implemented is the SCF, a programme designed to support people and businesses most impacted by the introduction of a new emissions trading system. Notably, one of the core objectives of this fund is tackling energy poverty and as such, it is relevant to measures designed to support energy efficiency and building improvements.

Accompanying the above strategies and legislation are physical and technological developments in construction materials and design approaches, all responding to the need to keep residences and buildings warmer in the winter and cooler in the summer at the same time as decreasing reliance on fossil fuels for heating and cooling systems.

Examples of building design innovations include passive cooling systems and integrated building design that incorporates factors such as building orientation, shading, insulation and natural ventilation. These approaches leverage natural elements to ensure indoor environments always remain comfortable. For example, evaporative cooling systems capitalise on the cooling effect of water; likewise, building design that incorporates cross-ventilation optimises air flow to replace warm air with fresh outdoor breezes. In low-cost housing in southern Spain, appropriate use of natural ventilation at night can reduce indoor temperatures by an average of 5°C (Escandón et al., 2019).

Innovations have led to the development of construction materials with superior insulation properties and thermal controls. More novel innovations still under development include cladding materials that change colour to help with heating or cooling and that can be retrofitted to improve the temperature performance of buildings (Aouf, 2023). When used on a façade, the material could potentially reduce the need for heating, ventilation and air conditioning and lower a building's overall energy consumption.

Energy efficiency technologies and devices are also increasingly available on the market. There is increasing evidence to show that financial incentives for energy efficiency investments in residential buildings not only contributes to reducing energy poverty but also has wider socio-economic outcomes like better health (IEA, 2019).

What injustices might emerge out of the implementation of targeted measures to support energy efficiency and building improvements?

There remains a risk that legislation designed primarily to address energy-related imperatives and goals results in negative outcomes for vulnerable groups. For example, investments in building renovations to target energy efficiency outcomes could result in housing becoming less affordable, thereby displacing lower-income households into housing with lower energy efficiency characteristics. In this scenario, no energy poverty-related benefits would result from investment into building retrofits (Grossmann, 2019).

Relatedly, these measures place the onus to invest in energy upgrades on the property owner. Where vulnerable community members live in rental properties, the benefits of such investments accrue to the tenant in the form of reduced energy bills but this may reduce a landlord's incentive to invest in upgrades or alternatively result in landlords passing on investment costs to tenants through rental increases, making the dwellings increasingly unaffordable (Ástmarsson et al., 2013).

The term 'renoviction' has been coined to describe this scenario where tenants move out because they can no longer afford to pay the new rent. One example of this is highlighted by the Institute for Human Rights and Business; they report that of Prague's 1.3 million inhabitants, over 8,000 people are homeless, over 10,000 people live in substandard housing and around 160,000 people face the potential loss of housing (Institute for Human Rights and Business, 2024). Their report voices a concern that retrofitting may lead to rent increases and potential renovictions instead of decreasing tenants' energy costs, thereby placing abovementioned 'at-risk' individuals in even more precarious situations.

Another risk is that renovations to improve building insulation to keep buildings warm in winter can result in the need for increased summertime cooling, with vulnerable individuals unable to meet the additional costs of this (Pezzutto et al., 2024). At present, the EPBD's provisions for long-term renovation strategies, namely its building renovation plans, do not include specific requirements for renovation schemes to address issues related to cooling or summer comfort levels, nor do they consider likely future climates (Pezzutto et al., 2024). This may result in disproportionate investment in more mitigation-focused actions with mechanical cooling devices remaining the main measure promoted for summer cooling. This is not desirable from the perspective of energy consumption and emissions and may also be an unaffordable option for low-income households experiencing summer energy poverty.

At the same time, the existence of products which reflect innovations in building materials and design and energy efficiency technologies does not automatically translate into their accessibility for lower-income residents. Many products have a price premium over traditional materials and designs. While they are recognised as contributing to reduced energy bills over time, they require an initial upfront investment, making them inaccessible to many lower-income property owners. Additionally, deeper renovations generally require residents to move out while work is being undertaken and renting short-term alternatives may be cost-prohibitive for many.

What approaches should be considered to make targeted measures to support energy efficiency and building improvements more just?

If designed and implemented with justice in mind, building performance and renovation policies can play a role in supporting adaptation goals and in reducing

injustices in mitigation and adaptation responses. Activities to improve the efficiency of buildings can also reduce heating and cooling costs and translate into more liveable residences, workplaces and social infrastructure buildings. For example, at the EU level, the Renovation Wave strategy explicitly mentions energy poverty and the need for renovation to be used as a mechanism to address the issue. Likewise, the EPBD requires the prioritisation of financing for vulnerable groups and those experiencing energy poverty.

Retrofitting results in cost burdens, which must be borne by either the building owner or the tenant, unless some kind of funding scheme absorbs these costs (Grossmann, 2019). In recognition of this, the EESC Opinion TFN/841 on Social housing in the EU calls for a combination of mandatory and supportive measures to ensure fair climate actions. The opinion indicates the need for support tools to enable everyone, regardless of financial situation, to carry out thermal and energy renovations and necessary water and sanitation improvements.

At the same time, it is necessary to protect tenants from excessive rent increases due to cost pass-throughs; this can be achieved by placing obligations on landlords such as introducing regulations requiring renovations but also limiting rent increases. The SCF is an example of a measure designed to play a role in ensuring that the most vulnerable can carry out thermal and energy renovations; it is explicitly designed to be used for direct income support and investments in energy efficiency-related building renovations.

At the national level, many EU Member States are also attempting to address energy poverty in the development of national building performance-related legislation and policies. For example, Greece adopted and published its National Action Plan for the Alleviation of Energy Poverty in September 2021 (CRES, 2024). One of its core measures is improving the energy efficiency of residential buildings of households affected by energy poverty. The plan envisages radical renovations of residential buildings and the installation of efficient heating and cooling systems to reduce energy consumption. Box 4.5 showcases several additional examples of how renovation schemes are being designed and implemented to address renovation affordability.

Box 4.5

Case study: just renovation schemes in Belgium, Netherlands and Estonia

Prefabrication, with concepts like Energiesprong and serial renovation, capitalises on economies of scale to increase the speed of deep retrofits; it also drastically reduces the time and onsite labour required for renovation. Entire buildings can be renovated in a matter of days while tenants continue to live in their homes, drastically reducing the complexity and costs associated with renovation.

A pilot project in Hoeselt, Belgium put this into practice with a concept called 'Sociale Energie Sprong'. With an explicit objective to speed up the retrofit of social housing building, while maintaining overall cost affordability, the project utilised industrially prefabricated external cladding which were attached externally to the façades of buildings. This process allowed for renovations to be completed in just nine days.

Case studies for the outPHit project have also demonstrated that prefabrication can be used to achieve EnerPHit renovations according to ambitious passive house principles. Such retrofits can cut cooling and heating demands by factors of 6 and 15 or more respectively. Prefabricated assemblies allow deep renovation to be achieved more quickly, more cost effectively and more reliably while drastically improving year-round comfort and slashing monthly costs. The EnerPHit renovation of the 194 unit Goes Polder social housing development in the Netherlands is a case in point.

EcoWorks serial renovations.
Source: © ecoWorks.

In Estonia, the Tallinn University of Technology has been developing different technologies for use in renovations. Part of their work has involved advancing approaches in modular building and industrialised building systems, which have been tested on a pilot project in the district. Affordability has been a driver for the university's efforts.

Box 4.6

Case study: the draft German national adaptation strategy

The 2024 draft of the updated German national adaptation strategy includes a section specifically dedicated to issues related to social vulnerability and justice. It mentions the need to consider tenants' structural and financial ability to improve their homes to adapt them to increasing heat. Additionally, it recognises that vulnerability is dynamic and may change over time. More broadly, it refers to the importance of identifying the social impact of climate adaptation measures and the need to design adaptation policies in a socially and gender-equitable manner in order to avoid maladaptation.

Across Europe there have been very few attempts to date to address the issue of renovictions. However, there is now one law in France that protects tenants, legislating a cap on rent increases when renewing a lease in denser localities. In the case of 'improvement works', the rent increase cannot exceed 15% of the actual cost of the renovations. While this is not viewed by some as sufficient to fully address the issue of renovictions, it is an important first step in the right direction (Bergoënd, 2022).

4.3.4 Financial measures to support the uptake of energy efficiency and building improvement materials and technologies

There is a whole range of different types of financial measures which can support just resilience, including subsidies, grants, loans, procurement mechanisms that bypass property owners/tenants and rebates. The key feature which is common to these mechanisms is that they partially or fully remove or distribute over a longer time horizon the financial burden of investing in different products and works.

What injustices might emerge out of the implementation of financial measures?

As discussed above, the costs associated with the purchase and installation of many energy efficiency materials and technologies make them unaffordable to many lower-income community members. Materials or building designs aimed at protecting properties from flooding — such as building elevations or flood gates to stop the entry of flood waters through doors or other openings — can be equally costly. Subsidies are often touted as a way to increase affordability but even when such programmes are available, the requirement for upfront payment can still make them cost prohibitive.

The authors of a 2024 European Parliament Committee on Employment and Social Affairs- commissioned study concluded that subsidies disproportionately benefit higher-income groups because they have the financial means to purchase subsidised items such as materials for house retrofits (European Parliament, 2024). There was evidence for this in Lithuania, Germany, Portugal and Belgium. The flipside of this is that lower-income groups were found to have insufficient financial resources to participate in these subsidy schemes.

Another study focused on property owner investments in flood risk management measures. It concluded that a large proportion of European property owners were generally unable to afford to make a one-time payment for the cost of protective measures (Hudson, 2020).

Additionally, many grant and subsidy programmes focus on mechanisms that support homeowners to undertake home upgrades. However, home ownership is beyond the reach of many members of society. As such, efforts must be made to develop initiatives specifically designed to support tenants in managing energy-related household costs.

What approaches should be considered to make financial measures more just?

Box 4.7 gives details of various programmes which attempt to reduce the financial barriers to access for materials, technologies and services.

Box 4.7

Case study: grant, loan and subsidy programmes in France, Bulgaria and Ireland

The Better Living ('Habiter Mieux') Programme in France supports low-income households to improve the energy efficiency of their homes through the provision of grants. Grants cover actions such as replacing boilers, insulating inside or outside walls and installing double or triple glazing. Importantly, grants can be combined with other programmes and financial aid. Since 2011, the programme has contributed to the renovation of 549,002 housing units, with an average energy savings gain of 50%. Around 70% of beneficiaries to date have been owner-occupied homes with low incomes. In a programme evaluation, 97% of low-income households indicated they could not have carried out the work without the support of this programme.

Habitat Bulgaria works with local NGOs to support the disbursement of small, interest-free loans to vulnerable homeowners experiencing or at risk of poverty (European Federation of National Organisations Working with the Homeless, 2023). Most microloan recipients live in segregated Roma communities or small villages. The loans, which are a maximum of EUR 600, are repaid in monthly instalments over the subsequent year, with all collected repayments reinvested back into the Home Improvement Fund and disbursed to other families in need.

The final example is of a flood mitigation scheme in Cork, Ireland. The scheme supports individual property protection actions considered effective in reducing flooding impacts. In this case, it targets home or business owners who have already been impacted by recent flooding, in the hope that implementation of preventive measures will significantly reduce the likelihood that these property owners will experience such hardships again. Eligible properties are inspected by an independent engineer who assesses if the property is suitable for Individual Property Protection (IPP) measures. If it is, Cork County Council is directly responsible for sourcing and installing the flood mitigation measures, with no financial outlay from the property owner.

There are also examples of subsidy or grant programmes targeting tenants. The kind of support schemes offered range from investments in energy efficiency actions to involving tenants in the formation of energy communities (Lager et al., 2023). The 2024 EPBD revision promotes these kinds of measures and includes suggestions on approaches to support tenants in investing in or obtaining energy efficient dwellings at affordable prices. The EPBD explicitly calls on Member States to alleviate energy poverty and support social housing (EC, 2021c).

Examples of other national policy approaches can be found in Belgium, Sweden and Wales; here energy poverty in the private rental sector is tackled through specifically targeted dissemination of information about financial incentives, subventions dedicated partly to rent reduction and/or mediation between landlords and tenants (Papantonis et al., 2022).

Box 4.8

Case study: INCLU:DE project in Germany

In Germany, cities involved in the INCLU:DE project are implementing subsidy schemes that target tenants at risk or in situations of energy poverty (Horn and Botha, 2024). Dortmund, Heidelberg, Bonn and Ludwigsburg focus their subsidy schemes on supporting the purchase of plug-in solar devices. Mini-PV systems are designed to be mounted on balconies or exterior walls and can be plugged into power outlets. Using these devices can lower electricity bills by 10-20%. Importantly, they can be easily transported by tenants if they move.

Bonn reimburses up to 90% of the cost of these schemes for lower-income residents versus 60% for other residents. Dortmund subsidises up to 95% of the cost for social welfare recipients compared to the standard 50% for other residents. Heidelberg requests a small EUR 50 flat-fee contribution from beneficiaries of their city-specific welfare programme HeidelbergPass(+). In Ludwigsburg beneficiaries of their welfare programme LudwigsburgCard indicate their interest via an online portal, triggering installation by one of the city's cooperation partners. To reduce the barriers related to the need to cover upfront costs, the partners themselves liaise directly with the city for payment.

To ensure target groups are aware of the support available, many of the INCLU:DE project cities have developed tailored communication and outreach strategies, for example advertising their subsidy schemes at locations that are often frequented by the target group.

However, challenges remain in managing these kinds of subsidy programmes. For example, Dortmund experienced an unexpected over-subscription to their programme resulting in premature depletion of allocated funds and some eligible households missing out. As a result, questions have been raised about whether it has actually been Dortmund's lower-income households the programme was targeting that have benefited, or the easier-to-reach broader population (Horn and Botha, 2024).

4.3.5 Protections for outdoor workers

The European Agency for Safety and Health at Work states that all workers are entitled to an environment where risks to their health and safety are properly controlled, with temperature at work being one of the risks that employers should play close attention to (European Agency for Safety and Health at Work, 2023). Such protections can include EU, national, subnational or private sector legislation, regulations or operating practices related to extreme weather — for example, maximum daily work hours, rest breaks, hydration approaches, protective clothing, technical and organisational approaches to control stress heat, workplace risks assessments, acclimatisation measures, health surveillance, worker information and training and worker consultation processes (European Agency for Safety and Health at Work, 2023).

What injustices might emerge out of the implementation of these protective measures?

While EU Directive 89/391/EEC requires that workers' health and safety must be protected from any risks, no binding EU-level legislation currently exists to protect outdoor workers from temperature extremes. A 2024 Eurofound report concludes that there is no level playing field in the EU in relation to the protection of workers from risks directly associated with climate change; national-level provisions on working in heat vary significantly (Eurofound, 2024).

What approaches should be considered to make these protective measures more just?

Despite the absence of EU-level legislation, some Member States have developed heat plans that include maximum temperature thresholds for this group of workers (EEA, 2024b). There are also examples of subnational governing bodies having introduced regulations to support this group. Examples are given below:

- In France, while the country's Code du Travail does not stipulate a maximum workplace temperature, it requires employers to ensure that workers can do their jobs under safe conditions and that workers can cease working upon fear of an immediate danger to their lives (Carbonaro, 2023). The degree to which a heatwave could be considered an immediate danger is still to be tested.

- Spain's law on worker protections during extreme temperatures Real Decreto ley 4/2023 on the prevention of occupational hazards during periods of high temperatures. Employers must ensure a temperature of between 17°C and 27°C is maintained for office-based work, with temperatures of between 14°C and 25°C required for work that requires light physical effort (Carbonaro, 2023). Spain is also soon due to ban outdoor work on all occasions when the state weather agency AEMET issues red or orange alerts; this is generally when temperatures are pushing up towards 40˚C or above (Symons, 2023). It is not yet clear which professions will be covered by the outdoor work ban, though it has been confirmed that working hours in the agricultural and construction sectors will need to be adapted during heatwaves.

    - In subnational examples, in Andalucia, Spain, construction workers are only required to work during morning hours in the summer months (Symons, 2023). And in Madrid, Spain, after the death of an outdoor worker in 2022, street sweeping is suspended on days when temperatures exceed 39°C.

- In Italy, the country's labour law does not stipulate a maximum workplace temperature but requires employers to ensure that job functions can be carried out safely when there are extremes of both hot and cold temperatures (Carbonaro, 2023). If workers do not feel these conditions are met, they may cease work without risk of repercussions.

More examples of how EU Member States are addressing this issue can be found in the EEA 2022 report *Climate change as a threat to health and well-being in Europe: focus on heat and infectious diseases*.

Non-state actors such as trade unions are also playing an important role in securing safer work environments as discussed in Box 4.9.

Box 4.9

Case study: protecting workers in France

France's Code du Travail has been used as the basis for stronger worker protections in the 2019 agreement reached by two French construction sector trade union federations, the Confédération française démocratique du travail (CFDT) and Confédération française des travailleurs chrétiens (CFTC), and the Regional Employers' Federation of Public Works (FRTP-EFPW) in the Limousin region. The agreement focuses on safeguarding workers' rights related to health, safety and working conditions during hot weather and heatwaves (European Trade Union Confederation, 2020).

As temperatures reach and exceed 30°C, preventative measures must be implemented on worksites. These include:

- offering employment compensation for work interruptions due to hot weather;
- requiring employers to monitor weather forecasts and adjust workloads, conditions and hours during heatwaves;
- providing appropriate work attire and designated spaces for workers in adverse weather conditions that might impact their health.

The CFDT continues to urge the government and employers to extend such agreements nationwide. Complementing these efforts, the CFDT has been conducting information, awareness and training campaigns for its members, alongside a lobbying effort known as 'the hidden face of the sun'.

A very recent development has been the Spanish labour ministry update to its workers' statute on 28 November 2024 — though it affects a broader category of workers than just built environment outdoor workers. Moving forward, workers will be allowed to take leave during climate disasters or in situations when adverse weather makes travelling to work unsafe.

The EU Agency for Occupational Health and Safety at Work (EU-OSHA) has developed guidance that addresses heat risks at work. The guidance recommends that employers prepare heat action plans, complemented by early warning systems where possible (European Agency for Safety and Health at Work, 2023).

4.3.6 Property insurance

Insurance products are an important tool to support property owners in recovering from extreme weather-related damage. Their primary purpose is to provide financial protection against unforeseen risks and losses. Insurance products vary by country but across Europe there is a whole range of individual-/household-level insurance products to protect personal health or property against flooding, drought, heat, wildfires or similar extreme events related to climate change.

What injustices might emerge out of the implementation of insurance-related measures?

When the premiums are based on risk and climate change-related risks continue to grow, insurance products can become too expensive for an increasing number of households (European Parliament, 2024). For example, 2016 research found that

about 20% of German and French households at risk of flooding found risk-based premiums unaffordable (Hudson et al., 2016).

This issue is discussed extensively within the EEA's 2024 report on the connections between health- and water-related hazards (EEA, 2024f). It indicates that flood insurance unaffordability is highest in high-risk areas of Poland and Portugal, followed by several regions in Croatia, Germany and the Baltic States. Currently, only about a quarter of the losses caused by extreme weather and climate-related events in the EU are insured, with the number falling to below 5% in several countries.

Drawing on EIOPA 2023 data, Croatia, Greece, Italy, the Netherlands and Romania have the lowest rates of flood insurance penetration for residential buildings (EIOPA, 2023). Given expected climate change impacts, unaffordability is projected to rise further in eastern Europe and some regions in Italy, Portugal and Sweden towards the end of this century, resulting in reduced insurance demand (EEA, 2024f).

What approaches should be considered to make insurance-related measures more just?

As the likelihood of extreme weather events such as flooding grows and with it, projections for economic damage, traditional models of insurance and reinsurance are becoming increasingly unfeasible. Either premiums will increase sharply to cover anticipated policy claims, reducing insurance affordability for many, or insurers will stop underwriting such risks altogether, which reduces the accessibility of insurance for all.

Partnerships between government and the private sector are seen as one of the main ways to remove the full weight of risk for individual policyholders or the insurance industry. Sharing costs can keep risk premiums low, leading to better affordability for low-income population groups.

