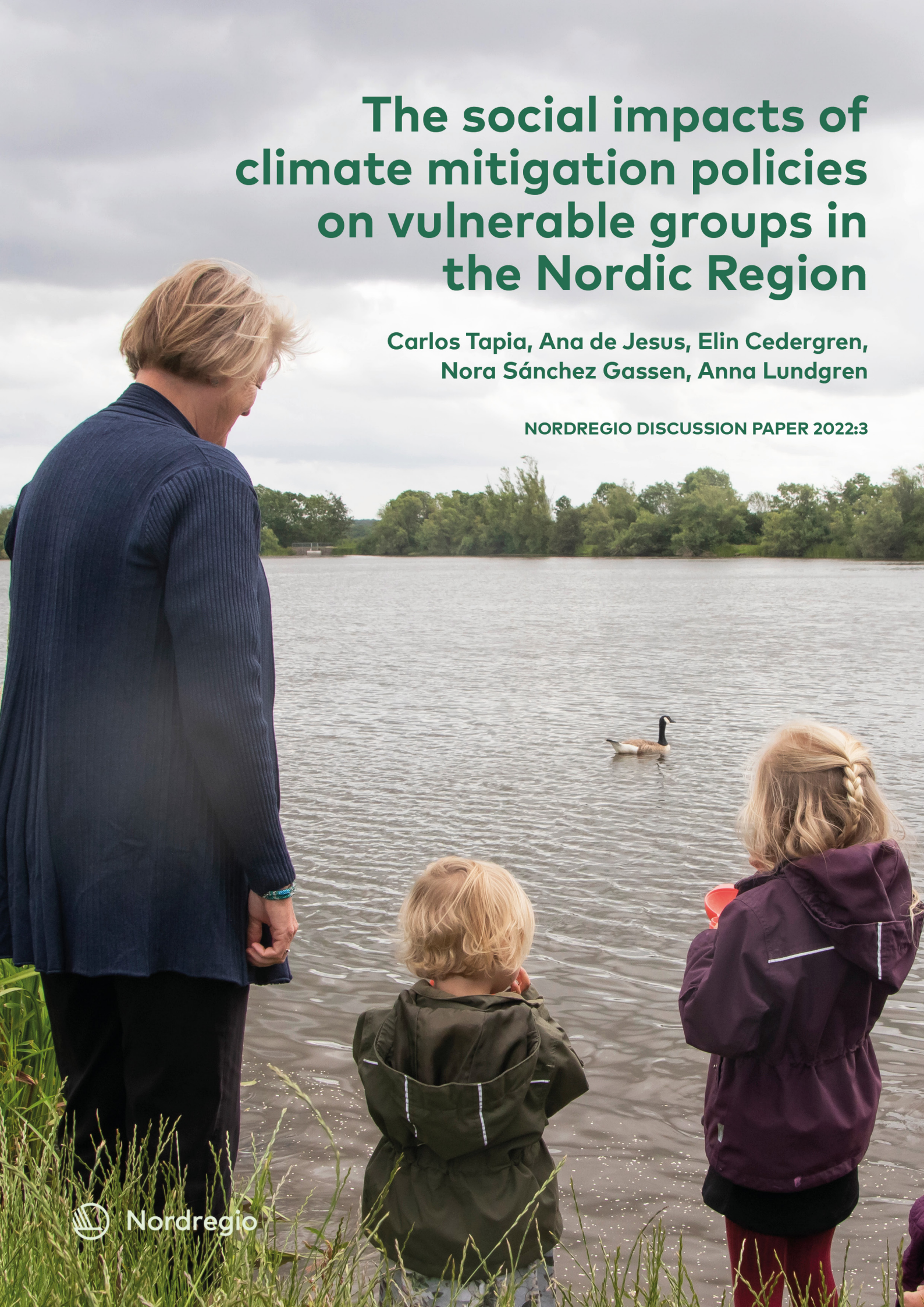
The social impacts of climate mitigation policies on vulnerable groups in the Nordic Region

Carlos Tapia, Ana de Jesus, Elin Cedergren,
Nora Sánchez Gassen, Anna Lundgren

NORDREGIO DISCUSSION PAPER 2022:3



Nordregio

Contents

Executive summary

This report is one of the first outputs from the project *Not Just a Green Transition – Examining the path towards a socially just green transition in the Nordic Region* (acronym: *NJUST*). Nordregio leads the project on behalf of the Nordic Council of Ministers. As its name suggests, NJUST focuses on the *just green transition* in a Nordic context. This concept has emerged as a highly relevant societal and policy goal, but one that, due to its complexity, faces challenges in terms of operationalisation.

Among the just green transition's building blocks are the policies geared at climate mitigation. These *climate mitigation policies* are designed to meet the climate targets and implement related policy instruments. As such, they include a broad collection of agreements, laws, protocols and measures, ranging from climate laws to sectoral policies and regulations approved at different governance levels.

This report focuses in particular on the impacts of climate mitigation policies on individuals belonging to specific target groups in the Nordic Region**.** These groups were selected according to their potential sensitivity to the impacts of climate mitigation policies, and are delimited as follows: *unemployed persons and those at risk of unemployment; older adults; children;* and *persons with disabilities*.

The analysis is conducted within a conceptual framework developed by the International Panel for Climate Change (IPCC) for the purpose of analysing climate risks. The focus is on *social vulnerability*, understood as sensitivity or susceptibility to harm and the lack of capacity to cope with or adapt to climate mitigation policies. However, in order to make the analysis more relevant from the policy perspective, we also consider other elements included in the *risk construct*, such as the potential *effects* of climate policies, the *hazards* and the *exposure* of the target groups to such impacts.

The main research method used in this report is a literature review of academic publications, legal documents and grey literature. There exists a very large corpus of literature that explores the effects of climate change on different groups in society and on individuals. However, the focus of this report is on the impact of climate change mitigation *policies* on the target groups, not of climate change as such. This literature is substantially more specific and limited. In total, we reviewed 146 academic papers, 25 reports, and no less than 30 legal documents.

For instance, although there are many papers focusing on the potential impacts of climate mitigation policies on labour markets, virtually none of the reviewed works focus specifically on **unemployed people** and **persons at risk of unemployment**.

When it comes to the balance between the jobs that will be created and those that will be destroyed, the findings are overall mixed, and generally not specific to the Nordic Region. The most generalised conclusion is that even if climate mitigation policies probably imply a profound reconfiguration of labour markets, their net effects in terms of total number of jobs will be rather modest, even if positive.

The impacts on the labour markets will materialise in four general situations, based on how the different industries are affected: some jobs will be eliminated without direct replacement, some will be substituted, some will be created in emerging sectors, and some will be transformed.

In the short run, the biggest impact on the labour markets is expected in the energy-related sectors. In the medium term, effects will be felt on the economy as a whole, as production systems adjust. However, the biggest effect is expected in the long run, when a widespread structural adjustment will take place.

Training and reskilling stand out as the most important tools to mitigate the potential adverse effects of climate policies on labour markets, particularly for the most vulnerable workers. Public administrations should adopt a proactive approach and provide unemployed people and persons at risk of unemployment with the skills required by emerging sectors in a carbon-neutral economy.

The literature exploring the climate policies' socioeconomic impacts beyond the labour markets is quite limited. This is the case for most of the remaining target groups in this research. Moreover, the literature does not consider some of our target groups as being intrinsically vulnerable to climate mitigation policies. This applies in particular to **older adults**, who according to the literature could only be considered vulnerable to these policies if co-occurring factors apply.

For instance, older adults in lower income strata are particularly susceptible to some degree of energy poverty. Keeping up heating during the winter and maintaining cool environments during the summer can be particularly challenging for this group due to their physiological needs. Similarly, increasing fuel prices may limit the ability of older adults, particularly those living in rural areas, to retain their desired levels of mobility.

The existing literature does not in general recommend specific policies to mitigate the impacts of climate policy on older people. Rather, the focus is on how policies are discussed, adopted and implemented.