The European Central Bank and EIOPA present several models for such partnerships (European Central Bank and EIOPA, 2023). One is to have national governments support ex ante contingent financing and risk transfer by creating national reserve funds or working with the private sector to establish public-private insurance schemes that pool and diversify risks. Another option is for governments to support the overall health of the insurance market by providing additional coverage via direct insurance or by indemnifying insurers against extraordinary events. Examples of this exist in European countries including in France where the Caisse Centrale de Réassurance provides reinsurance for natural disaster-related risks but requires that the damage be covered by private property insurance to begin with.

4.3.7 Land-use planning

Land-use planning is a non-structural measure being used across Europe to limit exposure to risks and vulnerabilities primarily from flooding but also increasingly from risks such as landslides and wildfires. Approaches include land-use restrictions, zoning and acquisitions that control the use of land in areas considered prone to risks (Der Sarkissian et al., 2022). For flood risks, land-planning decisions can be generally categorised as 1) those that enable forms of (managed) retreat, 2) those that are framed around avoiding the risks all together or 3) those which attempt to accommodate anticipated extreme weather-related events (Cottar et al., 2021).

Managed retreat is the most extreme response to addressing flooding risks. Considered a measure of last resort, managed retreat involves purposefully

relocating people, infrastructure, homes and businesses away from vulnerable locations into safer areas (Thaler, 2021). It is closely tied to private property rights and requires coordination at various spatial scales, aligning with national and subnational regulations and land-use planning (EEA, 2024h).

Avoidance measures include zoning restrictions that limit or prohibit the construction of permanent structures in areas identified as high-risk flood zones.

Accommodation measures can come in the form of local, regional or national regulations or ordinances (Doberstein et al., 2019). One example is the mandatory requirement for existing buildings in certain geographical locations to be elevated; the aim is to minimise damage to property and people in the likely occurrence of a flood event. It is estimated that better implementation of such private precautionary measures in residential buildings could reduce flood risk in Europe by 15% (Steinhausen et al., 2022).

What injustices might emerge out of the implementation of measures related to land-use planning?

Justice concerns for accommodation measures largely relate to the fact that many of them involve shifting responsibility for flood protection and recovery onto individuals and other private actors; this can place undue burden on lower-income groups or people with special needs (Tubridy, 2021; Johnson and Priest, 2008).

For example, a mandatory requirement to elevate buildings for flood regulations can be cost prohibitive for lower-income communities as was the case in Le Havre, France. The city's new requirement that all dwellings must sit at a level of four metres above sea level to reduce flood risk has resulted in many lower-income residents being forced to move away since they cannot meet the costs of elevating their homes (European Parliament, 2024).

Managed retreat can also be controversial due to increasing recognition that retreat may redistribute risk, exacerbate historical inequalities or perpetuate uneven vulnerability and loss of livelihood among different groups (Ajibade et al., 2022).

The use of managed retreat involves the relocation of house owners but also often results in winners and losers (Thaler, 2021). Drawing on evidence from outside Europe, European Parliament's report indicates that in the context of urban adaptation planning, poor populations often bear the burden of relocation; it is more common for low-income communities to be displaced and relocated than their more affluent counterparts (2024).

The level of compensation offered by public authorities plays an important, although not all-encompassing, role in how such policies impact vulnerable households. For example, a UK managed retreat initiative in Yorkshire in the early 2000s had no clear, standardised approach for compensating private landowners. While private landowners could apply for national financial support as a form of compensation, the regulations, criteria and level of compensation varied across retreat projects (Thaler, 2021).

Individuals with special mobility needs may also suffer disproportionately from managed retreat approaches not only due to the physical difficulty of moving but because of the potential mobility challenges in a new location.

What approaches should be considered to make measures related to land-use planning more just?

In specific situations, managed retreat is considered the only viable option for protecting populations from flood risks. Where this is the case, there should be thoughtful consideration for factors including the characteristics of the relocation destination (e.g. is the new location considered flood-proof, does it provide a good social environment, will new buildings be sustainable and energy efficient, are there good connections to local supplies?) and age- or health-related concerns (e.g. the physical capacity to move) (Truedinger et al., 2023).

Two case studies are given in Box 4.10. They are from Austria and Poland and shed additional light on potential justice dimensions of managed retreat initiatives.

Box 4.10

Case study: Managed retreat in Austria and Poland

In Austria, a voluntary managed retreat scheme along the Danube River was led by local, regional and national government authorities from 1970 to around 2015. Close to 80% of the estimated market value of the property and 80% of the demolition costs were offered to relocated owners as compensation (Thaler, 2021). The voluntary and compensatory nature of Austria's approach has ensured that vulnerable households have remained relatively protected.

Nevertheless, an analysis of this case study revealed that the compensation rate was applied indiscriminately without consideration for property owners' financial capacities or other factors that would still leave lower-income households in a worse situation than before the retreat (Thaler, 2021).

In Poland, the Racibórz dry polder was constructed in 2001 as a critical flood protection mechanism (Odra Vistula Flood Management Project, 2024). It necessitated the resettlement of 700 people (about 250 families) from two villages situated within the proposed polder boundaries. This resettlement, the largest of its kind in Poland for a hydraulic project, involved relocating landowners outside the polder basin as well.

Residents were invited to accept a replacement house with a similar value to their existing home plus a land plot in a village to be constructed on higher ground about 10km away. Alternatively, they were given the option of selling their houses to the government at replacement value and moving elsewhere. The process of acquiring the land for 42 single-family homes and critical municipal infrastructure was completed in 2015. Around 200 residents chose to move to the new village called Nieboczowy.

To increase acceptance for the relocation, significant efforts and resources were invested in ensuring that resettled residents felt at home. New communal facilities were constructed including a church, kindergarten, cultural centre, sports centre with a football pitch, park, playground, skatepark and outdoor fitness area. Municipal rental apartments were also provided for those needing support. The project also involved relocating the cemetery from the old Nieboczowy to the new village. A new cemetery with a chapel was created, ensuring the respectful transfer of the deceased. This resettlement project was successful because it maintained a connection to the original village while providing modern amenities for the relocated community.

4.3.8 Early-warning systems

Early-warning systems (EWSs) provide critical and timely information to community members in advance of an extreme event, upon which they are then expected to act. They are considered one of the best-proven and most cost-effective methods for reducing disaster deaths and losses (UNDRR, 2022). It is estimated that they provide a tenfold return on investment (International Telecommunications Union (ITU), 2023).

Under article 110 of the European Electronic Communications Code, EU Member States were required to have a system in place by 2022 to deploy a public warning via telephone networks in case of an ongoing crisis or upcoming disaster.

What injustices might emerge out of the implementation of EWSs?

For EWSs to be fully effective, active engagement with the people and communities at risk from hazards needs to accompany their physical and technological deployment. However, vulnerable community members are still not systematically regarded as a sub-group for targeted engagement.

This is exemplified in the global survey by the United Nations Office for Disaster Risk Reduction (UNDRR) published in 2013. It reveals why larger proportion of people with disabilities die during disasters: evacuation is highly challenging for 39% of people with hearing difficulties, 54% with sight impairments, 68% with more limited walking or step-climbing mobility and 45% with communication disabilities (Making Cities Resilient 2030, 2024). A repeat survey in 2023 indicates that insufficient progress has been made in addressing these known challenges for people with disabilities.

What approaches should be considered to make EWSs more just?

Box 4.11 gives case studies from Greece, Germany and Belgium. These demonstrate how procedural justice can be factored into the design and implementation of EWSs by including the perspectives, experiences and ideas of different vulnerable groups.

Box 4.11

Case study: EWSs targeting vulnerable groups in Athens, Greece, Kassel, Germany and Flanders, Belgium

In Athens, Greece, the needs of people with different forms of disabilities are being integrated into the development of disaster risk reduction plans and associated EWSs and evacuation plans. In October 2023, the National Confederation of Persons with Disabilities in Greece was part of a desktop scenario involving an earthquake, leading to a secondary fire incident (Making Cities Resilient 2030, 2024). A range of techniques were presented on how to support the evacuation of people with intellectual and development disabilities, as well as how to guide people with visual impairments away from danger zones. Power evacuation chairs to easily move people with physical disabilities were also displayed.

While only a desk exercise, the process:

- demonstrated why it is critical to involve people with disabilities in the design and implementation of evacuation exercises;
- highlighted the need to have inclusive criteria built into building evacuation plans;
- raised awareness and built the capacity of all parties involved in evacuations including vulnerable groups and their support networks;
- provided recommendations on how to prepare similar exercises in the future, centring the involvement of persons with disabilities.

Since 2010, the German city of Kassel has been implementing a project called the 'Heat Telephone Parasol' to provide heat-related early warnings. It is managed by the regional health department and city's Senior Advisory Board. From 15 June to 31 August each year, volunteers are involved in disseminating information about all Level-2 heat warnings issued by the German Weather Service for the city. Level 2 warnings mean that the perceived temperature rises above 38°C and poses extreme heat stress to the body. Anyone over 65 can register to receive this information service.

There have been two key takeaways from this service. Firstly, providing brief information and a heat warning via a telephone call is an effective way to disseminate information to this vulnerable group and the personal contact can result in the older people revealing other needs. Older residents highly value the personal nature of the service and, as such, it provides a broader and important social function. Secondly, the initiative relies on the personal commitment of volunteers making the phone calls. Without these volunteers, the service would become financially unfeasible. The ongoing commitment of this group of volunteers contributes to the success of the service and also ensures that trust is established and maintained.

As a final example, the Flanders region in Belgium has a heat action plan in place. It outlines how and when vulnerable groups and professionals working with them should be informed before and during periods of high temperatures. The plan's vigilance phase triggers an alert from the Health Department to all professionals working with vulnerable groups, recommending they prepare for a possible heatwave period. Should a very hot or prolonged heat event then occur, the warning phase is then enacted. This phase requires the general population and professionals who work with vulnerable target groups to implement a range of measures that have been identified earlier to protect themselves and at-risk groups.

4.3.9 Other measures

A range of other measures is also being deployed across Europe to ensure more just adaptation outcomes.

Integrated planning

Planning efforts to address the impacts of extreme weather are being strengthened at the sectoral level, particularly within the health sector. For example, Belgian health facilities are creating plans or protocols for how to deal with heatwaves to support the capacity of healthcare facilities to cope with increased heat days, the associated increased demand for services and how this is expected to impact staff and patients. A 2021 Belgian survey of such facilities and care homes for older people, psychiatric facilities and residences for people with disabilities showed the vast majority (86% average) already have plans or protocols in place (Van de Vel et al., 2021).

Information and raising awareness

Information campaigns, behavioural nudges, decision support tools and EWS applications are all approaches that are being used to share information and raise awareness in relation to climate adaptation. The aim of such efforts is to achieve long-lasting behavioural changes. For example, the EEA's 2024 urban adaptation report indicates that information campaigns are a common policy tool used by public authorities to focus the attention of residents and other societal actors on public policy problems and, in the best-case scenario, influence their behaviour (EEA, 2024h).

While information campaigns and raising awareness can take many forms and focus on many topics, in order to achieve their objectives, they must be designed with the needs, capacities and contexts of diverse groups in mind. This is particularly important when trying to raise awareness among vulnerable groups. Box 4.12 gives a case study from Hungary. It recognises that information shared by trusted local organisations and peer households is critical to the effectiveness of actions which can benefit low-income rural residents, alongside tangible demonstrations of their feasibility.

Box 4.12

Case study: Green Homes in Nógrád, Hungary

Habitat for Humanity Magyarország Alapítvány is experimenting with how best to use the available technical, social and community solutions to address the renovation needs of low-income households in rural residential areas in the Nógrád District of Hungary.

The project works in a context characterised by energy-substandard detached houses, generally low household income levels, a large percentage of the population experiencing energy poverty and low levels of energy efficiency and financial awareness or knowledge. Recognising the specific social context of the target population, the project showcases the tangible implementation of energy renovations among local households by offering eco-home tours. These tours demonstrate and disseminate information on the feasibility and benefits of energy renovations. They focus on specific housing conditions such as how to insulate mixed masonry buildings, what options are available to change inefficient wood-fuelled stoves to improve heating conditions and how energy consumption can be reduced.

The project has also been improving household awareness of the financial support available to subsidise renovations. Experts including local small and medium-sized enterprises, energy specialists and at least one financial institution have been engaged in promoting financial awareness and the capacity to access the funding and financing available for the renovations among local households.

Capacity building, empowering and lifestyle practices

While disseminating information and raising awareness in relation to climate change impacts is a crucial first step towards building resilient communities, taking action requires that actors believe themselves capable of adapting. Approaches which can support this kind of empowerment include identifying and sharing good practices as well as knowledge transfer through modalities including workshops and community training.

For example, since 2023, which was the hottest year on record, heightened attention is being paid to educating people on how to manage and act during heat waves. Growing recognition of the increased exposure and vulnerability of particular groups is resulting in more targeted capacity-building efforts. This is illustrated in the CooltoRise case study in Box 4.13.

Box 4.13

Case study: CooltoRise, Spain, Italy, Greece and Bulgaria

CooltoRise stands out as one of Europe's first energy poverty projects focused on reducing the incidence of summer energy poverty among vulnerable households. It has been running for three years in select cities across Spain, Italy, Greece and Bulgaria. Core elements of this Horizon 2020 project include raising awareness, capacity building and interventions to promote behaviour change. The project targets vulnerable households.

The project has made practical contributions by:

- exploring optimal housing use patterns in the hot season;
- developing strategies to optimise energy bills and access to social tariffs;
- developing and distributing low-cost solutions to reduce indoor overheating and to increase thermal comfort;
- implementing a range of outdoor interventions to mitigate the urban heat island and cool surrounding urban areas.

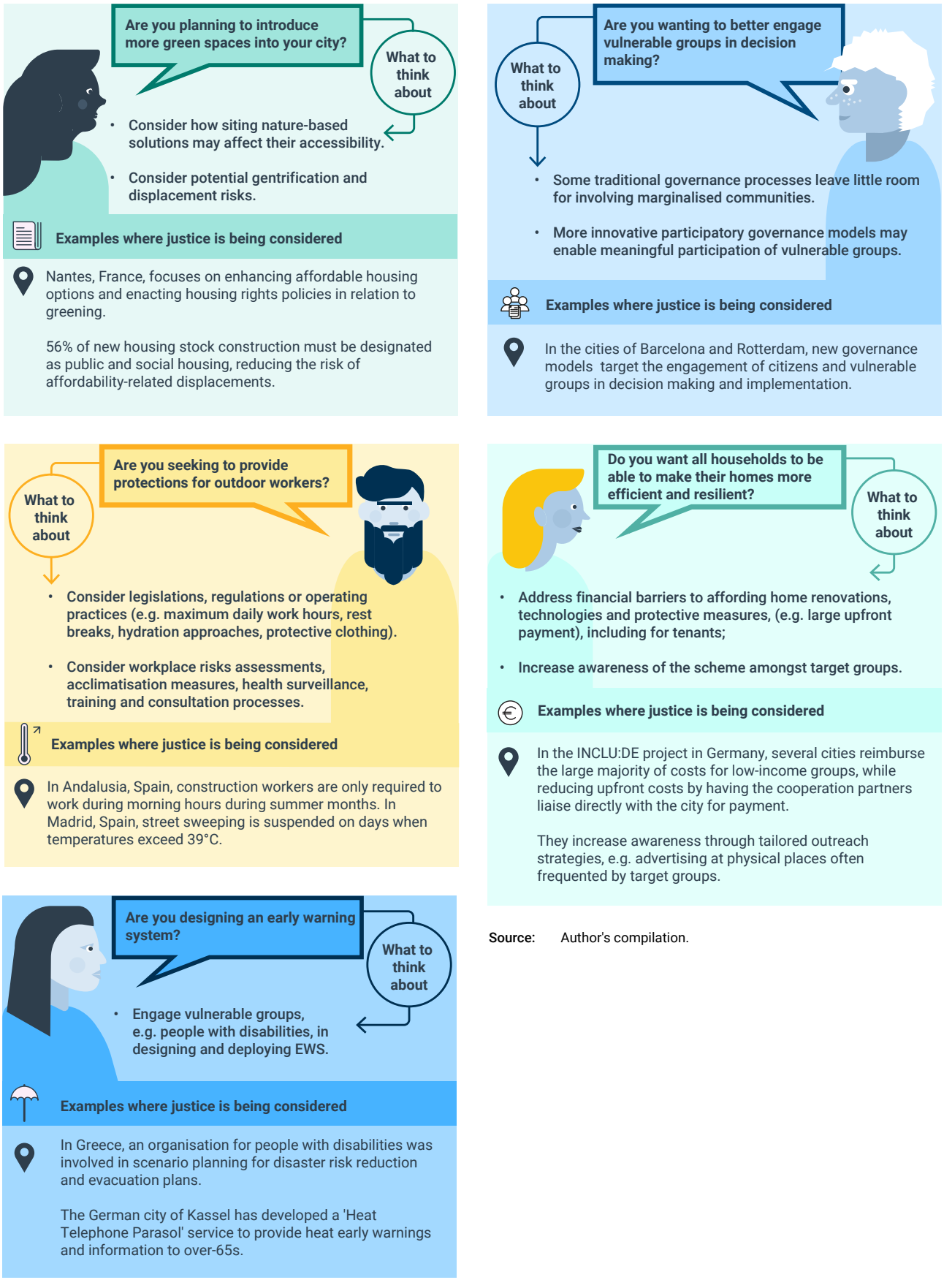
CooltoRise outdoor intervention and schoolyard cooling.
Source: © Carmen Sánchez-Guevara.

As part of the project, energy poverty agents have been trained and supported to work directly with energy-poor households. CooltoRise has also been focusing on addressing responsibilities, such as childcare or care for the elderly, which limit the participation of women in programmed actions. Additionally, it has developed an approach for a summer heat early-warning alert system within a community in Madrid, engaging vulnerable stakeholders in the process to ensure the system is accessible to community members with different needs.

Activity process guidelines, workshop presentations, activity materials and lessons learned have all been made available within the project's highly interactive final report, in order to encourage others to replicate the project solutions.

4.3.10 Pointers for addressing justice in adaptation responses in the built environment

Figure 4.2 Examples of just adaptation considerations in the built environment



Source: Author's compilation.

5 (In)Justice in adaptation responses in the agriculture and food system

Key messages

- The agriculture and food system is highly vulnerable to climate-related hazards, with significant implications for the livelihoods of agricultural workers and food security. Small-scale farmers and agricultural workers, particularly migrant labourers, are disproportionately affected by climate-related hazards such as droughts, floods and heatwaves.
- Lower-income consumers also feel the burden of the increased costs of food production that are passed along the entire food production chain; this will reduce their access to affordable sufficient, safe, nutritious, culturally appropriate food. In Europe, around 7% of the population is currently moderately-to-severely food insecure, with evident differences between countries.
- Injustice in this system is evident in the unequal distribution of adaptation measures, which often favour larger and more affluent agricultural enterprises. Both planned and autonomous adaptation measures are required to achieve just resilience. They must address the unique needs of different agricultural enterprises and workers. They may include implementing protections for agricultural workers and ensuring that financial transfers and insurance mechanisms — that have in the past contributed to growing inequities between farming enterprises — are designed differently, with justice in mind.
- Different farming and digitalisation technologies and the use of sustainable agricultural practices can reduce unequal burdens when designed to meet the needs of vulnerable farmers. However, upfront consideration of adoption affordability, access to knowledge and technical support and reliable fundamental infrastructure such as internet services are all essential to ensuring that these tools promote just adaptation.