Along these lines, the reviewed literature does not identify substantial impacts of climate policies on **children and younger generations**. Instead, most emphasise the potentially positive effects (co-benefits) of climate mitigation policies on this target group.

By contrast, several documents highlight the potential impacts of Nordic climate mitigation policies on children in the Global South. On these grounds, the literature stresses the importance of increased transparency and traceability in international supply chains for the primary and secondary raw materials required for energy transition, particularly those produced in low-income countries and conflict areas.

However, the most relevant consequences of climate mitigation policies for young and children are deemed to be those that occur indirectly, via the impacts on adults in shared households (potential loss of income due to increased energy prices, parents' emotional distress related to potential job loss or deteriorating labour conditions, etc.).

Most of the literature advocates a coordinated policy mix that only addresses children´s biological vulnerability to climate change, but also offers proposes a more meaningful and diversified participation of children and younger generations in climate debates.

The literature focusing on **people with disabilities** focuses on the human rights of persons with disabilities, including access to health, food, water and sanitation, housing, decent work, freedom of movement and personal development.

Several works express concern at the impact of climate policies on *disabled households*. The literature also recognises that specific measures linked to green transitions and climate policies may disproportionally affect this group, e.g. the

environmental consumption regulations related to some product categories, like the ban of single-use plastics.

Several papers agree that mainstreaming the core principles and standards from international human rights treaties into all policies and national programmes focused on climate change would enable more inclusive climate action.

Considering the lack of awareness among policy-makers regarding the specific needs of this group, the participation of persons with disabilities and the organisations that represent them is seen as a requirement for more effective policy action across the board.

In general, the social acceptability of climate mitigation policies, from international burden-sharing agreements to national social contracts, depends on their ethical implications. If people perceive that the burden of climate mitigation policies is disproportionally placed on specific regions, social groups or income categories, the acceptance of these policies will be hampered and their effectiveness will be undermined.

Still, the literature agrees that climate and social policies can go hand in hand. The different studies reviewed in this work show how climate policies may actively contribute to generate social benefits beyond job creation and economic benefits.

1. Introduction

This report is part of *Not Just a Green Transition – Examining the path towards a socially just green transition in the Nordic Region* (acronym: *NJUST*), a Nordic research project funded by the Nordic Council of Ministers. The report contextualises the notion of a *just green transition* in the Nordic Region, and elaborates on how climate policies can be implemented in such a way that the transition does not negatively harm vulnerable groups in society.

In general, there is scientific consensus that climate change is affecting individuals – and in particular, the most vulnerable social groups, as defined by the IPCC (2007, 2022b; 2014). However, the vast majority of the existing policies put in place to mitigate the effects of climate change, and their associated tools, focus exclusively on emission reduction potentials and aggregated economic costs. Few of these policies consider their direct and indirect impacts on stakeholders or define actions to mitigate such impacts (Casillas and Kammen, 2012). This omission is critical, since climate change mitigation policy can influence vulnerable social groups either positively or negatively, depending on how the policies are designed and implemented (Markkanen and Anger-Kraavi, 2019). For these reasons, it is recommended that climate mitigation goes hand in hand with other policies, to ensure that pursuing climate targets does not lead to negative impacts on vulnerable groups (IPCC, 2022a).

The *just green transition* emerges as a policy and societal concept in support of this goal. However, it faces difficulties in terms of operationalisation. The phrase is made up of three complex terms. The word *just* refers to social justice. This concept implies a variety of perspectives and types of values, including distributional, recognitional, spatial and procedural aspects, all of which are interconnected. The term *green* indicates that a green transition involves a shift to a green economy, which can be defined as an economic context in which prosperity and social equality increase, while pressures on the environment and ecological damage simultaneously decrease. The term *transition* refers to a process of socio-technical change encompassing transformations in economy, infrastructure and technology, but also social and cultural systems and governance. A just green transition is hence defined as *a process of far-reaching sociotechnical change leading to a green and climate-neutral economy that preserves biodiversity and ensures social justice* (for a more comprehensive definition, see Cedergren et al., Forthcoming).

This work analyses the Nordic just green transition from the perspective of a set of target social groups, including *unemployed persons and those at risk of unemployment*, *older adults*, *children* and *persons with disabilities*. Based on a diverse literature review, comprising peer-reviewed academic papers, legal documents and unpublished reports, the report explores how climate mitigation policies may impact these social groups, both positively and negatively, and thereby sheds light on how such policies may contribute to a just green transition in a Nordic context.

Photo: Mammut Media, norden.org

2. Goal and scope

The overall aim of this report is to enlarge the knowledge base of the potential impacts of *green transitions,* specifically *climate transitions* and *climate mitigation policies*, on specified target social groups. These include *unemployed persons and those at risk of unemployment*, *older adults*, *children* and *persons with disabilities*. Different sectors in the Nordic Council of Ministers identified these groups as being *potentially vulnerable* to climate mitigation policies on various grounds.

In addition to these groups, the present analysis considers two cross-cutting dimensions, namely the gender perspective and the spatial dimension of climate change policies. When it comes to gender, the analysis does not consider gender as a vulnerability dimension per se, but rather embraces, for conceptual and instrumental learning, the connection between sex and gender(+) approaches on the one hand, and climate policies on the other (Sauer and Stieß, 2021). Spatial aspects are considered in terms of the capacity of climate policies to increase disparities and undermine social justice through amplified spatial disparities or the uneven allocation of the burden of climate policies.

The analysis focuses on the Nordic Region, including all of the Nordic countries – Denmark, Finland, Iceland, Norway and Sweden – and the self-governing territories of Faroe Islands, Greenland and Åland.

The focus in this research is therefore not on the impact of climate change as such, but on the impact of climate mitigation policies on the specified social groups. By *climate mitigation policies* or simply *climate polices*, we mean any economic or environmental policy designed to meet climate targets and thereby enable climate transitions. These policies may have been designed and approved within individual Nordic countries and/or designed and agreed at the international level, most prominently the European Union (EU) and United Nations (UN) policy frameworks. Typically, these policies may include any of the following:

- Regulatory instruments: These include environmental regulations that have been specifically designed to meet climate goals, mostly affecting production technologies (e.g. emission limits on specific activities) and product standards (e.g. energy-efficiency requirements for new buildings or vehicles). The category also includes measures and regulations that may affect whole sectors (agricultural policy), and cross-sectoral regulations that may affect a range of economic activities (land use planning) and enforce behavioural change (transit regulations).
- Market instruments: These include a range of policy instruments whose main goal is to meet the climate targets by incentivising the adoption of greener

technologies, products or services. This is done by combining different subsidies and forms of taxation with other market-based instruments, like tradeable permits, with a focus on either the economy as a whole or specific sectors. This category also includes carbon bonds and other finance tools increasingly used by financial institutions to favour green investments.

- Voluntary actions: This category includes measures and non-binding agreements between different public or private organisations that aim to achieve environmental objectives or to improve climate performance beyond compliance with existing laws or regulations.

All of these policy instruments require substantial public and private investment, and can lead to chain effects that affect a range of stakeholders at various levels.

The specific objectives of this study are as follows:

- To characterise the ongoing decarbonisation process of the Nordic economies, including their production and consumption components
- To produce an overview of the climate policies and climate targets currently in place in the Nordic countries
- To increase awareness on the potential socioeconomic effects of climate policies on a range of target social groups
- To describe the processes by which individuals in these groups may be impacted by climate policies.

Photo: Unsplash.com

3. Concepts and definitions

Before jumping into the exploration of the effects of climate policies on our target groups, it is important to clarify what we mean by *just green transition* and related concepts such as *social justice* and *climate transitions*. It is also important to propose a conceptual framework that can help to understand how such transitions may affect the specified social groups.