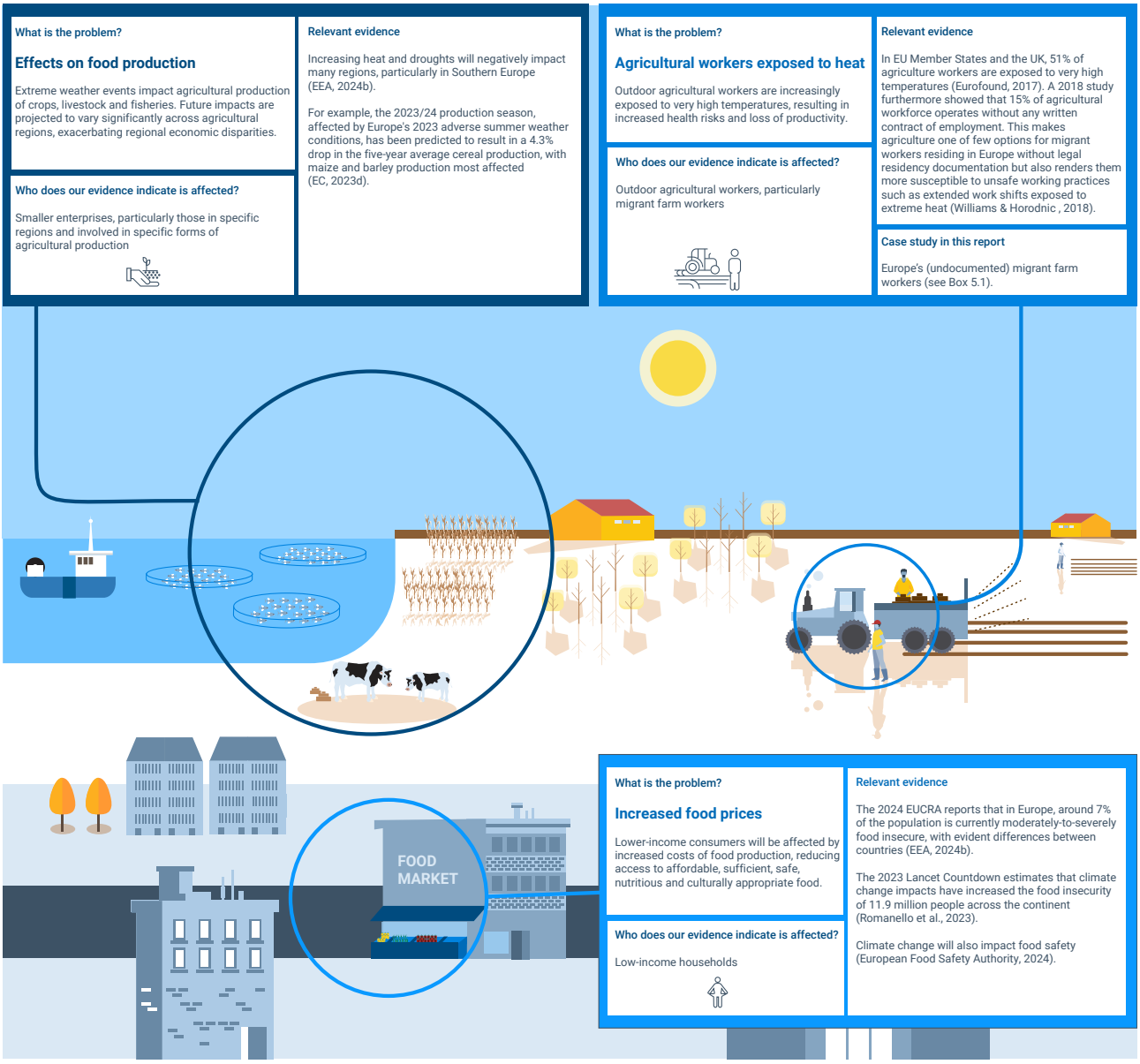
5.1 Introduction

Europe's changing and increasingly extreme weather is having differential impacts on what types of food can be produced and on how, where and how efficiently food can be produced and subsequently processed, distributed and consumed. This chapter focuses on agricultural food production, distribution and consumption to highlight some of the injustices that may be experienced by certain individuals or groups as a result of adaptation responses. It also considers how such injustices could be avoided.

Consistent with the scope of the EUCRA food production and security theme (EEA, 2024b), this chapter explores social injustices in line with the well-accepted food-security framing. Food security is defined as a situation when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2008). This chapter explores the justice aspects of four original and two more recently FAO-proposed dimensions of food security identified within this definition, namely availability, access, stability, utilisation, agency and sustainability (JRC (EC), 2023).

5.2 How does injustice manifest within the agriculture and food system?

Figure 5.1 How injustice manifests within the agriculture and food system



Source: Author's own production.

Box 5.1

Case study: Europe's migrant farm workers

The physical and mental health of particular individuals and groups within the agricultural ecosystem are most acutely exposed to the impacts of climate change, affecting their capacity to undertake dignified and prosperous work. Exposure to extreme heat is particularly topical, especially for these groups, with the number of heatwave days expected to increase everywhere but most markedly in southern Europe (Devot et al., 2023).

Europe's migrant farm workers are particularly impacted by this health risk. Work practices without any written employment contract are more likely to take place in the agricultural sector than other sectors because it has a higher proportion of self-employed, family-member, part-time, seasonal and migrant workers (Eurofound, 2016). According to a 2018 study, 15% of all agricultural workforce members operate without any written contract of employment, compared to 5% of workers across the whole economy (Williams and Horodnic, 2018). This makes agriculture one of the few options for undocumented migrant workers residing within Europe. Being employed outside established legal employment and occupational safety frameworks increases their exposure and vulnerability to unsafe work practices, such as extended work shifts in extreme heat.

5.3 How might injustice manifest within adaptation approaches used in the agriculture and food system – and how to address it

5.3.1 Supporting planned and autonomous adaptation in agricultural production

As indicated at the start of the chapter, climate change is having an impact on what forms of agricultural production will remain profitable and which new ones may soon become viable in different parts of Europe. For example, suitable cropland around the Baltic Sea could more than double by 2100, from 32% of land area today to about 76%, with certain crops now common to southern Europe taking root further north (EEA, 2019). However, such 'windfalls' are negatively offset in other parts of Europe, particularly the south.

This is giving rise to conversations at both the government and farmer level around how to manage these shifts in agricultural production; the need for agricultural relocation is even being considered. Adaptations which are already emerging from altered agricultural production patterns are the result of both autonomous as well as planned actions.

Planned adaptation requires conscious policy options or strategies to be implemented and these can alter the adaptive capacities of the whole agricultural system. Examples include deliberately selecting particular crops and distributing them across different agroclimatic zones or substituting new crops for old ones.

In contrast, the Food and Agriculture Organization of the United Nations (FAO) describes autonomous adaptation as adaptations by individuals working within a given sector. One example would be a farmer reacting to changing precipitation patterns by planting different crops or using different harvest and planting/sowing dates (FAO, 2007).

What injustices might emerge out of the implementation of planned and autonomous adaptation measures?

If left unmanaged, there is a risk that the process of change will exacerbate injustices in an already unequal agricultural production system where the income gaps between the biggest and smallest farms in Europe are reported to have doubled in the past 15 years (Niranjan, 2024).

Planned adaptation response measures must be built on an understanding of whether they will be acceptable to and feasible for farming enterprises and their communities, particularly for those with fewer resources to invest in altering production patterns. Agricultural knowledge and ways of doing things, particularly on smaller family farms, have often been handed down from generation to generation and this may mean that potential reluctance to change is also be connected to identity, history, legacy and specific knowledge systems that may not be transferred easily to new forms of production.

Completely unmanaged autonomous, uncoordinated adaptation measures also involve justice-related risks. Autonomous efforts, which are not linked to a broader approach, could result in failures leading to greater socio-economic disparities.

What approaches should be considered to make planned and autonomous adaptation measures more just?

It is hard to measure the extent to which planned or autonomous adaptation is taking place in the European agriculture sector; however, some shifts can be observed (Kuebler, 2020). In one example, farmers in the northern German state of Lower Saxony are responding to an average temperature increase of nearly 2°C over the past few decades by cultivating fruits typically found further south, such as apricots and nectarines. Similarly, places like Denmark and Sweden are increasingly cultivating grapes for wine production. New crops such as pistachios are also being tested in Spain, although experimenting with different varieties of existing crops that could withstand new growing conditions currently remains a higher priority (Kuebler, 2020).

Where there is sufficient capacity for autonomous shifts to take place, they should be supported to avoid maladaptation. Maladaptation can occur when:

- shifts are implemented based only on partial information;
- there is a lack of support from social networks;
- there is insufficient communication between actors (Tuihedur Rahman et al., 2021).

Case-by-case and regionalised/localised adaptations with a tailored design need to be part of a closely evaluated larger-scale transformative strategy. This must ensure that farmers' incomes remain viable, based on sustainable yields that respond to realistic new market demands. Simultaneously the overarching strategy must safeguard social sustainability and the ability of the next generation to undertake profitable farming, allowing farmers to remain in their fields and rural areas.

There must be supportive measures available for those with fewer means to make these shifts on their own, ensuring that no individual farming enterprise, community or region is left behind in these transformations. In their peer reviewed research publication, Tuihedur Rahman et al. conclude that 'to maintain a fertile climate for autonomous innovation, some planned interventions may be required for changing

local socio-political processes to ensure equitable power, knowledge and resource distribution' (2021, p. 2). The common agricultural policy (CAP) also has a key role to play in supporting farmers to undertake appropriate production shifts. For example, the *Approved 28 CAP strategic plans (2023-2027)* provides an example of how Greece is supporting farmers to shift production to drought-resilient crops, such as quinoa.

Box 5.2

Case study: autonomous adaptation in Zeeland, the Netherlands

An example of autonomous adaptation has been documented in Zeeland, the Netherlands (Van Tilburg and Hudson, 2022). In the context of the recurrence and increased severity of extreme weather and climate events, one third of farmers have autonomously stopped cultivating potatoes and onions, replacing these crops with more wheat. Complementary activities have included changing patterns of fertiliser usage and implementing reduced tillage as a strategy to conserve water in soils. The most revealing detail in the Zeeland study is that the upfront cost of implementing adaptation solutions has been the key factor in farmers selecting such practices to date.

5.3.2 Protections for agriculture workers

As discussed in Chapter 4 on the built environment, there is an increasing focus on protecting the health and safety of workers exposed to extreme temperatures. Given that most agricultural work is undertaken outdoors, the issue of worker protections is very pertinent to the agriculture and food system. This is particularly the case in the context of certain system-specific characteristics including the high prevalence of migrant workers and the fact that the average age of workers in agriculture is higher than for other sectors.

What injustices might emerge out of the implementation of protections for agriculture workers?

There is currently no legally binding legislation at the EU level to protect workers from extreme heat and only a few Member States have developed plans that specifically protect workers from heat events (EEA, 2024b). Moreover, the issue is further complicated within the agriculture and food system. As mentioned in Box 5.1, this is because work practices without any written employment contract are more of a feature in the agriculture sector than other sectors due to a higher proportion of self-employed, family-member, part-time, seasonal and migrant workers (Eurofound, 2016). For the large number of undocumented migrants employed in agriculture, existing outside established legal employment frameworks means that they face increased exposure and vulnerability to unsafe work practices. Even where protections exist for the broader category of agricultural workers, there is no guarantee that Europe's undocumented migrant workforce can access them.

The sector's demographic characteristics result in another potential injustice where protections are not designed with sufficient regard for these demographics. As mentioned above, Europe's farming population is of relatively advanced age, with a third of workers aged over 65 (European Agency for Safety and Health at Work, 2020). Their age increases their vulnerability to heat stress, including heat-related kidney diseases (Lager et al., 2023).

What approaches should be considered to make protections for agriculture workers more just?

There is little evidence that existing protections specifically target undocumented migrant farm workers, with the much bigger issue of undocumented migration requiring solutions that go beyond the scope of this report. That said, the introduction of regulations, ordinances and protections for the broader category of outdoor workers, particularly in European regions with large numbers of agricultural workers, has the potential to improve conditions for all.

The EESC exploratory opinion on 'Fostering sustainable and resilient food systems at times of growing crises' calls on the EU to guarantee the fundamental rights of all food-chain workers (in production, processing and distribution). It recognises that the working conditions, social protection systems and the health and safety of workers in the agriculture and food sector are somewhat weak, especially when it comes to seasonal workers. Fortunately, there are examples of regional and local authorities increasingly leading efforts to change this situation, often in collaboration with trade unions. Box 5.3 gives case studies from Apulia and Calabria as examples.

Box 5.3

Case study: safeguarding agricultural workers from extreme heat in southern Italy

In response to an increasing number of health-related work injuries due to extreme heat, in June 2021, the regional government of Apulia, Italy issued an ordinance to prohibit outdoor work in the agricultural sector between 12.30 and 16.00 on 'high-risk' days. The initial ordinance was in force for a year and then extended to the subsequent year; it applies to all days that are forecast to be 'high risk' and for 'intense physical activity' according to the warnings issued by WORKLIMATE (Climate-ADAPT, 2022).

While the labour unions were not actively involved in the process leading to the ordinance, La Confederazione Generale Italiana del Lavoro, one of the largest labour unions in Italy, has endorsed it. Additionally, at the request of La Confederazione Generale Italiana del Lavoro and two other major labour unions, Confederazione Italiana Sindacati Lavoratori and Unione Italiana del Lavoro , the nearby southern region of Calabria also passed a similar ordinance in July 2022; it aims to safeguard the health of workers, especially those performing outdoor and particularly strenuous activities in extremely high temperatures. The ordinance prohibits work under conditions of prolonged exposure to the sun, from 12.30 to 16.00 in industries such as agriculture, floriculture and construction.

5.3.3 Financing instruments under the common agricultural policy

The EU's CAP 2023-2027 is an important financial transfer mechanism designed to support regions and farmers and ensure no one is left behind. Launched in 1962, the CAP is a partnership between agriculture and society, and between Europe and its farmers. Its primary aim is to support farmers and improve agricultural productivity, ensuring a stable supply of affordable food (EC, 2024a). It also aims to maintain a vibrant rural economy by promoting jobs in farming, agriculture and food industries and associated sectors.

The CAP is a common policy for all EU countries but Member States tailor the tools and instruments to their own needs and priorities in their CAP Strategic Plans (CSPs). The European Agricultural Fund for Rural Development (EAFRD) provides the CAP's contribution (EU funds) to the sustainable development of rural areas. Under the

CSPs, the interventions are co-financed by the EAFRD and the national budgets of EU Member States.

The CAP also aims to help tackle climate change and to support the sustainable management of natural resources. As such it is an important source of funding facilitating the agriculture sector's adoption of much needed adaptation approaches.

What injustices might emerge out of the implementation of financing instruments?

Policy and adaptation planning in European agriculture have often been criticised for favouring the preservation of the status quo over more transformational adaptations that are increasingly demanded by climate change. These transformational adaptations will likely require agricultural and food system to be restructured significantly (Lager et al., 2023).

The existing power inequalities between large agricultural businesses and small- and medium-scale farmers contribute to some of this inertia, with smaller-scale farmers having much less influence on decision-making. An example of this disparity can be seen in the way the so-called farm income payment subsidy has been established. It is the CAP instrument that accounts for the highest share of the CAP budget and is still largely area-based. As a result, the distribution of payments reflects the same pattern as is found in agricultural land distribution; in other words, 20% of beneficiaries receive 78% of all farm payments (European Parliament, 2022).

What approaches should be considered to make financing instruments more just?

A 2024 EESC opinion tackles the urgent need for structural transformation of the EU's food system. It states that it is crucial to address the inequities within the CAP to secure a just transition, ensuring that all Member States receive equitable support to create a level playing field in the EU's agricultural sector.

This coincides with changes to the financial distribution under the CAP to improve equity, as well as an increased share of the funding to be directed towards climate resilient investments. The CAP 2023-2027 (R2021/2115, Article 29) requires Member States to provide complementary redistributive income support for sustainability (CRISS) to ensure that direct payments are redistributed from larger to smaller or medium-sized holdings in the form of an annual payment per eligible hectare to farmers.

Additional forward-looking developments have emerged out of the 2024 consultative process on the future of EU agriculture. Convened by the EC president Ursula von der Leyen, it involved farmers, retailers and environmentalists. Other steps towards greater justice within the CAP pre-date this process. A 2021 EC assessment of 2014-2020 CAP performance indicated that around half of all beneficiaries were small farms of under 5 hectares. It also showed an 18% increase in payments per hectare to smaller farmers compared to the 2011-2013 period (EU, 2021b).

The European Parliamentary report also regards the post-2022 deal as providing greater flexibility to Member States to better direct CAP resources. It notes, 'While the boost to the CAP's green ambitions concerns all farms, the fairer distribution of CAP payments primarily targets small and medium-sized farms' (European Parliament, 2022, p. 10).

The new EU CAP 2023-2027 includes adaptation to climate change in its policy framework. As a part of the CAP process, EU Member States submitted their new CAP strategic plans by December 2021. In these they were asked to draw a clear link between how they intended to implement the CAP-related and CAP-funded instruments and how that would contribute to European goals such as climate change.

This is a context in which EU Member States are required to meet specific spending requirements and performance standards related to environment and climate. It is necessary to monitor the degree to which the vulnerability of particular groups of farmers is reduced by implementation of the measures detailed in this section.

Box 5.4

Case study: the area-specific disadvantages intervention in Aragón, Spain

To address the issue of flooding, Spain's CSP promotes the area-specific disadvantages intervention for the region of Aragón (Devot et al., 2023). It compensates farmers for mandatory requirements stemming from the implementation of the Water Framework Directive (WFD). This is achieved through grant payments to farmers who are affected by flood adjustment measures, i.e. those who have had to shift to cultivation of crops which are compatible with periodic river flooding.

5.3.4 Insurance

With increasingly erratic weather threatening agricultural production and placing the profitability of agricultural enterprise at risk, insurance solutions are becoming ever more important risk management tools across Europe. This section refers to insurance measures designed to reduce or mitigate crop or production risks faced by agricultural enterprises due to extreme weather events.

What injustices might emerge out of the implementation of insurance-related measures?

Injustices in insurance-related measures relate to the large variance in the types of insurance products available across Europe. This often results in their uptake varying significantly by country. This varied uptake is also heavily influenced by factors such as levels of government-subsidisation and the extent to which insurance covers multiple perils and multiple crops (Dismukes et al., 2017).

For example, in 2018 only 60,000 farms or 8.7% of Italy's insurable agricultural area was insured (Koenig et al., 2022). In Spain, in the same year, 78% of fruit crops, 46% of vegetable crops and more than 75% of winter cereal crops were insured (Koenig et al., 2022). In Austria, France, Germany, Italy, Spain and Switzerland, insurance solutions are available to farmers for crops and horticulture for the most economically relevant weather risks. However, gaps remain, for example an underrepresentation of insurance products addressing drought and heat risks. Indemnity insurance (where pay-outs are based on assessed losses) is the most frequent type of insurance but there is also an increasing number of weather index insurance products (where pay-outs depend on the realisation of an index, such as cumulative precipitation) (Bucheli et al., 2023).

What approaches should be considered to make insurance-related measures more just?

Ensuring that insurance products are accessible to all is critical for this adaptation approach to contribute to reducing inequitable burdens for particular groups of people. The cost of insurance and/or the perceived cost/benefit ratio sit at the heart of this issue, with related considerations such as the timeliness of pay-outs also impacting individual decision-making.

Acknowledging these challenges, the EESC exploratory opinion on 'Fostering sustainable and resilient food systems at times of growing crises' proposes an EU-wide system of public insurance against natural disasters with a high level of public investment. However, focusing on supports that already exist, the risk management toolbox of the CAP authorises public support for different tools including insurance, mutual funds and income stabilisation tools.

The case studies in Box 5.5 describe how Spain and France invest significant levels of public funding in their insurance programmes, resulting in high accessibility to insurance protection for their farmers. Partnerships with the private sector are also key features of the design of these programme. Both insurance mechanisms are supported by funding from Member States which is unrelated to CAP funds (Devot et al., 2023).

In other countries such as Germany and the Netherlands, agricultural insurance products are generally more limited to covering hail damage and plant disease. Mostly they operate without public subsidies, generally translating into lower farmer subscription levels (Dismukes et al., 2017).

Box 5.5

Case study: nationally subsidised state agricultural insurance schemes in Spain and France

Spain's Combined Agricultural Insurance System (SSAC) was established in 1978. Since then, it has been crucial for stabilising farmers' incomes in the face of unpredictable production risks including extreme weather, pests and diseases (Devot et al., 2023). SSAC provides coverage against numerous natural disasters including droughts, fires, floods and hailstorms. The insurance scheme offers subsidies on premiums to encourage farmer uptake of insurance. This is feasible due to collaboration between the government and private insurers.

An important part of SSAC is Agroseguro, a programme where insurance companies work together to set prices and manage subsidies efficiently. Spain has indicated that it intends to rely on SSAC until at least 2027 to help manage climate risks in line with agricultural policy guidelines. This includes ensuring fair compensation for losses and prioritising the protection of small farms. SSAC's widespread use across Spain helps to reduce risks from extreme weather, allowing government funds to focus on helping rural areas adapt to climate change.