3.1. What is a just green transition?

As discussed in the previous report in this series, *Just Green Transition*: *Key concepts and implications in the Nordic Region* (Cedergren et al., Forthcoming), the notion of a just green transition is based on three conceptual building blocks: *social justice* (just), *environmental sustainability* (green) and *socio-technical change* (transition). These concepts are weighted and operationalised in different ways depending on the context.

The labour union movement formalised the expression *just transition* in the 1990s. Initially, the concept was understood as a set of measures supporting workers who lost their jobs due to processes of industrial transformation (Smith, 2017). The view was based on the often-traumatic experiences of American workers affected by industrial decline and conversion in the Rust Belt, as well as those who lost their jobs during the transformation of the Appalachian coal industry during the 1970s and '80s. In this context, the unions demanded support from the federal government to *mitigate* the impacts caused by the discontinuation of different types of extractive and industrial activities (Abraham, 2017; CSIS and CIF, 2020). This somewhat narrow interpretation of a just green transition as a process that deploys a set of corrective measures to assist workers whose jobs are lost during processes of industrial conversion is the interpretation that prevailed in research and policy documents published in early 2000s.[1]

The concept was later enlarged towards a more comprehensive interpretation, within the broader framework of *environmental justice* and *transition governance*, as a "deliberate effort to plan for a transition to environmentally and socially sustainable economies" (Smith, 2017). Environmental and social movements

1. For example, in one of the preliminary assessments of the socioeconomic impacts of the Kyoto Protocol on the Canadian economy, Bailie et al. refer to a *just transition* as a shift "to a technologically and environmentally advanced economy" that "would offer policy assistance and support to workers who would otherwise be dislocated during the beginnings of this transition" (Bailie et al., 2002: 14).

endorsed this notion as being key to not only *mitigating*, but also – and primarily – *preventing* the adverse social impacts of climate change mitigation policies.

In the aftermath of the Copenhagen COP, the international union movement began arguing that this concept should be explicitly acknowledged in future climate agreements. This was finally achieved in the Paris Agreement, the preamble of which explicitly included the concept: "Taking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs…" (UNCCC, 2015, Preamble).

In Europe, the notion of a just transition was first adopted in Germany as a response to the phasing out of coal extraction in the Ruhr area (Abraham, 2017). The EU Initiative for Coal Regions in Transition of 2017 upscaled the German example to the EU level, bringing together regions and stakeholders from member states affected by "challenges related to the transition to a low-carbon economy" in coal, peat and oil shale regions (EC, 2017). The framework later became central to EU policy when a Just Transition Mechanism was created as one of the pillars of the European Green Deal. The Mechanism is set to mobilise 55 billion euros over the period 2021–2027, to alleviate the socioeconomic impact of the transition in these regions (European Commission, 2021). In this instance, the concept was operationalised as "a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind".

Against this framework, here we embrace a broader interpretation of the concept of *just green transition* as one that includes social actors beyond the workers themselves, and considers potential measures that are not necessarily corrective in nature, but also proactive, preventive and community-driven, as opposed to the top-down measures prescribed by mainstream policies. Our interpretation is aligned with the definition currently endorsed by the international labour movement, in which the just transition is understood as "a conceptual framework in which the labour movement captures the complexities of the transition towards a low-carbon and climate-resilient economy, highlighting public policy needs and aiming to maximize benefits and minimize hardships for workers and their communities in this transformation" (Rosemberg, 2010: 141).

3.2 A note about social justice

In order to implement green transitions that "do not leave anyone behind", the principle of *social justice* must be safeguarded. One of the key enablers of social justice is an egalitarian distribution of income and wealth, or *distributional justice* (Jackson, 2005). The guiding idea is that economic inequalities should be reversed by means of redistributive policies and equal opportunities for all individuals (Rawls, 1971). Other important enablers of social justice are aspects related to *procedural justice* (how decisions are taken) and *recognitional justice* (the extent to which people's demands are heard). These principles emphasise the capacity of all individuals and social groups to influence decision-making processes, avoiding practices of institutional domination or subordination (Cambou, 2020).

In the context of the transition to low-carbon energy systems, the scope of social justice has been expanded to also encompass *cosmopolitan justice*, which recognises the universal applicability of the principles of social justice, independent of nation or region of belonging (McCauley et al., 2019). This harmonises well with the notion of *spatial justice,* as discussed by Dikeç and others (2001). Equally relevant in a context

of just green transitions are the notions of *environmental justice*, *climate justice* and *energy justice* (McCauley and Heffron, 2018). Decarbonisation processes require that attention is paid to several types of justice (Upham et al., 2022).

All these concepts are intrinsically related to how the positive and negative social impacts of climate mitigation policies may affect different social groups and territories. In a just transition, these should be distributed according to the principles of utility, equality, proportionality, priority, merit and rights (Bennett et al., 2019). Policies for a just green transition should therefore be designed to prevent social impacts or, when this is unavoidable, to ensure that the impacts are distributed guided by the abovementioned criteria.

3.3. Risk and vulnerabilities

In order to analyse in what ways and to what extent the target groups are vulnerable to the potential impacts of climate policies, it is necessary to explore the causal links between climate mitigation policies and the individual social spheres. In support of this task, the project draws on some of the most extensively deployed concepts in the literature on climate adaptation – namely *risk*, *hazards*, *exposure* and *vulnerability* (Figure 1).

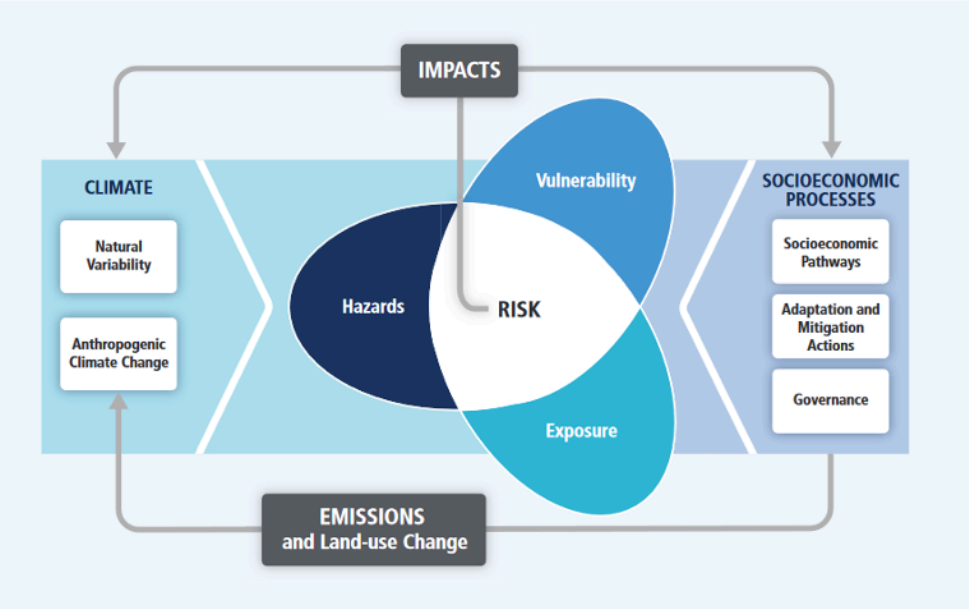


Figure 1. The role of vulnerability in the construction of climate risk, as depicted in the AR5 (IPCC et al., 2014)

According to the conceptual model developed by the Intergovernmental Panel on Climate Change (IPCC), it is important to differentiate external factors contributing to climate *risks*, including climate *hazards*, from those capturing the intrinsic characteristics (*vulnerability*) or behaviour of social groups (*exposure*). Combined, these three factors generate climate risks. Of these concepts, the one that seems most relevant to this research is the notion of vulnerability, defined as "the propensity or predisposition to be adversely affected" (IPCC, 2014, 2022b). This definition has three important implications:

The first is that vulnerability, along with the other concepts implicit in the definition of risk, is an intellectual construct. None of these concepts, but particularly vulnerability, can be directly measured. Although the intuitions behind the concepts are generally well understood, their formalisation in a scientific framework requires consensus-building processes involving a range of stakeholders with different backgrounds and expertise. These processes can be highly contextual and often lead to alternative definitions of the same concepts, and to a lack of universally accepted metrics or frameworks to monitor them.

The second implication is that the constituents of risk in this framework are themselves formed by other components and interactions. The notion of vulnerability "encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (IPCC, 2022b). This implies that the social vulnerability construct is to be understood and analysed by combining different dimensions that operate in the opposite direction. In general, the more *sensitive* individuals and groups are to the impacts of climate polices, the greater their vulnerability. Inversely, the greater the *capacity* of individuals or social groups *to cope*, *adapt* to and *recover* from the potential impacts of climate mitigation policies, the less vulnerable they are.

The third and equally important implication is that the concept of vulnerability is a wholly intrinsic feature of the exposed populations or assets. Unlike the other two constituents of risk, which depend on external stressors, vulnerability solely depends on the inherent characteristics of individuals or social groups. Therefore, in order to characterise the vulnerabilities of our target groups to climate polices, it is essential to understand which fundamental characteristics could make those groups more *sensitive* or less *capable of adapting* to climate mitigation policies.

Against this background, our analysis evolves towards a broader risk perspective (Cardona et al., 2012; Sygna et al., 2004). Where relevant, we explore the generic effects of climate mitigation policies – *hazards* – as well as the different target groups' *exposure* to such policies.

4. Methodological overview

The NJUST project uses a combination of research methods and analytical techniques to triangulate the results and contribute to the analysis. This report is based on a literature review of academic papers, legal documents and grey literature.

First, we analysed scientific research papers retrieved from academic journals. The papers were collected by applying a series of search strings on the Scopus Abstracts and Citation Database. Table 1 summarises the search strategy.

Topic (policies OR transitions)	link	Topic (effects)	link	Topic (group)	Hits
("climate [mitigation] polic*" OR "just [green / energy / climate] transit*")	AND	(effect*OR impact* OR consequen* OR implicat*)	AND	("social vulnerab*" OR "vulnerabl* group*")	18
				(unempl* OR job*)	67
				(elder* OR old* OR senior*)	54
				(child* OR infant)	22
				(disabled OR disabilit* OR handicapped OR"special needs")	9

Table 1. Overview of the search strategy (academic documents)

The searches were developed in a scoping process. Alternative searches were tested in terms of number of results and relevance. The search strings were progressively narrowed down to a level that enabled a manageable number of relevant documents to be selected for detailed analysis. The initial searches ran in February 2022 and were subsequently updated in several iterations until March 2022. This strategy yielded a total of 146 single papers.

The team of researchers used a common template to process the documents. They also applied bibliometric tools classify the papers by time of publication, subject area, affiliation of researchers, etc. A succinct bibliometric analysis can be found in the appendix to this report.

Second, parallel to the review of academic literature, we collected and analysed published reports and non-published materials generated in the Nordic countries. These resources include reports produced by organisations representing the target groups, like civil organisations and advocacy groups, including organisations supporting workers' rights (e.g. trade unions). Relevant materials were also found by running ad-hoc searches on the Diva portal and other knowledge repositories. As seen in Table 2, these documents are distributed rather unevenly across the various research domains.

String	No. of hits	Key subjects
Climate polic*	244	Engineering and Technology (85) Environmental Engineering (77) Environmental Management (74) Social Sciences (56) Natural Sciences (34)
Climate polic* AND effect*	20	Natural Sciences (6) Social Sciences (6) Earth and Related Environmental Sciences (5) Engineering and Technology (5) Climate Research (4)
Climate AND impact	50	Engineering and Technology (20) Environmental Engineering (18) Environmental Management (17) Natural Sciences (15) Earth and Related Environmental Sciences (12)
Climate polic* AND vulnerab*	7	Social Sciences (8) Social and Economic Geography (3) Natural Sciences (1) Economics and Business (1)
Social impact* AND climate polic*	9	Social Sciences (8) Social and Economic Geography (3) Natural Sciences (1) Economics and Business (1)

Table 2. Overview of the search strategy (documents in the Norden Diva portal)

Thirdly, our review also considers selected policy documents, including strategies, plans, laws, regulations and other legal documents issued by public authorities under the UN and EU legal platforms, as well as by Nordic institutions. These were collected following direct exploration of government websites and looking at existing inventories of climate policies.

Photo: Unsplash.com

5. The climate transition in a Nordic context

This section describes the decarbonisation trajectories of the various Nordic countries, and elaborates on the specific challenges facing the different sectors and countries. It concludes by describing the policy frameworks developed to reduce greenhouse gas emissions in the Nordic countries.

5.1 Decarbonisation trajectories

The Nordic countries are export-driven economies with many similarities when it comes to green transition challenges in sectors like manufacturing, transport, energy and agriculture. At the same time, the countries are very diverse when it comes to emission profiles. Emission sources vary greatly between them due to their different energy systems and diverse economic and industrial structures.

In terms of absolute emissions by sector, the main challenges can be found in the oil and gas sectors in Norway, the forest and pulp industry in Finland, the aluminium industry in Iceland, and the steel industry in Sweden. The agricultural sector accounts for a significant portion of Danish greenhouse gas inventory, whereas all countries struggle with sectors that are more difficult to decarbonise, like maritime and air transport, and carbon-intensive industrial processes such as cement production, oil refining, basic chemicals, etc. Figure 2 provides an overview of decarbonisation trajectories followed by large economic sectors in the Nordic countries during the last three decades.

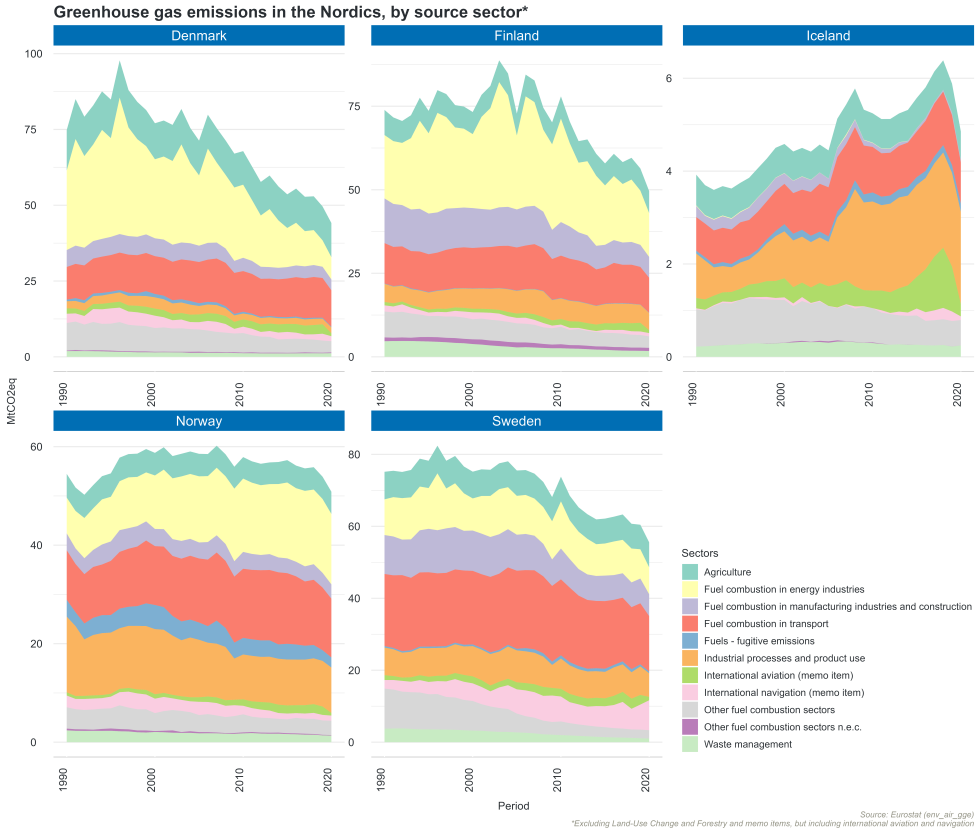


Figure 2. Greenhouse gas emissions in the Nordics, by source sector

The countries also vary in terms of the phases of transition of the various sectors. For example, Denmark has been a frontrunner in wind energy, Sweden in district heating and Norway in the electrification of land transport. Energy production remains emission-heavy in most countries, with the exception of Iceland. In the agricultural sector, emissions are mainly caused by intensive farming, primarily animal agriculture (pigs and cattle). Waste management is one of the least problematic sectors in the Nordic Region. While landfill sites for waste are prohibited, most countries valorise residual waste streams for the production of electricity and heating.