In France, a reform to existing crop insurance laws came into effect on 1 January 2023. It establishes a new system based on national solidarity and risk sharing between the State, farmers and insurers (Tranchant, 2023). All farmers on mainland France have access to this scheme with is based on a new three-tier system:

- For Tier 1 low-intensity risks, the farmer takes responsibility.
- For Tier 2 medium-intensity risks, compensation is provided through the subsidised crop multi-risk climate insurance policy, if the farmer is subscribed.
- For Tier 3 risks of exceptional magnitude, national solidarity compensation ('indemnisation de solidarité nationale') is paid by the State and the insurer:
    - If the farmer is insured for crop losses, the State compensates 90% of Tier 3 and the remaining 10% is compensated by the insurer.
    - If the farmer is not insured for crop losses, the State compensates 45% of Tier 3, the rest being borne by the farmer (this rate applies to 2023 claims only).

For Tier 3, the national solidarity payments are triggered for losses of over 50% for field crops, vegetables and vineyards and for losses of over 30% for meadows, orchards and other specialised crops. The system foresees a progressive reduction in the compensation rate for uninsured farmers to incentivise insurance and to consolidate financing for insurance subsidies.

Some efforts also explore possible insurance protection mechanisms at subnational levels. For example, the EU-funded project Solutions and Technologies for Regions through Insurance for Climate Adaptation (SOTERIA) aims to promote insurance solutions to address the climate protection gap and safeguard organisations and businesses from the impacts of climate change in Europe.

SOTERIA's focal region, Bavaria, Germany, boasts the highest number of farmers and the largest agricultural area within Germany but the region is also prone to climate risks that include drought, heatwaves, spring frost and heavy rain/hail. Sustainable insurance solutions are therefore seen as critical. Currently, however, the insurance products that are available are deemed by farmers to be cost prohibitive and insufficient. SOTERIA is therefore working with stakeholders to reach consensus on key climate risks, calculating future risk, defining risk-sharing agreements, identifying applicable insurance solutions and testing their implementation.

5.3.5 Digitalisation, early warning systems and other new technologies

New technologies to support agriculture sector workers to make good decisions will play an increasingly important role in supporting the viability of farming livelihoods. One example of this is the Internet of Things which can increase farmers' monitoring capacity, efficiency and help them to produce higher-quality products. Likewise, robotics and precision agriculture can help in collecting data, advise on optimal chemical and water use and help in the selection of plants with better traits. Equally, artificial intelligence (AI) can support yield predictions, disease and weed detection, water and soil management. Likewise, big data can improve overall farm production practices and guide supply chain efficiencies.

EWSs are also a highly cost-effective approach to supporting adaptation (World Intellectual Property Organization., 2022). Remote sensing data, such as that derived from satellite imagery, is allowing agricultural decision-makers to better understand climate events and how best to respond to them. They support longer-term understanding of climate patterns and this supports more reliable predictions about climate-related changes such as flooding patterns, expected rainfall, the length of growing seasons and other critical considerations for those making a living from agriculture.

This, combined with more real-time monitoring technologies and crowd-sourced data can support earlier and faster responses to climate-related threats. AI and machine learning are also increasingly being used within EWSs. These new technologies have been shown to improve nowcasting and short-term predictions, giving those receiving the warning more time to react (World Economic Forum, 2023).

What injustices might emerge out of the implementation of digitalisation and the use of technologies?

The degree to which technological solutions and EWSs play a role in reducing injustices related to climate change adaptation within the European food system will depend on how accessible they are to the diverse system actors. The concept of accessibility here refers to the perceived affordability of technologies as well as the degree to which different individuals have the technical capacity to use them. Technological approaches will only be good investments if they increase the profitability of agricultural enterprises by lowering the cost of production, increasing productivity, increasing the value of products at market and/or reducing the damage incurred because of extreme weather events.

The EC sees the digitalisation of the European agricultural sector as a game changer, with the potential to revolutionise the industry, promoting efficiency, sustainability and competitiveness (EC, 2024g). However, it also recognises challenges, a notable one being the potential of digitalisation to create a gap between those with and without access to these technologies, with particular risks for less connected farms. Reliable internet services are essential for digitalisation, yet only 30% of people living in rural or remote areas had access to full-fibre connectivity by September 2021, in comparison to a figure of almost 50% across all households (FTTH Council Europe, 2022).

The adoption of Precision Agriculture (PA) provides a good illustration of how digitalisation may inadvertently exacerbate divides. PA is an umbrella term for using modern data-driven technologies to help grow crops. It is expected to play an important role in supporting agricultural decision-making going forward. However, currently only around 25% of farmers in the EU are estimated to be using PA technologies (Petrović et al., 2024).

Looking into regional differences, 'the wide diversity of application of PA agriculture in central EU countries, especially in terms of the high investment costs for digitization technologies, the lack of knowledge, and the uncertainty of farmers about a clear definition of precision agriculture, poses a challenge for European policy (Petrović et al., 2024, p. 7). Numerous studies also show a positive correlation between the size of a farm enterprise and its profitability, and the adoption of PA (Barnes et al., 2019; Gabriel and Gandorfer, 2023; Tamirat et al., 2018). Many smaller, less profitable farms are already being left behind.

What approaches should be considered to make digitalisation and the use of technologies more just?

To minimise the growth of this potential chasm, the EC acknowledges the need for all players within this digital ecosystem to support agricultural sector workers with training, resources and incentives to adopt new technologies. An EU foresight exercise was undertaken in 2023 on the long-term implications of the digital transition for farmers and rural areas. It included considerations about the possible exacerbation of existing divides (Barabanova and Krzysztofowicz, 2023).

A systematic study from 2023 investigated how precision farming could work on smaller farms. It found references in the literature to a range of solutions including:

- joint/collective actions, zone delineation/field boundary detection;
- low-cost technology, common machinery usage;
- education, (common) knowledge, use of standards, simple and user-friendly technology;
- professional support for vendors, advisors, agricultural contractor services;
- policy-initiated investments and adequate regulations (Mizik, 2023).

The study also found that lower cost, modular technologies can help to accelerate the uptake of PA.

EWSs, whether targeting early responses in the agricultural sector or in the water, built environment or energy and transport sectors, must be designed to ensure that everyone, regardless of their background or abilities, can receive timely and comprehensible alerts prior to and during disasters. Such systems should address the unique needs of diverse groups, including marginalised communities, older people, people with disabilities and migrant populations. To serve these groups, design characteristics must include (World Bank, 2023):

- *Clear and Timely Warnings* meaning that alerts should be easy to understand and reach everyone promptly;
- *Accessibility* meaning that systems must consider language diversity, literacy levels and communication channels;
- *Customisation* meaning that alerts must be tailored to specific needs (e.g. sign language videos, braille messages);
- *Community Engagement* meaning that local communities must be involved in designing and implementing EWSs;
- *Technology* meaning that mobile phones, radio and other accessible platforms must be leveraged.

Box 5.6

Case study: an AI agronomic advisory platform for Croatian municipalities

In Croatia's predominantly small and medium-sized agricultural sector, the digitalisation rate of farming is only 5% (AGRIVI, 2024). The Croatian cities of Kutina, Novska, Djakovo and Ludbreg have recognised that a critical first step towards increasing farmers' access to such technologies is to provide them with easy-to-access advice and knowledge. In order to achieve this, they have introduced an innovative AI agronomic advisory platform called 'Local Advisor'. It is free to use and accessible via the readily-used WhatsApp application. It acts as a direct communication channel for farmers, no matter the size of their farm. It allows them to consult, share knowledge and information and engage directly with experts and the city. The platform supports farmers to improve productivity while also achieving sustainability by providing information on topics ranging from general agricultural to pest control, disease prevention, plant nutrition, fertilisation and regenerative practices.

Box 5.7

Case study: Worklimate 2.0, Apulia

In addition to EWSs that support agricultural production decisions, EWSs are now also being developed to better protect agricultural workers exposed to increasingly extreme and prolonged heat. The Worklimate 2.0 project (2023-2025) is developing an integrated weather, climatic and epidemiological heat health warning system in the agriculture sector in Apulia, southern Italy, thus protecting outdoor agricultural workers from extreme heat.

5.3.6 Nature-based and ecosystems approaches

The use of nature-based and ecosystem solutions can play an important role in reinforcing or restoring the integrity of agricultural or coastal/marine ecosystems upon which food production relies. The Institute for European Environmental Policy's 2024 report discusses how sustainable or regenerative cropping practices offer a wide range of different solutions. It highlights crop rotations, intercropping, agroforestry, no-tillage, mulching and cover crops as some of the options (van Dijk et al., 2024).

Another potential NbS is urban agriculture. The 2024 EEA urban adaptation report highlights the role of urban agriculture in enhancing food security in Europe's urban centres (EEA, 2024h).

What injustices might emerge out of the implementation of nature-based and ecosystem measures?

There are barriers to the adoption of nature-based and ecosystem measures. These include the need to invest in new machinery or equipment for certain practices such as intercropping or no-tillage, the potentially increased labour costs associated with agroforestry and the need to build farmer knowledge and capacity around how to implement these practices (van Dijk et al., 2024). Such barriers to access can create new or exacerbate existing injustices in terms of who is able to benefit from such practices.

An expansion of urban agriculture could also lead to negative outcomes for vulnerable community members. A 2021 European Parliament brief on the topic of

urban agriculture indicates that currently most urban farming projects require a large area of land and are located on the outskirts of cities, in former industrial zones or abandoned warehouses. Driven mainly by housing needs, the gentrification of such spaces could lead to land-use conflicts between urban farms and inhabitants, with lower-income citizens most vulnerable and at greater risk of being displaced (European Parliament, 2021). Additionally, urban agriculture could also expose people to heavy metals and other soil contaminants, with studie s revealing instances of produce grown in urban environments containing higher concentrations of several metals compared to their supermarket equivalents (Augustsson et al., 2023).

What approaches should be considered to make nature-based and ecosystem measures more just?

Growing food in an urban setting offers the opportunity for diversified and decentralised food production while reducing people's vulnerability to climate-related food production disruptions in rural areas. Urban agriculture can, in some situations, be as productive or more so than rural agriculture for a range of crops (Payen et al., 2022). It also has the potential to provide cities with significant amounts of food.

The city of Berlin estimates that urban agriculture could supply up to 80% of the city's fresh vegetable demand (Ruggeri et al., 2024). Miccoli et al.'s study also indicates that urban agriculture can provide the poorest families in particular with access to fresh food (2016). Importantly, the study highlights that urban agriculture can also improve the mental health of these individuals since it can reassure them about ongoing access to household food supplies and help them gain a new skill.

The benefits of urban agriculture for more vulnerable community members go beyond food production, however. Urban agriculture also increases the amount of green space in cities, often in former industrial zones or peripheral communities.

Additionally, participating in these kinds of initiatives can bring individuals and communities together in creative and collective processes, contributing to the creation of more inclusive, connected and socially cohesive communities (Orsini et al., 2020). Higher levels of community resilience have been statistically associated with higher levels of social cohesion (Patel and Gleason, 2018; Townshend et al., 2015). For example, 3,200 community plots have been developed under the FUSILLI project in Rome, Italy and these are important gathering points for social engagement with vulnerable members of the community including older people, people with disabilities and/or those facing issues with social integration (EEA, 2024h).

5.3.7 Systems and structures to safeguard access to food

Actors in public, private and charitable sectors across Europe have solid track records of providing different forms of social infrastructure to ensure that vulnerable population groups have access to regular supplies of nutritious food. However, the need for such services is increasing since climate change is impacting on the reliability of food chains and relatedly on food prices. The 2023 Lancet Countdown estimates that impacts related to climate change have exacerbated the food insecurity of 11.9 million people across the continent (Romanello et al., 2023).

There are a number of commonly found examples of social services designed to support direct and immediate access to food for community members experiencing short-term or chronic food insecurity. These include pre-paid credit cards for food purchases, meal vouchers, food pantries, banks or hubs, social supermarkets, direct

food deliveries, vouchers for farmers' markets, community gardens and education programmes (Andriessen and van der Velde, 2024; Eurocities, 2021).

Additionally, these approaches are complemented by more systematic efforts often led by national or subnational governments, in partnership with civil society organisations. Examples include the development of Right to Food frameworks or legislation and ambitious efforts to transition towards more sustainable food systems (Rocha Dias et al., 2022).

What injustices might emerge out of the implementation of food safeguarding measures?

Injustices in implementing food safeguarding measures can manifest in how such measures make the users of the services feel. For example, numerous studies show that pre-arranged food parcels handed out by foodbanks can prompt feelings of shame and humiliation among those receiving the service (Andriessen and van der Velde, 2024).

The distribution of foodbanks can also result in injustice if their locations mean that those in most need are not able to reach them.

What approaches should be considered to make food safeguarding measures more just?

Systematic approaches to addressing food insecurity are being deployed at the national and subnational levels. For example, the Belgian capital of Brussels takes a holistic approach to this challenge, creating a strong link between access to nutritional, culturally relevant and affordable food and climate change. Food and urban agriculture is an important pillar of its climate action plan which aims to achieve carbon neutrality by 2050 and adapt its territory to the effects of climate change.

The concept of justice strongly underpins its approach. The plan notes the importance of ensuring that transformation of the city's food system is accessible to all, namely through affordable prices for consumers, establishing solidarity-based food distribution channels and fair remuneration for producers.

Its work is also designed to build critical social connections between neighbours and neighbourhoods. The resulting social cohesion makes an important contribution to personal and community resilience (EEA, 2024h). Its actions include:

- producing the municipality's own fruit and vegetables for the external site 'Cuisines Bruxelloises' on public land;
- supporting the development of vegetable gardens and orchards in green spaces in the city;
- encouraging neighbourhood kitchens (see Box 5.8) and cooperative supermarkets;
- offering training and logistical assistance to support urban agricultural projects.

Box 5.8

Case study: Brussels' Cuisines de Quartier

Inspired by the Quebec 'Réseau des Cuisines collectives', Cuisines de Quartiers (Neighbourhood Kitchens) are a critical element of Brussels' efforts to realise a fair, sustainable and healthy food system. The expertise and facilities of the neighbourhood kitchens are available for use by self-organised groups of community members who define for themselves how to use the spaces. They may use them to prepare low-cost meals, process unsold produce, preserve seasonal vegetables, provide support for a local market gardener or make snacks for children.

The movement's primary objective is to boost food autonomy and access to quality food for all. In realising this objective, it also facilitates the development of a positive dynamic around food production at the neighbourhood level. Social ties are strengthened and social cohesion built by creating an environment where neighbours can cook together.

A Cuisines de Quartier shared kitchen, Brussels, Belgium.
Source: © Cuisines de Quartier asbl.

The way services are provided at the service or initiative level has been shown to have a strong impact on the extent to which service users maintain a sense of self-dignity. A few examples of good practice include (Andriessen and van der Velde, 2024):

- shifting the service away from the more traditional food bank model to something more like a social grocery store model;
- removing the need for service users to demonstrate their 'eligibility' to access the services through having to disclose their financial circumstances;
- reviewing the forms of interaction and exchange between service users and service providers;
- building in opportunities for reciprocity; this can be achieved through exchange of goods or through the chance to volunteer; it can dramatically impact a service users' sense of self-worth and also build solidarity and community;
- ensuring the food provided is appropriate in terms of culture, religion, nutritional value and preference.

In Finland, the Just Food Transition project is an example of an approach to ensuring food security and access to sustainable food products. It focuses on reducing greenhouse gas emissions from food production and provides policy recommendations on how to make the transition to more sustainable food production more just.

5.3.8 Acknowledging the rights and stewardship over land of indigenous peoples ([23])

Indigenous societies generally have strong ties to the land. This, combined with growing pressures due to climate change, has generated an interest in studying their adaptive capacity and levels of vulnerability (Brännlund and Axelsson, 2011). One such indigenous group is the Sámi people, whose traditional lands encompass much of what is now northern Norway, Sweden, Finland and Russia's Kola Peninsula. Historically, their semi-nomadic traditional practice of reindeer herding has been characterised by a high level of resilience to changes resulting from both human and environmental factors (Rosqvist et al., 2022). One key approach has been their flexible use of pasture areas by moving their reindeer herds when necessary (Brännlund and Axelsson, 2011).

What injustices might emerge out of the acknowledging the rights and stewardship of the Sámi people?

The Sámi people have a unique relationship with their environment, distinct from the dominant approaches found in other parts of Europe. However, their cultural perspectives and traditional adaptive practices are not adequately integrated into the design, selection and implementation of climate adaptation measures.

This injustice stems from the failure to acknowledge pluralistic perspectives on climate adaptation. Of particular relevance to this report is how national administrative borders and historically siloed governance approaches have shaped adaptation processes that oversee Sámi culture, the specific climate challenges affecting reindeer herding and the Sámi people's right to maintain their cultural identity (IPCC, 2022b).

What approaches should be considered to ensure that the rights and stewardship of the Sámi people are acknowledged more justly?

Some notable progress is being made towards greater recognition and inclusion of the Sámi people in decision-making at the national and subnational levels. Box 5.9 showcases the efforts currently being made to address these challenges. The approaches include the acknowledgement of historical injustices and more meaningful inclusion of the Sámi people in governance processes that intentionally take into account and benefit the Sámi people and positively impact their future ability to maintain their ways of life. This includes their ongoing practice of reindeer herding.

([23]) For the purpose of this report the evidence relates particularly to indigenous peoples in the context of agricultural practices; however, it should be noted that they may face injustices in other contexts as well, including the urban context.

Box 5.9

Recognitional and procedural justice for Sámi reindeer-herding people in Finland, Sweden and Norway

The distinct culture and way of life of the Sámi people is increasingly being recognised in the context of climate adaptation. Co-creating adaptation measures that align with their values, perspectives and needs is essential for safeguarding their traditional practices from the impacts of climate change. The Nordic countries have taken several initiatives to better integrate the Sámi into adaptation processes and decision-making. Some examples are given below:

- Finland has made legislative changes through the new Finnish Climate Act (423/2022), which established the Sámi Climate Council at the national level. This council ensures that indigenous priorities, needs, values and perspectives are included in adaptation processes. It functions as an expert body that must be consulted in climate adaptation decision-making.

- Sweden has created a dedicated national adaptation plan task force on the Sámi to ensure that they are included in adaptation processes. The Sámi Parliament of Sweden serves both as a government agency and an elected body representing the Sámi people, working to safeguard and promote Sámi rights, culture, livelihoods and languages. In 2019, the Sámi Parliament adopted a climate strategy which strengthens Sámi participation in climate adaptation decision-making. This is further supported by the 2022 Swedish Law, Consultation on Matters Concerning the Sámi People, which mandates engagement with Sámi communities on issues affecting them, including climate adaptation.

- Norway has supported the Sámi Council, a non-profit civil society organisation representing Sámi people across Finland, Sweden, Norway and Russia (distinct from the Sámi Climate Council). The Sámi Council has developed a climate change strategy, which promotes a coherent, Sámi-led approach to adaptation that strengthens and benefits Sámi communities, including reindeer-herding livelihoods (Saami Council and Sámi Parliament, 2023).

The Nordic governments have also supported several interdisciplinary research projects co-produced with Sámi communities, with two examples being:

- The CLIMINI research project (Finland) engaged Sámi reindeer-herding communities in Finland's Lapland, Northern Ostrobothnia and Kainuu regions, to produce knowledge on climate adaptation. It contributed to the 2022 national adaptation strategy and 2022 national adaptation plan by ensuring Sámi perspectives and vulnerabilities were recognised.

- Climate vulnerability assessments (Sweden), led by the Sámi Parliament of Sweden (Sametinget), KSA — klimatsårbarhetsanalys were piloted from 2019-2020 with funding from the Swedish Meteorological and Hydrological Institute and County Administrative Boards (Länsstyrelserna). They have played a key role in shaping adaptation efforts for reindeer husbandry (Löf et al., 2012).

5.3.9 *Pointers for addressing justice in adaptation responses in the agriculture and food system*

Figure 5.2 Examples of just adaptation considerations in the agriculture and food system

Source: Author's compilation.

6 (In)Justice in adaptation responses in the water system

Key messages

- Climate change is intensifying water stress across Europe with southern areas facing increasing water scarcity due to prolonged droughts. Meanwhile, increasingly heavy precipitation across all regions in Europe is leading to more frequent and more intense flood events. Water stress in Europe is significant, affecting 30% of European territory and 34% of the European population on average every year.
- Vulnerable communities, such as low-income households, the Roma and people living in remote locations, are particularly exposed to a range of resulting water-related injustices, mainly related to diminished access to and affordability of water services.
- Despite EU legislation requiring Members States to improve or maintain access to water intended for human consumption, in particular for vulnerable groups, numerous countries still lack measures that guarantee affordable access. That said, an increasing number of countries now explicitly consider affordability, access and reducing geographical disparities within their legislation and policies.
- Other measures being taken to reduce water-related injustices include:
    - increased use of green infrastructure to support stormwater management in recognition of the co-benefits that such solutions can provide for vulnerable community members if sited appropriately and with community engagement;
    - water-pricing support mechanisms that ensure that full cost recovery imperatives and water conservation goals that shape water tariff design do not ignore the needs and realities of low-income groups.
- Actions are required that incentivise or enable greater water efficiency to reduce water scarcity pressures and keep water services affordable for and accessible to all.

6.1 Introduction

This chapter examines how climate-related changes are impacting Europe's water system and the justice implications of the adaptation measures being implemented in response.

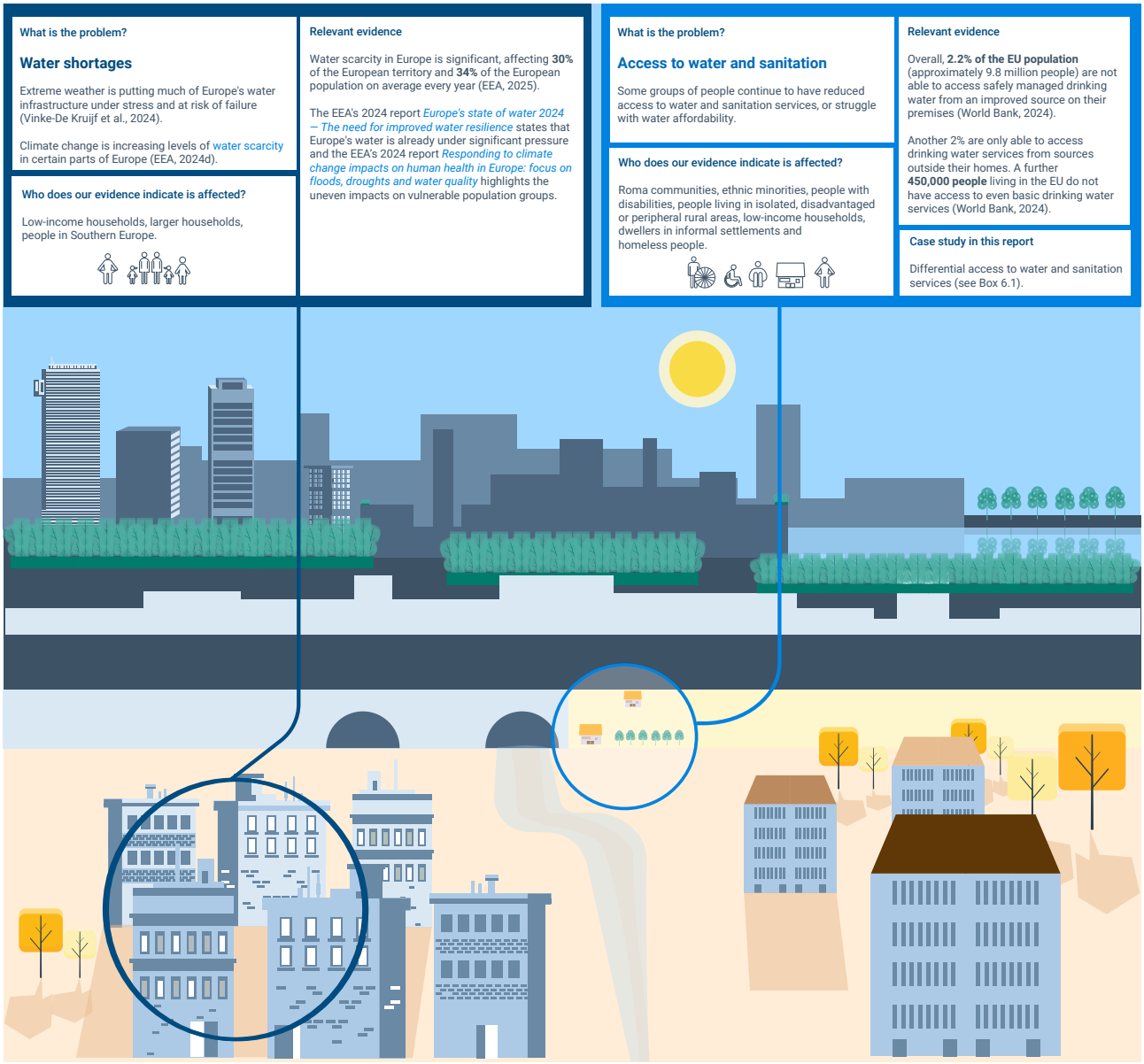
The term 'water system' refers to the interconnected natural and human-made structures, processes and resources that govern the movement, distribution, use and management of water (Hoff, 2009). Water-related topics are explored in depth in two

other 2024 EEA reports, namely *Europe's state of water 2024: the need for improved water resilience* and *Responding to climate change impacts on human health in Europe: focus on floods, droughts and water quality*.

As such, this chapter has a narrower focus, primarily investigating climate change impacts on and related adaptation responses to human and natural systems that are critical to the provision of sufficient, affordable and safe drinking water and sanitation services. Discussion of the impact of both flooding and heatwaves/drought on Europe's built environment and the agriculture sector can be found in the previous two chapters of this report.

6.2 How does injustice manifest within the water system?

Figure 6.1 How injustice manifests within the water system



Source: Author's compilation.

Box 6.1

Case study: differential access to water and sanitation services

Across Europe, the number of people without access to safely managed drinking water is relatively low; however, these numbers mask regional differences. For example, only 82% of Romanians and 89% of Polish have access to safely managed drinking water services compared to 100% in many EU countries including Malta, Cyprus and Denmark (World Bank, 2024).

There are also stark differences in access to water and sanitation across particular groups of Europeans. One third of Roma households do not have access to tap water and only just over half have indoor flushing toilets or showers (European Parliament, 2020; FRA, 2016).

6.3 How might injustice manifest within adaptation approaches used in the water system – and how to address it

This section identifies a list of adaptation responses that risk leading to maladaptive outcomes by shifting, exacerbating or creating new risks for groups which are already vulnerable. It should not be considered exhaustive, however. Additionally, this section also highlights responses aimed at addressing or reducing inequities and producing just outcomes.

6.3.1 Policies to ensure water accessibility for vulnerable groups

European legislation and policies recognise that access to safe drinking water is a universal human right. This is exemplified in the EU's 2020 Drinking Water Directive (DWD). This is considered the EU's main law on drinking water and it emerged in response to the European Citizens' Initiative Right2Water.

The DWD requires Member States to advance equitable access to drinking water, explicitly referencing justice through Article 16 which requires Member States to implement measures to 'improve or maintain access to water intended for human consumption for all, in particular for vulnerable and marginalised groups'. Member States must:

- ensure that people experiencing a lack of or limited access to water intended for human consumption are identified along with the reasons for this situation;
- assess possible ways to improve their access;
- promote measures to facilitate access for vulnerable and marginalised groups.

The legislation also acknowledges the specific water-related challenges facing particular groups including refugees, nomadic communities, homeless people and minority cultures such as Roma and Travellers, whether sedentary or not. It provides Member States with examples of measures that might improve access to drinking water for these group. These include providing alternative supply systems, individual treatment devices and water supplied by tankers, such as trucks and cisterns, in addition to ensuring that the necessary infrastructure is in place for camp (EU, 2020).

What injustices might emerge out of the implementation of water accessibility measures?

All European countries recognise the human right to drinking water in national legislation and their constitutions. They have also all introduced policies and targets to address the issue. However, a 2024 study drawing on 2022 national summary reports from 19 of the 26 high-income EU Member States under the international Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and a survey conducted by the European Network of Drinking Water Regulators reveals mixed outcomes to date (Huber et al., 2024). The study found that only 12 out of 15 countries indicated they were taking actions to keep drinking water and sanitation affordable for all. Equally only 10 had a focus on actions to ensure access for vulnerable and marginalised groups and only eight had a focus on reducing geographical disparities.

What approaches should be considered to make water accessibility measures more just?

While Huber et al.'s (2024) study reveals gaps in implementing measures to support water accessibility, it also showcases the policy measures being used by reporting on how Member States are reducing injustices. A non-exhaustive list of these measures is given below:

- In Croatia, identification of vulnerable and marginalised groups is required through the Law on Amendments to the Water Law, the Act on Mountainous Areas and the Islands Act. Additionally, the country's National Recovery and Resilience Plan 2021-2026 is being implemented to reform the water services sector and especially to invest in rural, mountainous and demographically endangered areas.

- Lithuania's Water Development Programme 2017-2023 included investments for equal access to water, with a particular focus on settlements with 200 to 2,000 inhabitants.

- Under Slovak law, all water operators must comply with a legal obligation to ensure equitable access to water.

Other policy examples are featured in Baptista and Marlier's (2020) study *Access to essential services for people on low incomes in Europe: an analysis of policies in 35 countries*. Two examples are given below:

- In Hungary the National Strategy of Social Inclusion aims to ensure access to water supply and sanitation in informal settlements.

- In Romania amendments to legal regulations were made so that as of 2018, cash benefits have been paid to subsidise water and wastewater costs for low-income groups.

Notably, Slovenia amended its constitution in 2016 to recognise the right to water (Human Right 2 Water, 2025, p. 2).

While the existence of policies and regulations to support vulnerable groups in accessing affordable water services is critical, it is important to note that ultimately it is the effectiveness of implementation that determines how just or unjust the outcomes are.

In fact, the EESC's Consultative Commission on Industrial Change Umbrella Opinion 209 calls for a 'Blue Deal'; this is on the basis that access to high-quality, affordable water and sanitation is a fundamental right and it is unacceptable that there are still people who have no access to water and sanitation in the EU. The opinion acknowledges that the EU has set up legal frameworks and developed initiatives to protect water resources yet it concludes that many of the objectives set have not been reached due to insufficient funding, slow implementation and insufficient integration of environmental objectives in sectoral policies.

6.3.2 Water restriction mandates

Severe and prolonged drought, particularly in southern Europe, is increasing the number of national and subnational governments that are restricting water consumption for both industrial/farming use as well as domestic use. Countries where restrictions have been implemented in the past few years include Italy, Spain, Portugal and France (Schauenberg, 2022; Weise and Zimmerman, 2023).

For domestic purposes, restrictions in some localities have included bans on watering gardens and sports fields, washing cars and patios, and filling pools and swimming pools. Overall daily maximum consumption levels per person have also been established in some places. In other locations, running water is only made available for a certain number of hours per day, although emergency supplies are always accessible.

Penalties for disregarding restrictions have included fines, both for businesses and individuals. For the farming sector, significant restrictions on irrigation have been issued and decisions have been made centrally regarding which agricultural crops to prioritise based on economic returns (Weise and Zimmerman, 2023).

What injustices might emerge out of the implementation of water restriction measures?

Such restrictions are not inherently 'unjust' when the needs of more vulnerable segments of the population are considered. However, restrictions can still result in different outcomes for different groups. For example, research shows that while water restrictions may mean wealthier groups have to reduce their water usage for leisure and luxury purposes, such restrictions for less advantaged groups can directly limit their capacity to meet basic health, hygiene and comfort needs (Satur and Lindsay, 2020).

There can also be injustice when certain groups that are not considered to have special needs are exempted in some way. For example, tourist operations in parts of Spain are exempted from water restrictions.

Due to prolonged and extreme drought in recent years, the Catalan region declared a drought emergency in February 2024. In response, regional businesses were legally required to cut their water consumption by 25%, farmers by 80% and residents were limited to 200 litres a day per person. However, to date hotels have been exempted from legally binding restrictions. So, while the average water consumption of a Barcelona resident is around 163 litres per day, five-star and four-star hotels respectively use an average of 545.5 litres and 373 litres of water per tourist daily (Congostrina and Velasco, 2024). This raises distributional justice concerns.

What approaches should be considered to make water restriction measures more just?

Ultimately, sustainable and effective adaptation measures to address water shortages require a move away from crisis management and water rationing towards long-term thinking. This would include implementing more long-term efficiency measures.

The EESC Opinion 891 calls for sustainable water management that involves optimising efficiency, reducing losses, prioritising uses, eliminating illegal uses and adopting measures to ensure the sustainability of the whole water system. To achieve this, there must be ongoing honest and robust conversations between the representatives of different stakeholders — farmers, industry, consumers and environmentalists. Any resulting agreements must be guided by the different dimensions of justice, namely distributional, procedural and recognitional.

In the short-term, however, decisions need to be prioritised in order to address potential injustices. The case study in Box 6.2 from Catalonia, Spain provides an example of how the region is managing the tension between tourism and water scarcity.

Box 6.2

Case study: tourism and water scarcity in Catalonia, Spain

A combination of new policies and awareness campaigns in Spain's Catalonia region aims at ensuring that water restrictions put in place in 2024 under the region's declared drought emergency are shared by tourists. In cooperation with the cruise industry trade organisation, Barcelona's local authorities issued a new decree in early 2024 restricting cruise ships docking at the Port of Barcelona from drawing on the city's water supplies, except in emergency situations (McGillivray, 2024). The aim is to reduce the percentage of ships requiring water supplies by 90%. This will free up water resources for use by local residents and businesses. The restriction applies while the region remains under a drought emergency.

Complementing these measures, many members of the city and region's tourism industry are taking voluntary proactive measures to reduce the water footprint of tourism (Congostrina and Velasco, 2024). The region's General Directorate of Tourism is providing subsidies to support hotels to adapt tourist facilities to the drought, in ways which do not damage tourists' experiences. The roll out of awareness campaigns is an important part of this effort; it aims to remind tourists to do their part in conserving the region's dwindling water resources.

6.3.3 NbS measures

NbS such as blue and green infrastructure are increasingly being incorporated into European urban landscapes. While the primary goal is often to support water and flood management objectives (Bona et al., 2024), such measures can also make important contributions to reducing droughts.

NbS are increasingly being used as part of a broader approach for managing stormwater. They are proving to be cost-effective alternatives or complementary approaches to more traditional grey infrastructure (Esraz-Ul-Zannat et al., 2024). They can slow down or detain stormwater during large precipitation events, thereby reducing the velocity and volume of water entering stormwater systems. This can help systems cope with high water treatment demands and/or reduce the amount of stormwater released, untreated, into waterways. This is particularly important in locations where stormwater systems are combined with sewer systems (European Climate and Health Observatory, 2024).

Using NbS to reduce the overall costs of stormwater management or to improve the overall effectiveness of the system has benefits for all system users. Although the benefits accrue to all members of the population (EEA, 2023a), NbS which can result, for example, in increased urban greenery do have the potential to provide particular benefits to vulnerable groups if justice is central to decisions regarding where they are sited.

What injustices might emerge out of the implementation of NbS measures?

As discussed in the chapter on the built environment, there must be upfront consideration of the well-known negative unintended consequences of NbS such as their potential to contribute to gentrification and the eventual displacement of existing residents. Likewise, attention must be paid to the issue of how decisions are made with regard to where such natural infrastructure is built and what that means for those who gain access to increased green space and its associated benefits.

What approaches should be considered to make NbS measures more just?

Several principal approaches to address potential gentrification and displacement as a result of NbS are discussed in the chapter on the built environment. Primarily these involve the use of regulations, protections and novel governance mechanisms.

More generally though, the value of using NbS to support stormwater objectives is apparent in the range of co-benefits for neighbourhoods where the infrastructure is situated. Such co-benefits include reducing urban heat islands, air purification and new green space for recreation. These co-benefits have been well documented. For example, Garrett et al.'s (2023) study shows that spending time in nature is consistently related to higher levels of perceived well-being and that it is a pathway for reducing socio-economic inequalities in well-being.

However, in order to ensure that such co-benefits can be accessed by vulnerable community members, inclusive approaches must be taken with regard to the design and implementation of NbS. This procedural justice aspect is critical for the achievement of successful and just outcomes. At the same time, recognitional justice dimensions are also important in terms of acknowledging the diverse expectations, experiences and needs of residents (Snep et al., 2023).

6.3.4 Water pricing

The affordability of water is directly related to how water tariffs and general water pricing mechanisms are structured. The design of these pricing measures can either reduce non-affordability or further exacerbate it.

Article 9 of the WFD requires Member States to implement the principle of the recovery of costs of water services, including financial, environmental and resource costs (Farnault and Leflaive, 2024). Additionally, Member States must establish water-pricing mechanisms that incentivise water users to use water resources efficiently.

Under the WFD, the recovery of economic costs is based on the extent to which the costs of providing water services are covered by water use charges and other cost-recovery mechanisms such as subsidies or abstraction and pollution charges. In terms of allocating charges to different users, the WFD stresses the 'polluter pays' principle; this means that financial contributions should reflect the extent to which

different users contribute most to water service costs, particularly with regard to the costs of pollution.

What injustices might emerge out of the implementation of water-pricing measures?

A tension can arise between meeting the objectives for financial sustainability through full cost-recovery mandates and social equity considerations, particularly in relation to affordable water services for all. This is well noted within the Organisation for Economic Cooperation and Development's (OECD's) 2024 working paper *Cost recovery for water services under the Water Framework Directive* (Farnault and Leflaive, 2024). As the paper states 'welfare maximisation does not consider distributional issues' (Farnault and Leflaive, 2024, p. 27).

However, it also points out that keeping tariffs artificially low for everyone — to meet the affordability needs of the most socially disadvantaged — can lead to utility under-financing resulting in decaying infrastructure and deteriorating services. This may reduce universal water access and ultimately harm lower-income households and other vulnerable groups to the greatest extent (Aqua Publica Europa, 2016; Farnault and Leflaive , 2024).

The EC position is that full cost recovery does not need to compromise the affordability of services in the EU (EC, 2021a). At the same time, however, the EC indicates that where full recovery has not been achieved and there are plans to increase tariffs for water and sanitation, the potential effects on affordability, in particular for vulnerable households, should be assessed. In such cases, measures to mitigate affordability are recommended. This could include the creation of social tariffs.

Full cost-recovery pressures can also result in decisions to cut off water supplies to customers in arrears. Of the 35 European countries reviewed in Baptista and Marlier's study (2020), there were only 11 EU Member States (Austria, Croatia, Finland, France, Germany, Italy, Latvia, Luxembourg, Malta, the Netherlands and Spain) with national or almost national-level procedures to ensure that low-income households would not be deprived of basic supplies of water for bill non-payment.

A further injustice relates to the perceived fairness of bundling stormwater charges into everyone's water bills. Stormwater management is a problem exacerbated by increasing areas of impervious surfaces in urban environments. These hard surfaces are not able to absorb or retain rainwater and so water which falls on them immediately runs off into stormwater sewers, which can quickly become overloaded. The cost of dealing with this water has been increasing over time as there are more extreme rain events and more impervious surfaces (Knapik et al., 2024).

The injustice here is due to the fact that households or businesses with larger property sizes and often larger corresponding areas of impervious surfaces contribute disproportionately to the problem but they do not pay their fair share under the polluter pays principle under water-pricing mechanisms that allocate water charges based only on water consumption levels.

What approaches should be considered to make water-pricing measures more just?

A United Nations Economic Commission for Europe (UNECE)-WHO report clearly states that it is not possible to ensure affordability only through the design of tariffs; accompanying social policy infrastructure — that must be provided by state of regional administrations — is also required (UNECE-WHO/Europe secretariat, 2022). The 2024

OECD report reaches a similar conclusion (Farnault and Leflaive, 2024). It is now more commonly accepted that sustainable cost recover should include:

- an appropriate mix of tariffs and taxes;
- predictability in public subsidies to facilitate investment (planning);
- tariff policies that are affordable to all, including the poorest, while ensuring the financial sustainability of service providers (Farnault and Leflaive, 2024).