The Nordic countries' differences in geography and access to energy sources means that they have diverse challenges and opportunities in terms of cutting emissions. Norway, Finland and Denmark have access to their own fossil resources; while Finland and Sweden have large forested areas, which means that changing land use to create natural carbon sinks is a viable solution. The countries are also, to different degrees, dependent on specific industries that produce high emissions and require large amounts of investment, e.g. the aluminium industry in Iceland, the mining and automotive industries in Sweden and the forest industry in Finland. Unless disruptive technological solutions are found, some industries might need to be progressively phased out, such as oil and gas in Norway and the peat industry in Finland (Leinonen et al., 2020). Nevertheless, there are promising alternatives to these industries, such as wind (Mäkitie et al., 2019), and carbon capture and storage (CCS) (Swennenhuis et al., 2020), inter alia.

However, industry and transport are not the only sectors affected by the climate transition. The service sector also faces challenges. For example, the IT sector may affect and be affected by the climate transition through increased electricity prices that have an impact on data centres that enable digital streaming services, cloud computing, blockchain technologies and other energy-intensive developments. When

it comes to transport polices, all of the Nordic countries are facing very similar challenges, and have experimented with a range of incentives to reduce CO_2 emissions. For example, several countries are introducing biofuels into the energy mix (fuel blending), while Norway and Iceland are offering incentives to buy electric cars.

All in all, the pathways for reducing greenhouse gas emissions in the Nordic countries can be explained via each country's natural resource endowments, industrial structures and path dependencies in energy generation, distribution and consumption patterns, as well as the governance thereof (Weber & Søyland, 2020).

5.2 Climate mitigation policies

This section provides an overview of the key policies relevant to climate transition in the Nordic context. It begins with a classification of climate policies and then elaborates on the relevant climate policies in the Nordic Region.

5.2.1 Types of climate mitigation policies

The expression *climate policy* is rather ambiguous. It comprises both far-reaching international climate agreements and much more granular and targeted policies. In general, the international policy frameworks are enabled by policy instruments that are designed and applied at various levels, from multilateral organisations like the EU to regional or local administrations in each country. These policy instruments include a range of specific policy measures, with associated goals, that operationalise climate mitigation through ad-hoc laws and regulations.

There exist several taxonomies of climate mitigation policy instruments. Traditionally, these consist of four categories: *regulations and standards*; *taxes and subsidies*; *tradeable permits;* and *voluntary agreements*. Regulatory instruments include non-tradeable permits, technology standards, emission limits, product bans, and public direct investment. Taxes, charges, incentives and subsidies are often combined with tradeable permits in a broader category known as *market-based instruments*. Finally, voluntary agreements are defined between public and private legal entities to "achieve environmental objectives or to improve environmental performance beyond compliance" (IPCC, 2007).

This classification has been adopted and applied, with minor adaptations, by international organisations in the UN system, as well as by the OECD (Duvali, 2008). However, several of the taxonomies developed by sectoral organisations focus on some of these instruments while neglecting others. For example, the FMI has classified macroeconomic and financial policies for climate change mitigation into *fiscal*, *financial*, *monetary* and *sectoral* measures (Krogstrup and Oman, 2019).

Other inventories also add "soft governance" instruments to the previous list. A good example is the Climate Change Laws of the World (CCLW) database created by the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science, which classifies climate mitigation policy instruments into five broad groupings: *direct investments; economic instruments*; *governance instruments*; *information;* and *regulations* (Grantham Research Institute on Climate Change and the Environment, 2022).

All these typologies are based on four classification criteria, namely applied *governance frameworks* (hard instruments like laws or regulations vs soft governance, like incentives), main *funding mechanisms* (private vs public), the key

economic sectors targeted by the measures (industry, agriculture, etc.) and the *key actors* affected by the measures (businesses, citizens, specific social groups, etc.). Against this framework, this project has opted for an instrumental classification of policy instruments with a focus on the sectoral dimension. The taxonomy includes the following climate mitigation policy instruments:

- Overarching climate laws, plans and regulations
- Energy policies (electricity, heat, petroleum) focusing on the decarbonisation of energy production and consumption systems
- Private and public transport planning (including land, air and water) aimed at decarbonising the transport sector in all modalities
- Industrial policies (process and manufacturing industries) that target energy efficiency gains, often involving the transformation of entire industrial processes or value chains
- Building and construction policies and regulations, particularly those designed to increase the energy efficiency of buildings
- Housing and urban planning measures and regulations, in particular those that facilitate more efficient energy use in transportation and housing, and in general a more efficient use of space
- Agriculture and livestock, particularly measures aimed at enabling sustainable production and more effective energy use
- Forestry and land use policies, particularly those aimed at ensuring more sustainable forestry practices and more effective carbon stocking
- Waste management, particularly those targeting waste prevention, material and energy recovery, in this order.

This selection takes account of their overall alignment with existing classifications, their relevance in a Nordic context and their role in the construction of risk or potential impacts on the target groups, as described in Section 3.

5.2.2 International agreements to mitigate carbon emissions

International climate change mitigation policies have a long history. The United Nations Framework Convention on Climate Change (UNFCCC) sets the main international framework for mitigating greenhouse gas emissions and climate change. The UNFCCC was established in 1992 and entered into force in 1994. As of 2021, 197 parties have ratified the convention, implying near-universal membership.

Under the umbrella of the UNFCCC, the Kyoto Protocol was adopted in 1997 and entered into force in 2005. This was the first legal instrument for cutting greenhouse gas emissions at the international level. While the Protocol was ratified by 192 parties, the major polluters did not ratify the agreement, resulting in only 12% coverage of total global greenhouse gas emissions.

The Paris Agreement that entered into force in November 2016 was adopted by 196 parties and set the first legally binding international treaty on mitigating climate change. The overall goal is to limit global warming to well below 2°C compared to pre-industrial levels. However, the signatories committed to invest resources to limit global warming to below 1.5°C compared to pre-industrial levels.

The Paris Agreement works on a five-year cycle of climate action on the part of the countries. By 2020, the countries that ratified the agreement submitted their proposals for Nationally Determined Contributions (NDCs), which describe the actions to be taken at national level to reduce greenhouse gas emissions. The Paris Agreement also encourages countries to develop long-term development strategies

for low greenhouse gas emissions. A key feature of the agreement is to ensure transparent and efficient reporting systems on emission levels and the status of implementation of the agreement in each country (UNFCCC, 2015).

During the COP26 meeting in Glasgow in 2021, the parties took a number of decisions aimed at strengthening collective efforts to limit the global temperature rise to 1.5°C. The Glasgow Climate Pact strengthened efforts to build resilience to climate change, curb greenhouse gas emissions and provide the necessary finance for these goals (UNFCCC, n.d.).

5.2.3 The EU 2030 Climate and Energy Framework

The 2030 Climate and Energy Framework was introduced in 2014 (EU Council, 2014). The Framework defines a set of EU-wide targets and policy objectives for the period 2021–2030, including:

- At least 40% cuts in greenhouse gas emissions from 1990 levels
- At least 32% share for renewable energy of the EU's gross final energy consumption
- At least 32.5% improvement in energy efficiency.