Many of these elements already feature as part of national or subnational laws or programme designs. Some examples are given below:

- In Flanders, Belgium, a social fund intervenes in the payment of water invoices or repairing leaks for people with payment problems. The fund is financed by a contribution of EUR 0.03 for each cubic metre (m^3) of drinking-water invoiced. A uniform tariff structure was also introduced in 2016 but takes into account family size and a social correction for the most vulnerable population groups (Huber et al., 2024).
- In Croatia, under the Water Services Act, socially vulnerable residents are only expected to pay up to 60% of their water services bills; the rest is subsidised through the local government (Huber et al., 2024).
- In Italy, the government provides a social tariff for people living in poverty and older people. Low-income households may be entitled to receive a 'water bonus' which entitles them to 50 litres of water per day per person free of charge (Huber et al., 2024).
- In Hungary, local regulations determine the eligibility of low-income households to cash benefits that alleviate financial pressure relating to residents' access to water and sewage services (Baptista and Marlier, 2020).

Stormwater fees are another increasingly common mechanism being used across Europe to address injustices related to the unequal distribution of costs for stormwater services (EEA, 2024h). These fees are often calculated based on the average area of impervious surface on a home/business owner's property (typically known as the Equivalent Residential Unit (ERU)), although the EEA's 2024 urban adaptation report details a wide range of approaches being used in different European municipalities (2024h). Such fees are seen as a way to reflect the polluter pays principle more fairly as opposed to flat fees; people residing on smaller properties with less impervious surface pay a proportionately smaller fee for such services.

As indicated above, models for calculating stormwater fees vary in complexity, with associated impacts on the cost of establishing and maintaining each approach. This can also impact the extent to which citizens understand the fee rationale and perceive it to be fair. Variable charging is considered to be fairer, while also incentivising users to decrease the area of impervious surface on their properties.

For example, in response to the perceived unfairness of former models, several German cities introduced stormwater management charges based on impervious area in the 1990s. New fee allocations are now determined based either on estimations according to zoning, as is the case for Munich, or more detailed measurements of the impervious area on a given property, as in Hamburg or Dresden (Novaes and Marques, 2022).

Other cities are taking a more hybrid approach, recognising some of the complexities and associated costs of switching fully to an ERU model. Stockholm, Sweden uses a fee model based on a combination of property surface area and type of property. The city also offers stormwater tariff discounts where users have disconnected from the city's sewer system or where Sustainable Urban Drainage Systems are installed on the property (Kondratenko et al., 2021).

Regardless of the stormwater model chosen, it is essential that citizens perceive the system to be fair. It must also be reliable and easy to establish and maintain (Rydningen et al., 2022). Involving stakeholders in the design of fees is always recommended in order to achieve both objectives.

Finally, efforts are now being made to reduce water disconnections resulting from bill non-payment, where there is a genuine inability to pay. This approach is endorsed by the EESC. Numerous national and subnational laws and policies are already envisaging disconnection protections, following the EU's commitment to SDG 6 – Clean water and sanitation – in the UN Agenda 2030.

Countries including Austria, Germany and Luxembourg have established mechanisms for preventing disconnections, seeking alternative solutions such as offering assistance to households via social protection offices (Baptista and Marlier, 2020). Similarly, in Cyprus service providers are exploring possible repayment plans through mechanisms like minimal payment increments. Croatia and Italy have both established a basic supply of 50 free litres of water per household per day for vulnerable users (Baptista and Marlier, 2020).

Box 6.3

Case study: managing water bill non-payments in Flanders, Belgium

In Flanders, Belgium, the Public Social Welfare Centre conducts assessments on a case-by-case basis to try to avoid scenarios where households are disconnected from the water supply due to unpaid bills (Baptista and Marlier, 2020). The Local Advisory Committee may choose to limit water flows to a property rather than disconnecting it completely. Furthermore, Belgium works to alleviate financial strain on customers through legislative measures that include extending the repayment period for debts, eliminating charges for initial reminders, conditions for debt recovery requiring agreement on the repayment schedule, capping additional fees for delayed payments or halting debt collection for those in debt mediation at the Public Social Welfare Centre.

6.3.5 Incentivising or enabling reduced water use

Economic incentives are widely considered to be an effective tool for increasing water efficiency. The EEA's *Assessment of cost recovery through pricing of water* report indicates that increasing tariffs is an effective strategy for reducing residential water demand (2013). While there are different degrees of demand elasticity depending on whether water is being used for basic drinking and hygiene versus recreational purposes, overall variable pricing mechanisms based on consumption levels can maximise water efficiency in urban settings.

A JRC report found that across most (then) EU-28 countries, household water consumption goes down by less than 1% for a 1% price increase (Reynaud, 2015). The model indicates that a 10% increase results in water consumption decreasing by 1-5%.

There is little evidence for how prevalent the practice of using water pricing to incentive reduced water consumption is across the EU. However, Article 9 of the WFD encourages such an approach, indicating that 'Member States shall ensure that water-pricing policies provide adequate incentives for users to use water resources efficiently'.

Another effective measure to encourage reduced water consumption is providing enablers. These can be in the form of household investments in small technological or physical products such as water-saving showerheads, rain barrels and grey water recycling systems, among others. They can also include information and communications technologies (ICT) that provide critical information to consumers, allowing them to take responsibility for structural and behavioural changes with regard to resource use (Laskari et al., 2016). ICT often come in the form of smart meters that are linked to display units that allow household members to track consumption use and patterns in near-real time. The EEA estimates that using such domestic water-saving devices could save up to 40% of water per year per household (2017).

What injustices might emerge out of the implementation of measures to encourage reduced water use?

Several injustices can emerge out of approaches designed to incentivise reduced water consumption. Starting with economic-style measures, water pricing that increases as consumption levels go up can place financial pressures on multi-family households or other potentially vulnerable individuals that — for health or other reasons — require larger volumes of water.

There is also a risk, however, that if the revenues previously received due to higher consumption rates are not covered by other means, there may be impacts on the quality of water service provision. This is discussed above with regard to artificially keeping water tariffs low as a way of addressing water affordability.

In the case of technology-related measures, programmes that do not provide adequate advice, expertise and finance often result in sub-optimal outcomes, particularly in the case of low-income households (Laskari et al., 2016). Yet even when such advice is built in, the evidence indicates that low-income households or those with residents facing other vulnerabilities may still struggle to follow such advice. This is particularly the case when it requires households to undertake some kind of financial investment. This is because such household members are often tenants and sometimes have a low level of basic literacy and numeracy skills (Laskari et al., 2016).

What approaches should be considered to make measures to encourage reduced water use more just?

With regard to ensuring the effectiveness and fairness of economic incentives, complementary measures that respond to the capacities, needs and different members of society can be an effective approach to managing both water scarcity and affordability imperatives. One such combination could involve economic incentives in pricing combined with readily available social support measures for socially vulnerable households; these could be in the form of automatically applied water discounts, reimbursements or social security payments.

The Dunkerque case study in Box 6.4 demonstrates this kind of approach. It involves a pricing structure that also builds in the need to provide an affordable basic level of water for everyone. This is an approach endorsed by the EESC whose umbrella opinion 209 recommends a 'three-block tariff structure' that ensures a basic 'human rights' amount of water is accessible to all. The second and third blocks ensure that the cost of water services is recovered and that there is the potential for higher tariffs to generate cross-subsidies from unnecessary uses.

With regard to using ICT measures, some of the limitations mentioned above can be addressed through the design of advice programmes for disadvantaged households. For example, such households may have a preference for verbal rather than printed advice. Language barriers should also be taken into account in terms of how advice is relayed. Thus, it may be critical to ensure that more personalised approaches are used, such as having advisers undertake home visits, especially where target households need to establish relationships of trust.

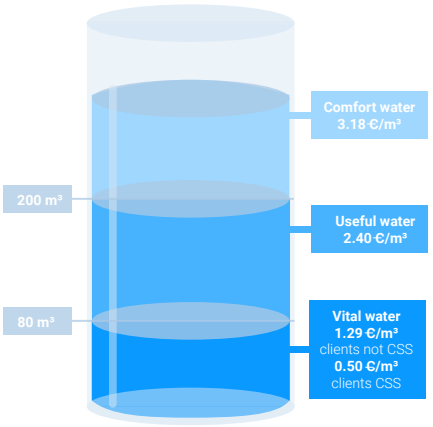
Box 6.4

New Climate-ADAPT case study: water tariffs in Dunkerque

The city of Dunkerque in the north-east of France is in a region that is severely impacted by increasingly frequent and extreme temperatures and precipitation anomalies. To respond, the city has been focusing on ways to increase the efficiency of water provisioning and improve awareness of better water resource management among its residents. But the region also has one the country's highest rates of persons at risk of poverty and social exclusion, reaching 25.9% in 2022. As such, the city is conscious that water efficiency must be achieved without creating additional financial burdens for vulnerable groups. Economic incentives for water efficiency must take into account existing inequalities.

In 2013, the city of Dunkerque began trialling a progressive and incentive-based water pricing system, by metering water consumption. The aim was to reduce non-essential water consumption by applying a three-tier pricing system. The price of a given volume of water increased progressively the more water a household consumed. The aim was to distinguish between an amount of water considered necessary to meet basic human needs and non-essential water consumption.

The pricing level associated with each tier increases in a non-linear manner but ensures that all residents can afford water to cover their basic needs. For low-income households, an additional automatic mechanism has been introduced to offer further support: beneficiaries of social welfare automatically receive a 70% discount on their water bills, paying EUR 0.50/m³ (all prices refer 1 January 2023).



Incremental tariffs are applied to incremental water consumption levels.

Source: Adapted from a visual developed by Syndicat de l'Eau du Dunkerquois.

To make this pricing system possible, the city has introduced a metering system for single-family dwellings to measure household water consumption. It has also developed a mechanism to identify households most in need of support with paying water bills based on data shared from one of the public social security systems (Caisse primaire d'assurance maladie, CSS).

Two outstanding issues are still being resolved, namely obtaining household-level data to factor it in to pricing structures and installing individual water meters in a number of the region's multi-family dwellings so that they too can benefit directly from water efficiency incentive mechanisms.

As a result of the shift to this new scheme from the previous flat-price model with equal tariffs for all households, 80% of water users have made savings on their bills, accompanied by significant decreases in average consumption per household — from 83-85m³/year to 67m³/year.

The full case study can be reviewed here: the Eco-social water tariff in Dunkerque, France.

Box 6.5

Case study: the ICE-WISH project to improve water efficiency in social housing

Ten European countries took part in the ICE-WISH project (2011-2014) (Laskari et al., 2016). The project piloted an innovative solution for social housing, using interactive ICT. Its aim was to support sustained reductions in household energy and water consumption of at least 15% without compromising the living conditions of the 300 social dwellings participating in the pilot.

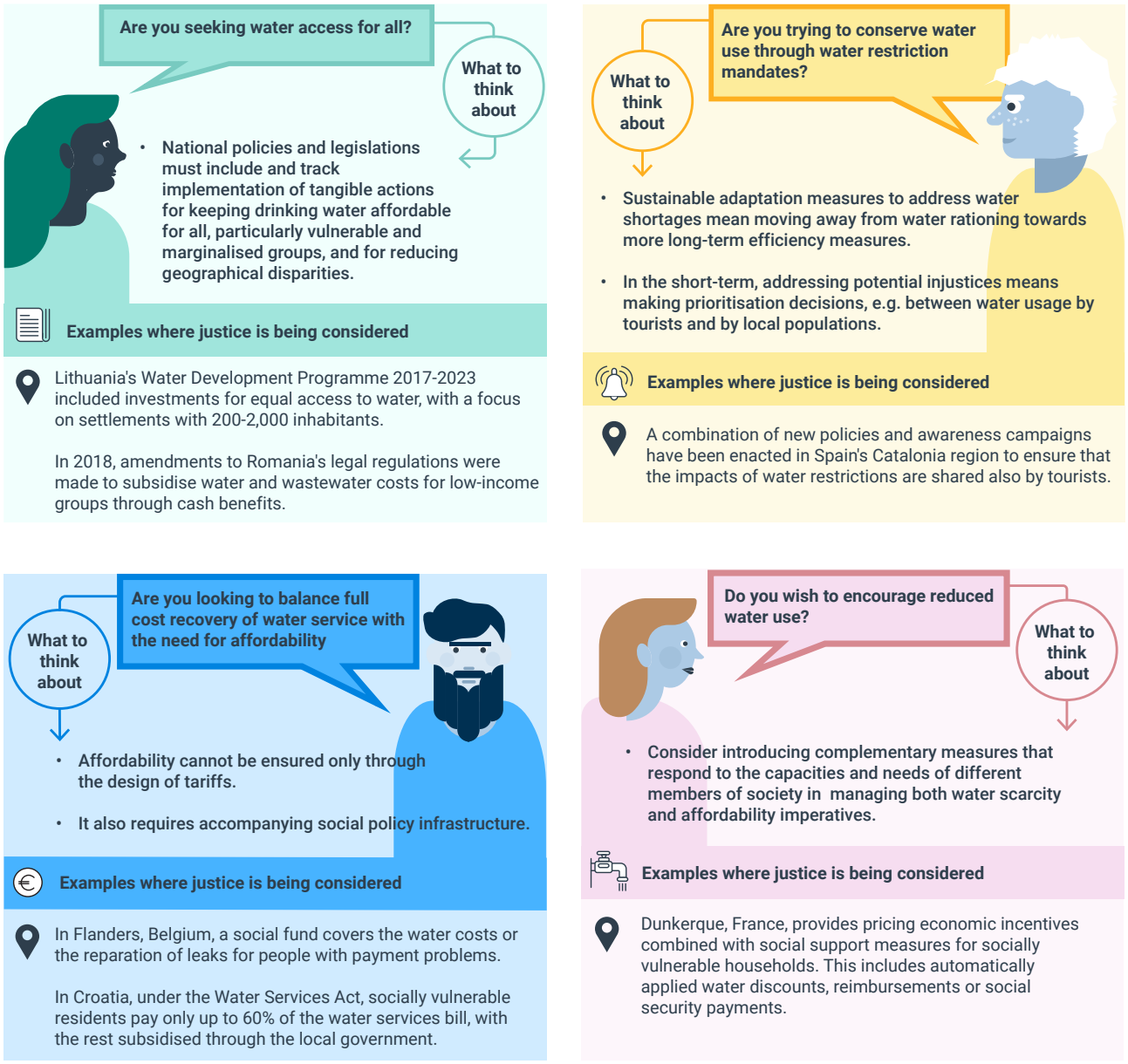
The project's 'user-friendly' and widely accessible ICT-based service engaged individual households as active players in developing water and energy conservation practices. The technology provided accurate and real-time monitoring and control of energy and water usage as well as environmental conditions and user behaviour. This enabled the project households to undertake appropriate behaviour change and invest in actions to reduce energy and water consumption.

Understanding that information alone is not always sufficient to incentivise action, the project introduced an advice programme to supplement the direct feedback provided by the ICT. Integrated into the ICT platform interface, messages were tailored to the characteristics of the building a household was living in rather than the situation in individual dwellings; they were then further tailored to take into consideration individual household needs and circumstances.

Recognising that certain actions were more difficult for the pilot's lower-income tenants due to the costs and reliance on landlord permissions, the vast majority of advice messages related to actions that had no or very affordable cost implications and those that required no major physical alternation to the property. The advice that was provided also took into account the fact that actions that led to reduced utility bills had greater appeal — and therefore uptake — than those that resulted purely in environmental outcomes.

6.3.6 *Pointers for addressing justice in adaptation responses in the water system*

Figure 6.2 Examples of just adaptation considerations in the water system



Source: Author's compilation.

7 (In)Justice in adaptation responses in the transport system

Key messages

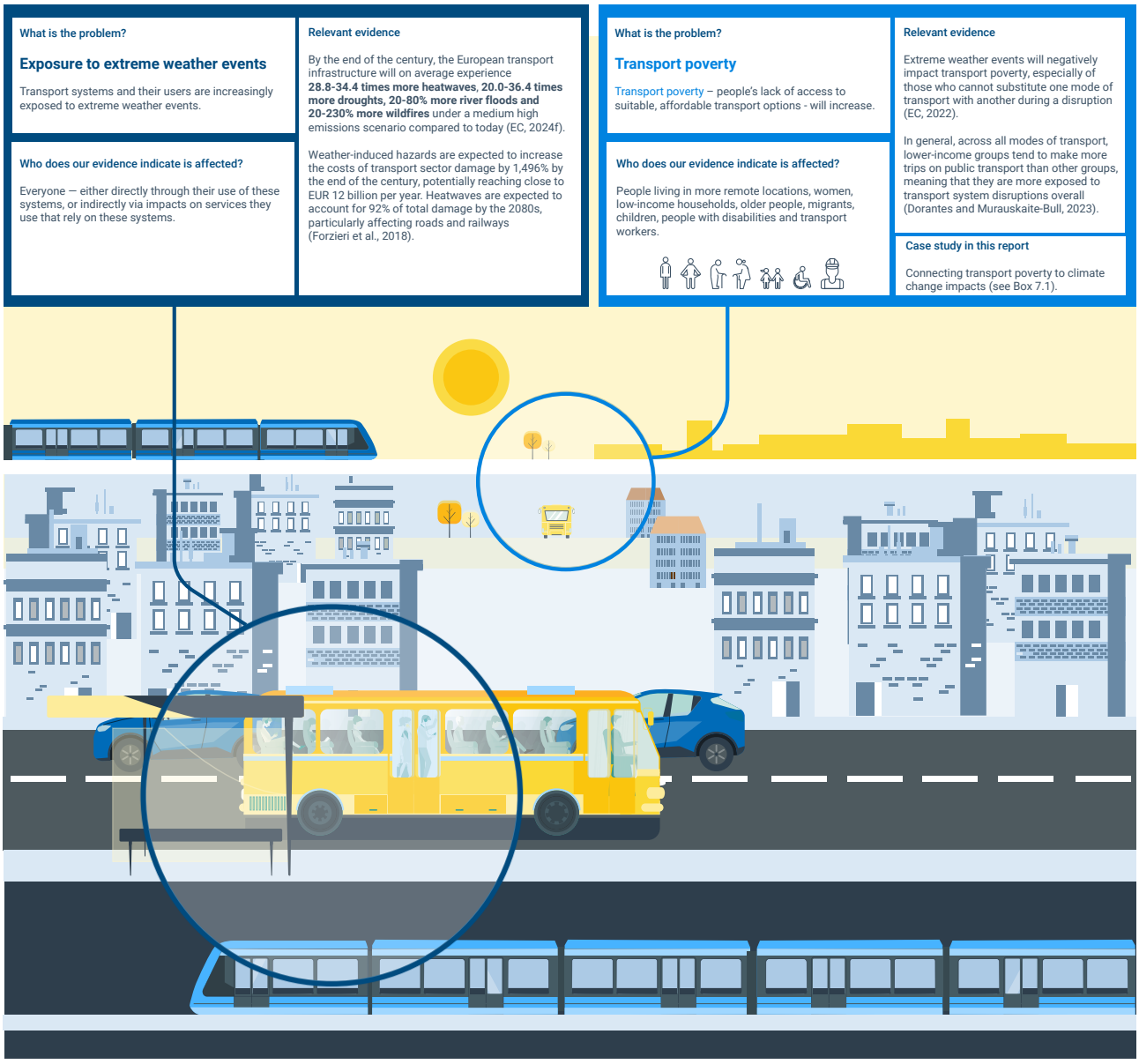
- The transport system is essential for the functioning of communities and economies but it is also vulnerable to climate-related hazards. By the end of the century, the European transport infrastructure will experience 28.8 to 34.4 times more heatwaves, 20.0 to 36.4 times more droughts, 20-80% more river floods and 20-230% more wildfires, under a medium high emissions scenario compared to today.
- While all transport system users will increasingly be exposed to how these impacts manifest (e.g. interrupted transport services due to rail or road infrastructure damaged by extreme heat or flooding), the emerging concept of transport poverty helps identify the groups that are more greatly affected. In particular, population groups with less ability to substitute one form of transport for another during service or infrastructure disruptions (including women, immigrants and older people) will be more heavily impacted.
- The transport workforce is also highly vulnerable to extreme weather events.
- Adaptation measures should focus on improving transport infrastructure to ensure that it is resilient to climate impacts and accessible to all members of society.
- Just adaptation measures include implementing social tariffs to make public transport more affordable, incorporating more climate-proof materials into transport infrastructure, developing and promoting more climate-friendly walking/cycling routes and integrating green elements into transport infrastructure to a much greater degree (e.g. green bus stops).

7.1 Introduction

This chapter analyses justice aspects of climate change and related adaptation in the transport system with a focus on Europe's transport infrastructure and public transport system.

7.2 How does injustice manifest within the transport system?

Figure 7.1 How injustice manifests within the transport system



Source: Author's compilation.

Box 7.1

Case study: connecting transport poverty to climate change impacts

While all transport system users will increasingly feel the impacts of a changing climate on the transport system, the emerging concept of transport poverty helps to identify why some groups are expected to be more greatly affected (EC, 2024f; Dorantes and Murauskaite-Bull, 2023).

A 2024 report commissioned by the EC provides a working definition of transport poverty: 'An individual or household is in transport poverty when they do not have (suitable) public or private transport (options) available to them and/or when the transport system limits access to (other) essential goods and services and/or when they have difficulty or are unable to meet the costs of transport' (EC, 2024f). The three key contributors to transport poverty relate to:

- limited transport availability — a lack of transport options or infrequent availability of transport, also referred to as mobility poverty;
- lack of accessibility to transport — limited access to essential socio-economic services due to transport limitations;
- low transport affordability — the inability to meet the cost of transport.

Two other dimensions are also relevant, namely:

- too much time spent travelling — also referred to as time poverty;
- inadequate transport conditions — available transport options are dangerous or unsafe, for instance for people with disabilities (UPPER, 2024).

Extreme weather events will exacerbate each of the above issues and those population groups with less ability to substitute one form of transport for another during service or infrastructure disruptions will be more heavily impacted (EC, 2022).

Such groups include people living in more remote locations where distances to destinations rule out walking or cycling and where there is also limited access to public transport or public transport is infrequent. In these cases, private car use is often the only option. Higher average numbers of motor vehicles per inhabitant are often found in suburban, rural and peripheral regions, reflecting a lack of alternative modes of inland passenger transport (Eurostat, 2023).

7.3 What adaptation approaches might reduce injustices within the transport system?

This chapter takes a slightly different approach to the other systems-focused chapters. This is due to the fact that, to date, most of the available research and evidence on the connection between exposure and vulnerability to extreme weather in the transport system focuses on impacts on physical transport infrastructure and much less on which individuals or groups of people are most impacted. This limited understanding makes it challenging to assess the extent to which different adaptation measures being deployed are creating new or exacerbating existing injustices for these people. The following section therefore focuses on providing examples of a number of adaptation measures that appear more likely to reduce injustices through their implementation.

7.3.1 Policies and regulations

A final version of a revised Regulation on Union guidelines for the development of the trans-European transport network (TEN-T) was adopted in May 2024. It aims to enhance EU efforts to build a sustainable and resilient transport network as the backbone of the internal market. The regulation offers strong incentives to promote more sustainable transport modes, advance digitalisation in the sector and improve multimodality. It aims for a network that contributes, amongst other areas, to:

- better social conditions for transport workers;
- greater accessibility for all users including women, people with disabilities or reduced mobility and other vulnerable population groups;
- the prevention and mitigation of transport poverty.

Importantly, the regulation also addresses climate change challenges on the TEN-T network, acknowledging regional differences in how climate change will impact users of the transport system. Member States are required to give due consideration to risk assessments and adaptation measures that seek to improve system resilience to climate change and natural hazards. Active mode infrastructures such as walking and cycling infrastructures are to be promoted, in particular as a means of offering 'the first/last mile' ([24]) solutions to public transport users.

The regulation also provides for a reinforced urban dimension; the 431 urban nodes of the network are required to adopt a sustainable urban mobility plan (SUMP), covering the city core and the surrounding commuting zone, to ensure seamless connectivity between the local and regional mobility system and long-distance traffic along the TEN-T network. The SUMP should be adopted by the end of 2027. Member states are also encouraged to use climate-proof materials, designed as far as possible to reduce any negative impacts on the health of citizens living around the transport network, from the environment, including from air and noise pollution and the degradation of ecosystems.

7.3.2 New technologies and materials

A range of new technologies, materials and approaches are being developed and deployed to reduce climate impacts on transport infrastructure and the system. Several examples include heat-resistant paving materials to reduce damage like rutting and the softening of roads or airport runway asphalt, reflective railing paint or the use of continuous welded rail lines which are considered more resilient to extreme heat (EC, 2024f). Additional examples can be found in Box 7.2.

Lower-income groups make more trips each day across all modes of transport but, in particular, they rely more heavily on public transport compared to other groups (Dorantes and Murauskaite-Bull, 2023). As such, the deployment of new technologies and materials in the public transport system may contribute to a greater extent to achieving more just outcomes.

([24]) Although bus and rail services might cover the main part of a trip, people need to first walk, drive or use another method to get to and from the nearest station or stop. The first and last leg of the trip are referred to as the 'first mile/last mile'.

Box 7.2

Case study: new technologies in Austria and in Barcelona and Seville, Spain

In Austria, new overhead power lines have been retrofitted which are more resistant to overheating; white paint has also been applied to rail tracks to increase their heat-resistance (Hughes, 2024). Austria is also monitoring locations next to train lines at high risk of landslides and undertaking remote monitoring of rail track heat levels.

Other adaptation measures have been implemented by Transports Metropolitans de Barcelona. They are looking to improve environmental quality (e.g. temperature, humidity and indoor air quality), hygiene and passenger comfort in their stations by piloting smart ventilation regulation that uses temperature, humidity and indoor air quality data to lower the heat index for both passengers and staff (UITP, 2022).

New approaches to designing more climate-adapted public transport infrastructure, such as green bus stops, are being tested and slowly rolled out. Such innovations are critical for reducing public transport users' exposure to extreme temperatures.

As one example, scientists at the University of Seville's School of Engineering are pioneering the design of a 'self-conditioning' bus shelter (Sustainable Bus, 2023). To reduce waiting passengers' exposure to heat, the shelter uses smart technologies to detect the presence of passengers at the stop and trigger the activation of a thermal conditioning system. Photovoltaic panels on the shelter's structure generate energy to cool wastewater contained in a tank under the shelter, allowing the entire structure to act like a refrigerator, emitting cool air. The system is designed to consume only 10% of the energy it generates and the wastewater tanks only need to be replenished once per summer. Even when the temperature is as high as 42°C, the bus stop temperature can be reduced to a temperature range of between 22-28°C.

Physical and technological investments are also being made in the areas of cycling and walking infrastructure to reduce citizens' exposure to climate hazards. While all people benefit from such investments, their designs are increasingly being informed by the needs and realities of vulnerable citizens, as exemplified in Box 7.3 showcasing case studies from Spain.

Box 7.3

Case study: climate itineraries in Cornellà de Llobregat, Spain

The municipality of Cornellà de Llobregat in Spain is developing a proof of concept for 'climate itineraries' specifically to meet the mobility needs of the city's vulnerable communities. The plan is to upscale the concept to other neighbourhoods in the municipality eventually. The climate itinerary concept involves ensuring that social infrastructure remains accessible during hot weather, particularly for the most vulnerable. This is achieved by reducing weather exposure along selected routes to critical services and amenities.

The concept is being tested in one of the municipality's most vulnerable neighbourhoods, Sant Ildefons, a working-class neighbourhood, which originally grew up due to internal migration; today it is home to thousands of foreign migrants. Sant Ildefons is compact with very limited green space. The metropolitan heat risk mapping lists it as one of the area's top five most vulnerable neighbourhoods.

Central square in Sant Ildelfons, Cornellà De Llobregat, Spain.
Source: © Dr Leon Kapetas.

A high percentage of the population has a low income and certain demographic groups face higher exposure to and risks from heat (e.g. older people, children and outdoor workers).

The process of co-designing and implementing 'the climate itineraries' has included:

- mapping the most critical neighbourhood services and amenities;
- drafting routes to connect the services;
- engaging stakeholders to validate and/or amend the draft routes;
- running participatory walking workshops to present and further test the proposed routes and discussing proposed adaptation interventions needed to reduce weather exposure;
- designing and implementing solutions;
- monitoring the impact to see if the interventions have indeed improved the quality of life for residents, by reducing their exposure to climate extremes.

The involvement of citizens has been critical to the process and has included, for example, identifying potential trade-offs such as replacing parking spaces with green space.

7.3.3 Nature-based solutions

NbS are an increasingly commonly used measure within all the built environment and they are now being deployed to increase the resilience of public transport infrastructure and also reduce exposure to extreme weather among public transport users.

Examples of this include the deployment of blue and green infrastructure as design features for public transport service infrastructure such as bus or tram stops. Design aims can include reducing the exposure of service users to extreme heat or heavy precipitation and resultant flooding while awaiting the arrival of public transport.

Other examples include the integration of green infrastructure into the design of train or tram lines:

- to reduce line buckling due to extreme heat;
- to buffer such infrastructure from landslides or floods because of soil destabilisation resulting from heavy precipitation;
- to act as a natural fire break during wildfires.

Several examples from across Europe can be found in Box 7.4.

Box 7.4

Case study: Maribor, Slovenia, Vienna, Austria and Warsaw, Poland

The city of Maribor, Slovenia has recognised that its increasingly high temperatures are resulting into greater exposure to extreme heat among residents waiting at bus stops. Many stops currently provide little or no shade from the sun. In 2024 the city began to develop NbS to combat urban heat islands at selected bus stops; these will be tested and implemented in 2025. The objective is to have a positive health impact on all citizens using public transport, noting that the city's most frequent public transport users are members of particular vulnerable groups such as children and older people.

Similarly, four cities in Poland are also using NbS to increase the resilience of their public transport infrastructure. With stormwater retention and re-use goals, and to reduce urban heat impact, bus stops have been designed with a plant-based green roof and a water-retention layer. This allows up to 90% of stormwater to be captured, with this water being used to water the bus stop's green components in dry weather. These green bus stops have been found to emit up to 10°C less heat than traditional bus stops.

The city of Vienna has also been testing various green roof solutions for their bus stops, evaluating the effectiveness of different plant types and shading techniques for cooling this form of transport infrastructure. Sedum mat roofs have been found to be the most effective solution, with 200 transport facilities 'climate-adapted' to date. Further scaling is envisaged.

Finally, NbS are also being used to support better-adapted train and tram lines (Blackwood et al., 2022). Researchers in Warsaw, Poland have found that planting grass between tram tracks reduces the risk of rails buckling. Green tram tracks not only cool the surrounding area through the evapotranspiration of stored rainwater but also dampen noise. They have been well received by the public (Sikorski et al., 2018). Following Warsaw's example, a number of municipalities in central Europe have planted grass between the tram tracks that cross their cities to reduce the risk of rails buckling.

7.3.4 Social tariffs for public transport

Many national and subnational governments are providing different forms of social tariffs for using public transport. This is in recognition that transport non-affordability is a critical dimension of transport poverty and that it will likely be exacerbated as the costs of repairing weather-related damage to the transport system rises.

Attempts to address the problem are in line with the EESC view that public transport is an individual right. Such programmes also serve to incentivise a shift away from private car use towards group transport, thereby contributing to the objective to reduce greenhouse gas emissions.

The 2024 report entitled, *Transport poverty: definitions, indicators, determinants, and mitigation strategies* commissioned by the EC provides an extensive set of examples of how social tariffs are being implemented at the national and subnational levels across Europe (EC, 2024h).

7.3.5 Improved infrastructure and mobility solutions in urban, peri-urban and rural areas

As highlighted in a study published in November 2024 by the EC, transport poverty is a multidimensional concept. It includes the (non) availability and the (non) accessibility of public transport and other mobility solutions for citizens Europe (EC, 2024h). In the context of the green transition, EU transport policies aim to increase the use of collective transport, active modes (e.g. walking and cycling) and shared-mobility solutions to reduce dependency on personal cars and emissions from combustion engines, in both urban and rural areas.

The Expert Group on urban mobility (EGUM) assists the EC in implementing the new EU urban mobility framework, including on cross-cutting issues such as inclusiveness and climate-resilience. In 2024, the EGUM issued a recommendation on 'How to guarantee public transport inclusiveness considering aging, gender, disabilities and reduced mobility' and a guidance document on the SCF. These cover a broad range of issues related to transport poverty, transition to zero-/low-emission transport, social justice, spatial planning and housing developments, among others.

About 30% of the EU population live in rural locations, with many affected by rural mobility limitations. Typical problems arising from the rural mobility deficit include extreme car dependency, limited public transport, social exclusion and economic setbacks in rural areas. Europe's climate goals are unattainable unless these issues are addressed, as people living in rural or remote areas travel farther and more frequently but very often lack sustainable transportation options.

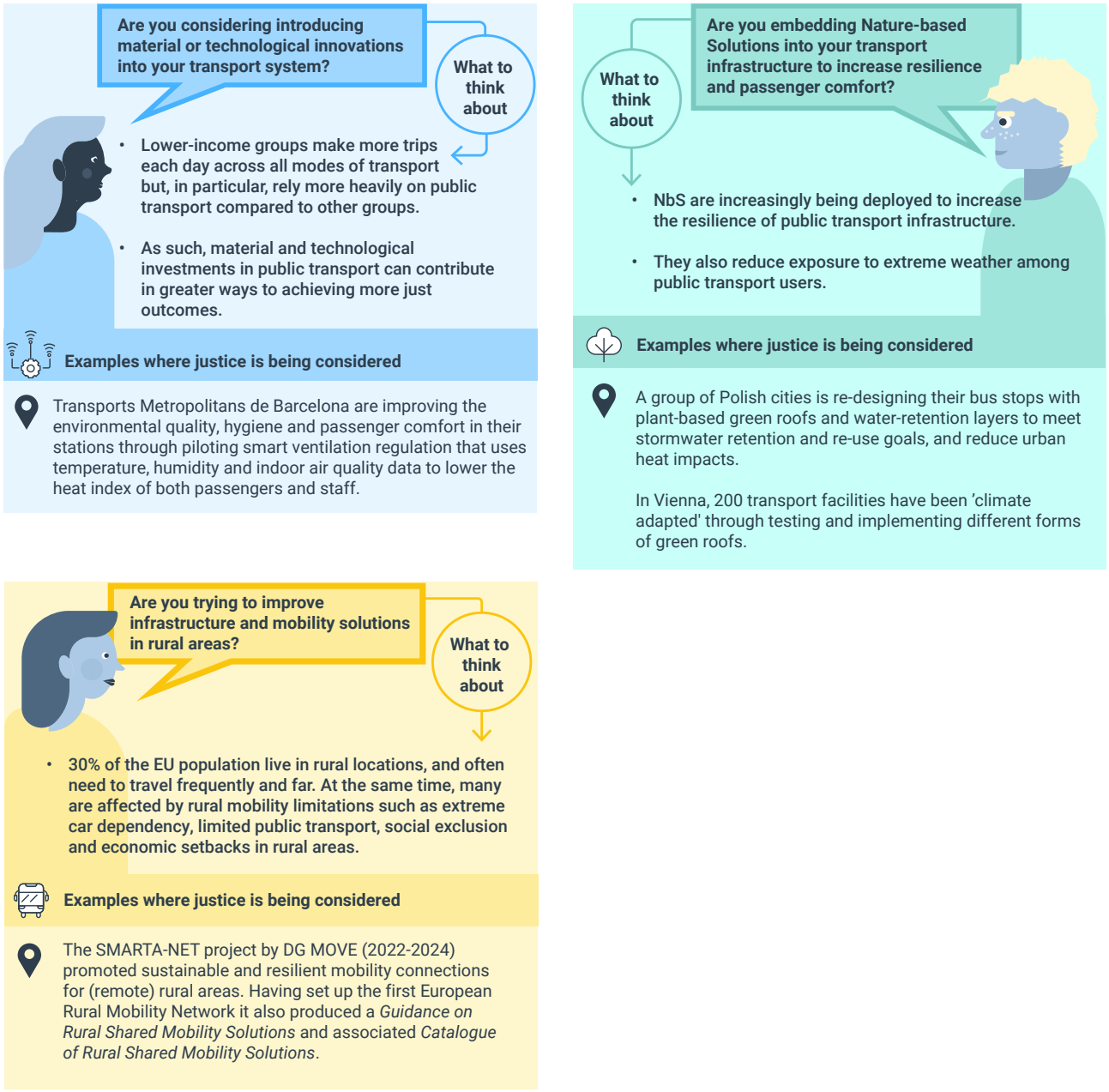
The EC has funded several projects related to rural mobility. The most recent one is the SMARTA-NET project (2022-2024), which aims to promote sustainable and resilient mobility connections between rural areas, within remote areas and between remote rural areas and urban areas, as well as supporting ecotourism. The project set up the first European Rural Mobility Network as a follow-up to the long term vision for rural areas About 30% of the EU population are affected by rural mobility limitations.

It has also produced several practical tools and guidance documents, including the *'Guidance on Rural Shared Mobility Solutions'* and the *Catalogue of Rural Shared Mobility solutions*. The catalogue aims to provide information and share experiences and key insights from existing rural mobility schemes implemented across Europe for conventional public transport, including fixed-route bus and rail, demand-responsive transport, ride-sharing services and asset-sharing services.

SMARTA-NET outcomes clearly highlight the multi-dimensional context of rural mobility, with implications across multiple policy areas (mobility and transport, rural development connectivity, environment and decarbonisation, territorial and social cohesion).

7.3.6 Pointers for addressing justice in adaptation responses in the transport system

Figure 7.2 Examples of just adaptation considerations in the transport system



Source: Author's compilation.

8 Looking forward: conclusions, emerging issues and priorities for action

8.1 What the report's analysis has revealed

8.1.1 On the integration of just resilience in the adaptation policy cycle

Just resilience is increasingly included in national and subnational planning. However, there is still a lack of practical guidance and coherence in implementing it alongside a low level of consideration for the broader dimensions of justice.

This report's analysis of just resilience at the European, national and subnational levels indicates that justice is increasingly recognised as an important principle for adaptation across all governance levels. There is a growing awareness of the need to consider vulnerable groups in adaptation planning. However, there are still gaps to be addressed:

- Many Member States only make implicit references to just resilience, which weakens accountability and increases the risk of vulnerable groups being overlooked in adaptation measures. This highlights the need for more explicit references to just resilience in adaptation plans.
- Attention to vulnerable groups tends to decrease in later phases of the adaptation policy cycle, especially in the implementation and M&E phases. This underscores the need for consistent integration of vulnerable groups throughout the entire adaptation cycle.
- Significant differences exist in how European regions identify vulnerable groups and their inclusion in adaptation actions. These variations should be further investigated to understand differing approaches and explore opportunities for shared learning between regions to strengthen representation and resilience-building efforts.
- Justice considerations tend to focus on the distributional dimension; meanwhile, considerations of procedural and particularly recognitional dimensions of justice are increasing to some extent but overall still in their infancy. This is even more so for other dimensions of justice such as restorative or intergenerational justice.

Overall, these gaps underscore the urgent need for more practical and coherent support for national and subnational governments to integrate justice into current adaptation processes effectively.

8.1.2 On justice in adaptation measures

Individual-level measures may create injustice for low-income households and other vulnerable groups.

The analysis reveals that many adaptation measures within the built environment, agriculture and food and water systems require households or agricultural enterprises to take individual actions. Typically implemented through governance mechanisms or financial and economic incentives, these measures can risk excluding low-income groups who may not have the financial means to participate.

To address this, some countries or subnational governments have introduced subsidy programmes to reduce barriers due to affordability and therefore access; however, these initiatives too may inadvertently exclude low-income groups if they are overly technical or complex. To prevent this kind of injustice, such programmes must be designed inclusively with their target beneficiaries. Additionally, paying attention to diverse social groups when monitoring the implementation of these programmes can help improve access and prevent further injustices.

Other than financial barriers, there are further obstacles that individuals or households may face when required to take measures. These include information or knowledge barriers (e.g. due to education level or language skills) or technological ones (e.g. limited internet coverage restricting the adoption of digitalisation in farming). In the case of extreme temperatures, there may be legal/policy barriers preventing individuals from receiving protection to stop working if working conditions become unbearable.

Injustices emerge when physical, technical and nature-based measures in the public space are not tailored to a diversity of needs.