The Framework establishes that efforts to meet the 40% greenhouse gas target should be distributed between the EU Emissions Trading System (EU ETS), the Effort Sharing Regulation (ESD), including Member States' emissions reduction targets, and the Land Use, Land Use Change and Forestry (LULUCF) Regulation.

In 2021, the European Commission adopted a series of legislative proposals, the *Fit for 55* legislative package, which aim to make the EU climate-neutral by 2050, and ensure a just and socially fair transition (EC, 2021a). The plan sets out to increase the ambition of many of the existing instruments of EU Climate Policy, including the following incremental proposals towards 2030:

- Increase the EU greenhouse gas emissions target to 55% compared to 1990 levels
- Increase the share of renewable energy in the Union's gross final energy consumption to 40%
- Increase the target for improvement in energy efficiency to 36% for final, and 39% for primary energy consumption.

The Fit for 55 package is currently under ´trilogue negotiation´ between the European Commision, the EU Council and the Europen Parlament (European Council, 2021).

On May 2022, in response to Russia's invasion of Ukraine, the European Commission launched a new Energy Strategy for Europe. The aims of the strategy, *REPowerEU*, are saving energy, diversifying energy sources and speeding up the planned transition to renewable energy sources. Some of the proposed targets go beyond those included in Fit for 55. Among other measures, REPowerEU proposes to raise the EU-wide renewable energy production target for 2030 from 40% to 45% of gross final energy consumption (EC, 2022b).

The EU Emissions Trading System (EU ETS)

The EU Emissions Trading System (EU ETS) is the world's first and largest carbon market, in which emission rights are traded across international borders (EC,

2022a). The ETS is a market-based scheme conceived to make large industrial facilities pay for the greenhouse gases released by their installations. The EU ETS is regulated under Directive 2003/87/EC. It works as a cap-and-trade system, which means that the companies involved are subject to an emission limit that decreases over time (a *cap*), and that companies can sell, buy and lend emission permits (a *trade*). Currently, the ETS covers power plants, large industrial factories and the aviation sector. CO_2 emissions from aviation within the European Economic Area (EEA) have been included in the EU ETS since 2012. The EU ETS system is based on transparent carbon auctioning and registry systems, and covers roughly half of all CO_2 emissions within the EU (Silbye et al., 2019).

The EU ETS has been deployed in different phases, starting in 2005. Carbon prices remained at very low levels until the fourth phase, starting in 2021. In this phase, the supply cap is set to decline at a rate of 2.2% each year. At the same time, free permits and other compensation systems that were accessible during previous trading phases were partially or totally removed, which resulted in a significant increase in the price of emission allowances. Since the EU ETS was introduced in 2005, emissions have been cut by around 43% in the sectors covered by emissions trading. The ambition is that sectors represented in the EU ETS should contribute a further 43% reduction of emissions by 2030, compared to 2005 levels (EU Council, 2014).

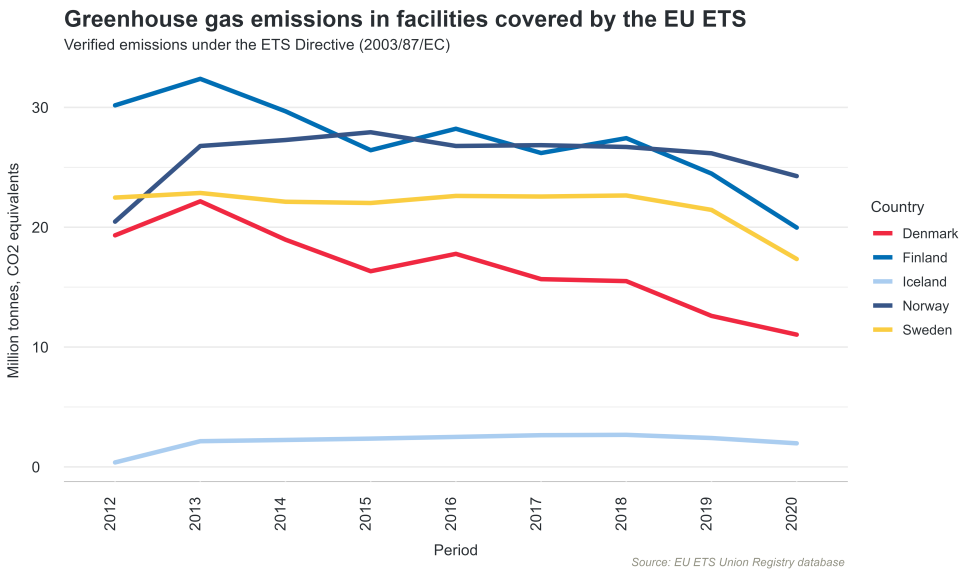


Figure 3. Verified greenhouse gas emissions of industrial origin in the Nordic countries

As part of the Fit for 55 package, the European Commission has proposed a set of comprehensive changes to the existing EU ETS that should result in an overall emission reduction in relevant sectors of **61% by 2030**, compared with 2005 (European Council, 2021).

The Effort Sharing Decision (ESD)

Most emissions outside the EU ETS fall under the Effort Sharing Decision (ESD), approved by Regulation (EU) 2018/842. This regulation covers activities like domestic transport, housing, agriculture, small industry and waste management, which are responsible for the vast majority of emissions outside the EU ETS. The 2030 Climate and Energy Framework of 2014 determined that these sectors of the economy must reduce emissions by 30% by 2030, compared to 2005 (EU Council, 2014).

Based on the comprehensive target for 2030, the ESD sets binding annual greenhouse gas emission limits for each signatory country for the period 2021–2030. The annual limits for greenhouse gas emissions per member state under the ESD are set out in implementing decision (EU) 2020/2126 for the EU member states (EU, 2020), and Decision of the EEA Joint Committee No 269/2019 for the EFTA countries (EEA Joint Committee, 2019). The calculation method for the national targets is based on GDP per capita, with a limited number of corrections to address cost-efficiency concerns in some sectors and countries. All of the Nordic countries, including Iceland and Norway, have committed to apply the current Effort Sharing Regulation (EU) 2018/842. Figure 4 shows the annual ESD targets agreed for the period 2021–2030 in all Nordic countries.

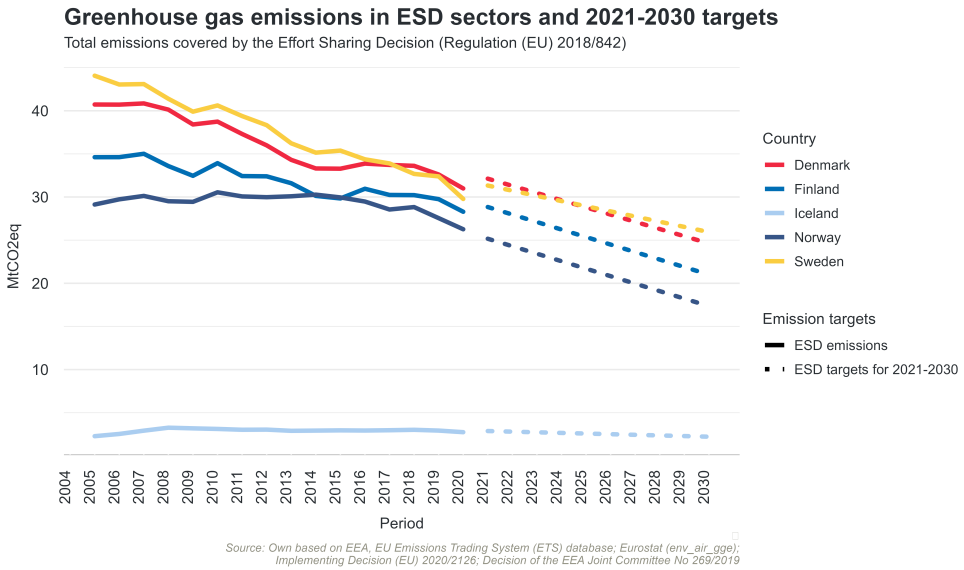


Figure 4. Greenhouse gas emissions and targets under the Effort Sharing Decision

As part of the Fit for 55 package, the European Commission proposed to increase the EU-level greenhouse gas emissions reduction target **from 30% to 40%**, compared with 2005 (European Council, 2021).

Emissions not covered by the EU ETS and ESD

The Land Use, Land Use Change and Forestry (LULUCF) Regulation (EU) 2018/841 defines the sector's role in terms of its contribution to the climate goals, and lays down the rules for the accounting of emissions and removals from LULUCF (EU, 2018). According to this regulation, the EU member states must ensure that greenhouse gas emissions from LULUCF are fully compensated by an equivalent removal of CO_2 from the atmosphere through action in the sector. This is known as the "no-debit rule". The no-debit rule means that the EU LULUCF sector is required

to capture an annual amount of CO_2 equivalent to no less than 225 million tonnes of CO_2. This implies that both the agricultural and LULUCF sectors are covered by national obligations that apply to the total emissions from non-ETS sectors.

Currently, there is no common climate regulation covering the agricultural sector at the EU level. However, this may change soon. The European Commission's Fit for 55 package already proposes to extend – starting in 2031 – the scope of the regulation to include agricultural non-CO_2 emissions, and to set an EU-level objective of climate neutrality by 2035 for the new combined land sector. The package also proposes to set an EU-level target for net removals of greenhouse gases of at least 310 CO_2 equivalent (MtCO2eq) of net greenhouse gases by 2030, to be distributed among the member states as binding targets.

Another net-emitting sector that is not currently covered by any binding greenhouse gas emission target, neither in the EU nor at the international level, is maritime transport. According to recent estimates, this sector accounts for almost 3% of global greenhouse gas emissions (IMO, 2020). For the time being, the emphasis at the EU level has been on monitoring, reporting and verification of CO_2 emissions from large ships using EU ports of call. However, it is expected that a forthcoming policy package targeting maritime transport will include binding targets for this sector.

5.2.4 Climate mitigation laws and policies in the Nordics

This section provides an overview of a selection of national climate and energy policies in the five Nordic countries. It also briefly covers the self-governing territories (Greenland, the Faroe Islands and Åland).

Climate frameworks and laws in the Nordic countries

In all Nordic countries, climate law sets the framework for the climate goals, climate policies and their implementation. The Nordic countries also have in place fiscal climate policy tools, such as energy and carbon taxes on fuels and industries. In addition, the Nordic countries align their climate mitigation efforts with the European Union's targets for cutting greenhouse gas emissions. By doing so, the Nordic countries aim to reduce greenhouse gas emissions by at least 40% by 2030, compared to 1990.

However, there are differences between the countries in terms of their decarbonisation milestones. There are also differences in terminology regarding how to implement the climate mitigation targets and reduce greenhouse gas emissions. Table 3 summarises a selection of the climate acts and their application in each country.

Co.	Climate law	Purpose	Responsible body
DK	Climate Act/ Lov om klima LOV nr 965 af 26/ 06/2020 Passed in 2020	Danish climate law specifies the regulatory framework for Danish climate-related policies. The purpose is to reduce Danish greenhouse gas emissions by 70% in 2030, compared to the level in 1990, and that Denmark becomes a climate-neutral society by 2050, in line with the Paris Agreement's goal of limiting the global temperature rise to 1.5°C.	Ministry of Climate, Energy and Utilities
FI	Climate Change Act/ Ilmastolaki / Klimatlag 609/2015 Passed in 2015 Undergoing revision in 2022	The goals of this law are to establish a framework for the planning of climate change policy in Finland and the monitoring of its implementation; to enhance and coordinate the activities of state authorities in planning measures aimed at mitigating and adapting to climate change, and at monitoring the implementation of these measures; and to strengthen the opportunities of Parliament and the public to participate in and affect the planning of climate change policy in Finland.	Ministry of Environment
IS	Climate Change Act/ Lög um loftslagsmál 2012 nr. 70 29. júní Passed in 2012	The objectives of the law are to reduce greenhouse gas emissions in a cost-effective and efficient manner; to increase carbon sequestration from the atmosphere; to promote adaptation to the effects of climate change; and to create conditions for the government to meet Iceland's international climate commitments. This act applies to all types of activities in the country, including in Iceland's airspace and economic jurisdiction, which may have an impact on greenhouse gas emissions.	The Environment Agency
NO	Climate Law/ Lov om Klimamål (LOV-2017-06-116-60) Passed in 2018 Last revised 2021	The law promotes the implementation of Norway's climate goals as part of the transition to a low-emission society in Norway in 2050. It also promotes transparency and public debate on the status, direction and progress of this work.	Ministry of Climate and Environment
SE	Climate Law/ Klimatlag SFS 2017:720 Passed in 2018	The law imposes a responsibility on current and future governments to pursue a policy based on climate goals and to report regularly on developments. A key starting point is that conditions must be in place that enable co-operation between climate policy and budget policy goals.	Ministry of Environment

Table 3. Climate laws in the Nordic countries

From climate frameworks to climate policy instruments

As previously outlined in this report, there are many global, national and regional policy and fiscal mechanisms aimed at mitigating greenhouse gas emissions. The implementation of such climate policy commitments and the respective climate laws looks slightly different in each Nordic country.

In **Denmark**, the long-term strategy for global climate action is aimed at reducing 70% of its greenhouse gas emissions below 1990 levels by 2030, and becoming climate-neutral (net-zero) by 2050 (The Danish Ministry of Climate, Energy and Utilities, 2020). The main specific policies in Denmark include a prospective ban on sales of vehicles that use fossil fuels by 2030 and the introduction of tax incentives to replace them with electric vehicles. Denmark also imposes significant road fuel taxes and is among the top 10 countries in the world in terms of carbon taxation, which is roughly equivalent to $26 per ton (Batini et al., 2020). Other mitigation actions involve a mix of regulatory and voluntary measures for renewables and

energy efficiency (Ibid).

In **Finland**, the ambition is to cut emissions by 80% in 2050 compared to the emission levels in 1990. The Finnish Climate Change Act (2015) was intended to ensure a coherent and long-term approach to climate policy up to 2050. However, the Act is currently being revised with a view to achieving a more ambitious target towards 2035. The Act also outlines a Finnish climate policy planning system and a monitoring system for the achievement of climate objectives. This includes a long-term Climate Change Policy Plan, a medium-term Climate Change Policy Plan and Adaptation Plan, and a separate Energy and Climate Strategy (Ministry of the Environment, 2021). In 1991, Finland introduced a carbon tax that applies to energy consumption in the transport and heating sectors. These measures complement the excise tax exemption for biogas and wood-based fuels, as well as taxes targeting vehicles (EC, 2021b). Municipalities and regional bodies are another important part of the climate policy landscape in Finland, as they implement the national land-use guidelines that also aim to reduce municipal and transport emissions, enable renewable energy supplies and implement targets in land-use planning (Finnish Government, 2017).

Iceland has set targets of achieving carbon neutrality before 2040 and cutting greenhouse gas emissions by 40% by 2030, compared to 1990. In 2020, a national Climate Change Action Plan was approved that sets out mitigation actions in all economic sectors in order to meet the Paris Agreement goals for 2030. While Iceland is not a member of EU, it is part of the EU ETS and ESD. The government also has in place a long-term Climate Change Strategy (Ministry of Environment and Natural Resources, 2020). The Ministry for the Environment and Natural Resources is responsible for co-ordinating the work under the Climate Action Plan. The local authorities are important actors in implementing climate policies and reducing greenhouse gas emissions. They have their own sources of revenue and budgets, and are responsible for physical planning, waste management, industry licensing and public transport (Ministry for the Environment and Natural Resources, 2018). In 2010, Iceland introduced a carbon tax that applies to both individuals and businesses. The tax part of the government's plan for the harmonisation of vehicle and fuel taxation is intended to promote energy savings, reduce greenhouse gas emissions and increase the use of domestically sourced energy (EC, 2021b).