Adaptation measures in public spaces — such as physical, technical or nature-based solutions — can also lead to injustices if they fail to address the specific needs of all kinds of vulnerable groups, not only low-income groups. For instance, urban greening projects that create parks may not adequately consider the needs of women who may feel unsafe in these spaces, even if they provide cooling benefits. They may also lead to unintended consequences such as increased property prices driving out low-income groups, particularly tenants.

This highlights the importance of understanding the unique needs of diverse social groups and involving them in the co-design process to address procedural and recognitional justice. Additionally, traditional planning and decision-making methods, often driven by CBAs, may bias outcomes toward wealthier areas. Incorporating more relational, care-based and inclusive approaches in planning and decision-making (e.g. consulting social services and community representatives), can help address these biases and ensure more equitable outcomes.

Information and capacity-building measures should be tailored to different abilities and needs in order to be just.

Injustice may also arise if information and capacity-building measures are not tailored to the abilities and needs of vulnerable populations. Where this is the case, it may be necessary to co-innovate new, more accessible types of information and capacity building measures. Ensuring that these efforts are accessible, inclusive and designed with a focus on justice is essential to prevent inadvertent harm.

8.1.3 On the state of the knowledge base

There is currently a fragmented but growing knowledge base, with gaps still remaining.

As demonstrated throughout this report, the knowledge base on just resilience in Europe is growing steadily. While it is still characterised by some degree of fragmentation in the scientific literature, considerable evidence has been presented on how injustice in climate change adaptation action manifests and how it can be addressed within the built environment and water systems. Insights have also been

provided for the agriculture and food systems. However, for the transport system and other systems not part of this report, such as the energy system, significant gaps persist in the data, evidence and shared understanding of the linkages between justice, exposure to climate change and vulnerability.

This finding is in line with a review of the scientific literature, which reveals a limited number of empirical studies on justice in climate adaptation. Much of the existing research remains theoretical, lacking the practical assessments necessary to inform actionable interventions (Coggins et al., 2021; Mohtat and Khirfan, 2021).

Additionally, there is limited understanding of how current adaptation measures impact the broad and diverse groups often labelled as 'vulnerable' to climate change. Definitions of vulnerable groups are inconsistent or lacking and the ways that they are affected by adaptation responses are not always clearly understood. There is also a need for more empirical studies that analyse the influence of justice across spatial and temporal scales (Coggins et al., 2021; Mohtat and Khirfan, 2021; Araos et al., 2021).

8.2 Where to go from here

8.2.1 On the operationalisation of the concept of just resilience

There is a need for a common definition and assessment frameworks to help build shared understanding.

Just resilience is inherently multifaceted; currently there is no single, universally accepted definition or framework. As part of the EU adaptation strategy, the concept of justice is encapsulated in the principles referred to as 'bearing uneven burden' and 'leaving no one behind'. These same principles increasingly feature within other European sectoral policies, strategies and programmes. Arguably this points to their resonance within the broader European context. In addition, the term 'social fairness' is being used increasingly.

A common definition and framework do not yet exist and interpretations of justice are highly contextualised since vulnerable populations are not homogeneous groups. As such, it is necessary to establish a shared understanding of the specific characteristics of justice and how justice is to be interpreted at the start of each adaptation process.

It is also important to recognise that, to some extent, any interpretation of justice is a political one. As illustrated in Table 2.4, there are many ways to allocate resources that may be considered just but they prioritise different groups and result in different outcomes.

It is necessary to develop a deeper understanding of the interrelationship of the distributional, procedural and recognitional dimensions of justice in adaptation.

The distributional aspects of justice are the dimensions that are most frequently explored and incorporated into adaptation responses. This is apparent within the scientific literature, this report's analysis of the different systems and studies on national and subnational adaptation strategies.

Much less attention is given to procedural and recognitional justice in adaptation. This points to the need for further exploration of these dimensions, as well as their interrelationships with distributional justice, to create a more comprehensive and just

approach to adaptation planning and implementation. Enhancing our understanding of these dimensions should lead to the development of frameworks that support procedural and recognitional justice at all phases of adaptation.

8.2.2 On the knowledge base

Cross-sectoral data aggregation and adjusted data collection approaches should be used to build a knowledge base on just resilience.

This report has identified significant data and evidence gaps, limiting the ability to fully understand the injustices that may arise from climate change and adaptation measures. As such, there is a need to build a knowledge base on just resilience. This can be done by enhancing cross-sectoral data aggregation, allowing for a more comprehensive view of the social groups at risk of being left behind.

For example, bringing together hospital data on patient health issues and social service department information on socio-economic characteristics, and then overlaying that with the timing and incidence of heatwaves could provide much greater clarity around both the location and characteristics of those people bearing a disproportionate burden within a respective territory.

Furthermore, data collection can be improved by better collaboration with disaster and emergency teams, as they regularly gather and evaluate data following extreme events. Monitoring the impacts of extreme events and assessing the effectiveness of adaptation measures taken before, during and after these events would lead to clearer picture of where and how disparities in resilience are most acute.

Additionally, it is essential to adjust EU-wide data collection approaches in line with justice-focused objectives to better understand the differences in how justice is understood and how just measures are implemented across regions and social groups. For example, while the EU collects annual data from farmers, it lacks crucial indicators such as disposable income which serves as an important proxy for vulnerability and potential risk from injustice. Systematic data collection would support decision-making aligned with just resilience principles, ensuring that the needs of vulnerable groups are considered and addressed effectively in adaptation efforts.

Vulnerability should be assessed through an intersectional and dynamic lens.

It is well recognised that vulnerability to climate change is strongly shaped by intersecting factors such as socio-economic status and demographic characteristics such as age, health status and gender. These characteristics may compound to negatively affect someone's adaptive capacity (Amorim-Maia et al., 2022). This recognition is supported by the literature (Pham and Saner, 2021; Walker et al., 2024; Araos et al., 2021) which indicates that gaps remain in addressing the intersectional needs of individuals with these characteristics.

To prevent injustices and foster just resilience, research and practice must incorporate intersectional approaches. These approaches should recognise diverse local and expert knowledge, actors and phenomena essential for designing effective, transformative strategies that benefit both people and ecosystems (Amorim-Maia et al., 2022; Olazabal and Castán Broto, 2022).

Another important characteristic of social vulnerability is that it is dynamic — the extent to which an individual or social group is socially vulnerable may change over

time, increasing or decreasing as a result of various factors. The changing nature of vulnerability needs to be assessed as such in the planning process to enable procedural justice (van den Berg and Keenan, 2019).

An EU-wide vulnerability dashboard would allow measures to be tailored for just resilience.

Understanding (social) vulnerability patterns is essential for shaping adaptation strategies that address the unique needs of the most affected populations. Integrating this knowledge into the adaptation process requires reliable, accessible data to guide policymakers.

The JRC's vulnerability dashboard, primarily developed for disaster management, offers a top-down assessment framework that can serve as a valuable starting point for EU Member States and subnational authorities. Improving the dashboard's spatial resolution could further reveal within-region differences that may currently appear homogeneous, especially in areas where smaller-scale disparities exist but are not captured in the data.

However, there are some challenges to applying the JRC's vulnerability dashboard in the context of furthering the understanding of just resilience. First, it would require the dashboard to provide data at a more localised resolution than is currently politically or legally feasible. In addition, the functionalities of the dashboard are already heavy. As such, adding many more functionalities may make the dashboard unwieldy.

At the national and subnational scales, data protection laws make it hard to understand social vulnerability levels and implications. They often prevent policymakers from accessing socio-economic data at a more localised scale, making it highly challenging to map areas where high levels of exposure and socio-economic vulnerability overlap.

Lived experiences would enrich the vulnerability insights.

While the JRC's dashboard provides a valuable overview of vulnerability, there are challenges in applying it to try to fully capture the complexities of climate vulnerability at the individual or community level. As a complementary approach, bottom-up assessments — where diverse social groups share their experiences and needs — can reveal insights that quantitative data may overlook (e.g. the unique challenges faced by people often undocumented in official systems, including migrants, homeless people or those who slip through social safety nets).

Through participatory engagement, policymakers could gather qualitative data on people's lived experiences of climate impacts. This would enrich the evidence base for locally tailored adaptation measures that address root causes of vulnerability and effectively build resilience (Breil et al., 2018).

8.2.3 On the integration of justice in the adaptation policy cycle

This report represents a call to prioritise justice from the very beginning of adaptation processes.

A key finding of this report is that adaptation processes and strategies must prioritise justice from the outset, ensuring equitable outcomes that address the

needs of marginalised communities. This finding is supported by a wide number of scientific studies that indicate that integrating justice as a core component is crucial for achieving fair and effective adaptation results (Bertana et al., 2022; Coggins et al., 2021; Peck et al., 2022; Walker et al., 2024; Araos et al., 2021).

Recognising just resilience explicitly as a key principle offers a way forward for adaptation planning at the national, subnational and local levels. Furthermore, consideration for intersectionality within assessments will help policymakers to have a better understanding of the different kinds of vulnerabilities in their areas. Adaptation measures should be co-developed with diverse societal groups, informed by social vulnerability mapping and grounded in an inclusive recognition of their values and worldviews.

There is a need to resolve the tension between acting with urgency and taking the time required to integrate justice properly.

As the EUCRA notes, the current pace of adaptation is not fast enough; there is an increasing urgency to accelerate planning and implementation. Speed is therefore of the essence. However, this creates a potential tension with the simultaneous need to position just resilience as a core element of adaptation action. This is because essential 'justice-related' data are still missing. As such, there is still only partial understanding of the topic and methods and capacities to embed justice are still under development.

Additionally, time is needed to build procedural and recognitional justice dimensions into actions to identify, establish trust with and where necessary build the capacity of vulnerable groups in order for them to be able to participate meaningfully. Unless justice is mainstreamed in this way, there is a significant risk of maladaptation, which could lead to increased vulnerabilities and disproportionate impacts on certain social groups. As such, it is essential to stress the fact that consideration for justice may make adaptation efforts more effective (EEA, 2024b; IPCC, 2022a; Lager et al., 2023; Bednar-Friedl et al., 2022). Recognising this may make it more politically acceptable to build in more time for the process.

Existing policies and funding mechanisms should be leveraged to support just resilience objectives.

Existing policies and funding mechanisms have the potential to support just resilience objectives, even if they have not been explicitly designed for this purpose. A European Parliament-commissioned study (2024) analysed a set of EU mitigation policies and funds to determine how they address the needs of specific social groups; it found that a substantial range of social groups was targeted.

Additionally, greater integration of insights and lessons learned from just transition into policies for just resilience would be highly beneficial. Such an analysis could help identify remaining justice gaps and explore ways to strengthen and align existing policies with just resilience principles more effectively.

Finally, in the absence of a dedicated financial mechanism to support just resilience measures, it may be worthwhile to explore how just resilience objectives can be more explicitly integrated into existing funding instruments (e.g. the CF or new funding streams to support the Renovation Wave).

It is essential to ensure that justice is strongly embedded in existing and forthcoming policy frameworks, including the forthcoming European climate adaptation plan.

Just resilience considerations could be integrated to a greater extent into EU cohesion policy more broadly and cohesion reports specifically. The inclusion of mapping and analysis of regions exposed to or impacted by climate change in the 9th cohesion report (EC, 2024c) is a good starting point; however, more insight into adaptive capacity would be valuable.

In addition, the EC's European climate adaptation plan provides a critical opportunity to integrate justice into national adaptation processes, strategies and plans. Expected in 2026, the plan could provide the much needed guidance and tools for enhancing preparedness, competitiveness and resilience. In addition, the plan offers a chance to ensure fairness and inclusivity, leaving no one behind. To be successful, however, it requires the thorough integration of justice considerations at every stage of the planning process, supported by a sound understanding of social vulnerability across the EU and the potential justice implications of all proposed measures.

8.3 Priorities for Action

Based on the information given above and overall conclusions throughout this report, the priorities for action are summarised in Table 8.1.

Table 8.1 Priorities for action at three governance levels

EU level	Member State level	Subnational level
• Make available **dedicated funding** or leverage existing funding.	• Explicitly integrate justice in **national-level adaptation policies and laws**.	• **Prioritise justice** from the very beginning of the planning process.
• Gather **comprehensive EU-wide data**.	• Consider just resilience in **related policies and laws** (for example energy and building policies).	• Actively engage vulnerable groups in **an inclusive and meaningful way**.
• Develop a common definition and **assessment framework**.	• Prioritise the inclusion of vulnerable groups in adaptation planning and ensure they have **fair access to adaptation measures**.	• Implement **targeted adaptation measures**, recognising that individual level-measures in particular may result in injustice.
• The **European Commission's climate adaptation plan** (ECAP) will be a key opportunity to integrate justice into national adaptation processes, strategies and plans.	• Develop **national-level monitoring frameworks** to assess the progress.	• **Tailor information and capacity-building measures** at the level of abilities and needs.

Abbreviations

AI	Artificial intelligence
CAP	Common agricultural policy
CSP	CAP Strategic Plan
CBA	Cost-benefit analysis
CDP	Carbon Disclosure Project
CF	Cohesion Fund
CFDT	Confédération française démocratique du travail
CFTC	Confédération française des travailleurs chrétiens
CPR	Common Provisions Regulation
CRISS	Complementary redistributive income support for sustainability
DWD	Drinking Water Directive
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
EEA	European Environment Agency
EESC	European Economic and Social Committee
EFS+	European Social Fund Plus
EGF	European Globalisation Adjustment Fund
EGUM	Expert Group on urban mobility
EIB	European Investment Bank
EIGE	European Institute for Gender Equality
EIONET	European Environment Information and Observation Network
EPBD	Energy Performance of Buildings Directive
EPRS	European Parliamentary Research Service
ERDF	European Regional Development Fund
ERU	Equivalent Residential Unit
ETC CA	European Topic Centre on Climate change adaptation and land use, land-use change and forestry
ETS	Emissions Trading System
EU	European Union
EUCRA	European Climate Risk Assessment
EU-OSHA	European Union Agency for Occupational Health and Safety at Work
EWS	Early-warning system
FAO	Food and Agriculture Organization of the United Nations
FRA	European Union Agency for Fundamental Rights
FRTP-EFPW	Regional Employers' Federation of Public Works
GCoM	Global Covenant of Mayors
GDP	Gross domestic product
ICT	Information and communications technologies

IPCC	Intergovernmental Panel on Climate Change
IPP	Individual Property Protection
JRC	Joint Research Centre
JTF	Just Transition Fund
JTM	Just Transition Mechanism
KSA	Klimatsårbarhetsanalys
KTM	Key Type Measures
LCAP	Local climate adaptation plan
NbS	Nature-based solutions
NECP	National Energy and Climate Plans
NECPR	National Energy and Climate Progress Reports
NGO	Non-governmental organisation
M&E	Monitoring and evaluation
OECD	Organisation for Economic Cooperation and Development
PA	Precision agriculture
PEPI	Local and Interior Spaces Programme
RES	Renewable energy sources
SCF	Social Climate Fund
SDG	Sustainable Development Goals
SOTERIA	Solutions and Technologies for Regions through Insurance for climate Adaptation
SSAC	Spain's Combined Agricultural Insurance System
SUMP	Sustainable urban mobility plan
TEN-T	Trans-European transport network
The Covenant	EU Covenant of Mayors
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UPPER	Unleashing the potential of public transport in Europe
WFD	Water Framework Directive
WHO	World Health Organization
WRS	Water Resilience Strategy

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Annex 1 Glossary of key concepts

This glossary of terms provides an easy-to-access list of how key terms are used within this report.

Table A1.1 Glossary of key concepts

Adaptation	The process through which resilience is achieved, involving the implementation of measures to adjust to the effects of climate change
Distributional justice	A concept to ensure the fair allocation of resources and burdens from climate impacts and adaptation efforts, ensuring that vulnerable communities are protected and not disproportionately affected
Equality	Treating everyone the same, regardless of different individual needs, circumstances or starting points, which does not necessarily result in the same outcomes
Equity	Recognising that people have different circumstances and allocating resources or opportunities accordingly to reach a fair outcome; addressing fairness in the societal distribution of burdens and benefits, across determinants and outcomes, to reduce disparities for the most disadvantaged
Exposure	The extent to which systems are exposed to significant climatic variations
Fairness	Linked to the distribution of benefits and burdens in society
Intersectionality	Overlapping and compounding risks from ethnicity or racial discrimination, gender, age or disability, etc. which contribute to systemic injustice and social inequality
Justice	A concept to help address the systemic and structural issues that perpetuate inequalities, focusing on transforming the underlying causes of injustices in adaptation efforts
Just resilience	A concept to help address the uneven impacts of climate change and ensure that vulnerable individuals or social groups benefit fairly from adaptation responses and are not disproportionately burdened, including tackling systemic inequalities, ensuring fair access to resources and decision-making and ensuring recognition of diverse perspectives and values
Just transition	A concept to ensure that the shift toward a climate-neutral society does not leave behind regions dependent on high-emission industries or vulnerable social groups
Leaving no one behind	A concept to ensure that all social groups are included and benefit from adaptation responses, with fair processes and outcomes
Maladaptation	Adaptation actions that unintentionally increase vulnerabilities or inequalities, thereby undermining sustainable development and social equity
Procedural justice	A concept to ensure fair, transparent and inclusive decision-making processes that respect participants' rights and promote meaningful engagement, especially for those with lower political power
Recognitional justice	A concept to ensure that diverse values, cultures and perspectives are respected and integrated in assessing climate impacts and designing adaptation actions and that deeper causes of inequity are addressed
Resilience	A state achieved through adaptation, referring to the ability to handle the impacts of climate change
Social fairness	A concept to support reductions in social inequalities and disparities, closely related to the distribution of adaptation benefits and burdens
Social vulnerability	The internal and external characteristics that lead to individuals or social groups being disproportionately affected or impacted by climate change
Sustainability (and/or Sustainability transitions)	A concept to support a better understanding of the socio-economic dimensions of sustainability transitions, including the justice dimensions therein
Uneven burden	A concept referring to the unequal distribution of climate impacts and risks due to differences in exposure, vulnerability and adaptive capacity and capabilities that result in exacerbated impacts and increased vulnerabilities for certain groups
Vulnerability	The degree to which systems or groups of people interacting with systems are susceptible to or unable to cope with the adverse effects of climate change, including climate variability and extremes

Annex 2 Complementary workstreams

Several complementary workstreams by the EEA and its ETC CA have accompanied the development of this report. Elements have been incorporated into it. Work has included:

- consultations with the European Environment Information and Observation Network (EIONET), including an EIONET enquiry;
- several Climate-ADAPT case studies, with summaries found within the relevant chapters;
- a podcast series ([25]) developed together with the EIB;
- a panel session focused on just resilience at the 2024 European Resilience Forum.

Box A2.1

Related EEA knowledge products

This report builds upon previous work by the EEA together with the ETC CA on the topic of just resilience, including:

- *Just Resilience for Europe: Towards Measuring Justice in Climate Change Adaptation* (Lager et al., 2023);
- Just resilience briefing (EEA, 2023b);
- 'Leaving No One Behind' Just Resilience scoping paper (Breil et al., 2021);
- Social Vulnerability to Climate Change in European Cities scoping paper (Breil et al., 2018);
- *Unequal exposure and unequal impacts* report (EEA, 2018).

It also builds on broader justice in sustainability transitions work which aims to better understand the socio-economic dimensions of sustainability transitions, including the justice dimensions therein. Recent publications include the report *Just Sustainability Transitions — From Concept to Practice* and the briefing 'Delivering Justice in Sustainability Transitions' (EEA, 2024e, 2024a).

Furthermore, the recent EUCRA highlights justice aspects of several climate change risks (EEA, 2024b).

The issue of health and adaptation is thoroughly addressed as part of the European Climate and Health Observatory. Justice aspects of the relationship between water and health are specifically covered in a 2024 EEA report *Responding to climate change impacts on human health in Europe: focus on floods, drought and water quality*; this pays special attention to vulnerable social groups (EEA, 2024f). Meanwhile, a 2024 report on *Europe's state of water 2024* discusses the distributive impacts of water policy on various social groups, including households and farmers. A 2022 EEA report focuses on heat and infectious diseases (*Climate change as a threat to health and well-being in Europe: focus on heat and infectious diseases*) (EEA, 2022d).

([25]) Episode 1: 'What is "just resilience"?';
Episode 2: 'What are countries doing about climate adaptation?';
Episode 3: 'The future of climate adaptation'.

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