In **Norway**, the main emphasis of the climate action plan introduced in 2021 (Klimaplan for 2021–2030, Meld. St. 13 2020–2021) is on emissions outside the EU ETS (Ministry of Climate and Environment, 2021a). These include emissions from transport, waste, agriculture and buildings, as well as some emissions from industrial production and the oil and gas industry. However, the plan also deals with the EU ETS, which applies to the bulk of emissions from industrial production and the oil and gas industry. In addition, the action plan discusses CO_2 emissions and removals in the LULUCF sector. The Klimaplan is designed to enable Norway to meet the Government's ambition of a 45% reduction of greenhouse gas emissions for non-ETS sectors by 2030, compared to 1990 levels, hence exceeding the assigned EU target of 40%. The climate action plan's main policy instruments are the taxation of greenhouse gas emissions, regulatory measures, climate-related requirements in public procurement processes, information on climate-friendly options, financial support for the development of new technology, and initiatives to promote research and innovation (Ministry of Climate and Environment, 2021b).

Sweden has implemented a Climate Policy Framework that includes a climate law, a climate policy council and national climate goals. The overall national goal for the energy and climate area is that, by 2045 at the latest, Sweden will no longer produce any net atmospheric emissions of greenhouse gases. A milestone is that by 2030,

total greenhouse gas emissions outside the EU ETS should have decreased by at least 63%, compared to 1990 (Regeringskansliet, 2021). In terms of energy production and energy efficiency, electricity production must be 100% renewable by 2040. Energy use must be 50% more efficient in 2030 compared with 2005. In 1991, Sweden implemented a carbon tax, alongside the pre-existing energy tax. The carbon tax is a key component in the Swedish climate mitigation measures aimed at energy efficiency, reducing energy consumption and increasing the share of renewable energy in the system (Regeringskansliet, 2018). In 2020, Sweden levied the highest carbon tax rate in Europe (EC, 2021b). Various levels of local and regional governance, especially those with responsibility for spatial planning and public transportation, are also important actors in the Swedish climate policy landscape. These bodies also set regional or municipal climate and energy strategies, in line with the Swedish climate policy framework and environmental quality goals.

Greenland, the Faroe Islands and Åland have also introduced climate policies or plans. The basis and extent of the self-governing territories' environmental legislation depends on the nature of their administration and forms of government. Applying an Arctic perspective, adaptation to and ameliorating the impacts of climate change are of particular concern, due to this region's fragile biodiversity. Another focus area is the potential impact on the cultural heritage of indigenous Arctic peoples.

Greenland has sectoral climate adaptation plans and strategies in place, with a particular focus on the fisheries sector, maritime transport, tourism and hunting. There is also a Mineral Strategy for 2020–2024 that focuses on the sustainable development of the mineral resources industry. According to the Danish Government, Greenland has committed to join the Paris Agreement at the 26th United Nations Climate Change Conference (COP26, RCI, 2021). Stopping oil and gas exploration in the country is seen as an important step towards reducing Greenlandic greenhouse gas emissions. The Government of Greenland has also implemented a comprehensive sector plan for public energy and the water supply, which outlines a transition to 100% renewable energy (Bird, 2017).

The **Faroe Islands** have had a climate policy in place since 2009. The policy's main aim is to reduce domestic emissions of greenhouse gases by at least 20% over the period 2010–2020, compared to 2005 levels. Already, around 50% of the energy consumed in the islands comes from renewable sources such as wind and hydropower. The Faroese Government's overall ambition is that the islands' energy production will be 100% green by 2030 (The Government of the Faroe Islands., 2022). However, heating and transport remain key sectors in terms of curbing greenhouse gas emissions (Bird, 2017).

In **Åland**, a strategy is in place that outlines climate and energy efforts up to 2030. The goals are to reduce greenhouse gas emissions by 60% compared to 1990 levels, and to satisfy at least 60% of its gross energy needs with renewable supply. A further aim is that 60% of electricity consumption should be locally sourced from renewable electricity (Government of Åland, 2017). The government of Åland also works with climate mitigation cross-sectorally, via the Development and Sustainability Agenda for Åland (Barkraft, 2017).

Nordic climate policies: A comparison

The main differences between the Nordic countries in terms of climate policies and targets for reducing greenhouse gas emissions are evident from the timeline for reaching climate goals, including medium-term targets. The Nordic countries also

apply different terminology in their strategies for climate change and energy transition. Norwegian climate policy outlines that, by 2050, the country will be a "low-emission society". In the case of Iceland, this transition implies achieving "carbon-neutrality" by 2040. Finland aims to become "carbon-neutral" by 2035. Denmark describes the transition as a process of becoming "climate-neutral" by 2050 (see Table 4).

The pathways to these targets differ depending on each economy's energy mixes and emission profiles. In most countries, the starting point is the EU 2030 Climate and Energy Framework. All of the Nordic countries have to some extent committed to and/or aligned their own policies to this framework. In doing so, they have set specific targets for greenhouse gas emission reduction by 2030, and have also developed integrated national energy and climate plans. Similarly, the EU Renewable Energy Directive establishes legally binding targets for the share of renewable energy in the final energy consumption in Nordic countries that are part of the EU, as well as for those in the European Economic Area (EEA), namely Norway and Iceland. Increasing the production of renewable energy is therefore a shared priority for all Nordic states (Nordic Energy Research, 2021). Moreover, since the Nordic energy systems are integrated into the European and global energy markets, geopolitical events that affect global energy supply also have implications for the Nordic Region (Nordic Council of Ministers, 2021) – as clearly illustrated by the war in Ukraine – and as such can have far-reaching implications for the Nordic green transition.

Co.	Climate policy	2030 targets	Long-term targets	Responsible ministry/national authority
DK	The Danish Climate Act describes the framework for Danish climate policy. An energy policy report is also to be submitted by the government to the parliament every year. A climate council has been established to conduct a professional assessment of whether the government is on the right track with respect to the goals of the Climate Act.	Denmark must reduce greenhouse gas emissions by 70% in 2030 compared to 1990. The EU's 2030 obligations for greenhouse gas reduction in the non-quota sectors, including buildings, agriculture and transport, have been translated into a national commitment to a 39% reduction in those sectors compared to emission levels in 2005 (Energi- og Forsyningsministeriet, 2016).	By 2050, Denmark must not emit more greenhouse gases than are absorbed by the natural sinks in its own territory (Energi- og Forsyningsministeriet, 2016).	Ministry for Energy, Utilities and Climate
FI	The Climate Change Act is a key pillar of Finland's climate policy. The climate policy planning system under this act consists of the Long-term Climate Change Policy Plan, Medium-term Climate Change Policy Plan and Adaptation Plan, and a separate Energy and Climate Strategy.	The Medium-term Climate Change Policy Plan, "Towards Climate-Smart Day-to-Day Living" from 2017 sets out that Finland shall achieve the target of reducing emissions by 39% by 2030, compared to 2005 levels. However, the plan is currently being updated to meet the EU obligations for 2030 and the government's target of achieving carbon neutrality by 2035 (Ministry of the Environment, 2022a). The Climate Change Act is being revised during 2022 to set new emission-reduction targets for 2030 (Ministry of the Environment, 2022b).	Finland's long-term objective is to be a carbon-neutral society. According to the Climate Change Act, and consequently the Long-term Energy and Climate Roadmap 2050 from 2014, Finland must reduce its greenhouse gas emissions by at least 80% by 2050, compared to 1990 levels (Ministry of Employment and the Economy, 2014). The ongoing revision of the Climate Change Act will result in new emission reduction targets for 2040 (Ministry of the Environment, 2022b).	Ministry of the Environment (responsible for the Medium-term Climate Change Policy Plan) Ministry of Economic Affairs and Employment (responsible for the Long-term Climate Change Policy Plan)
IS	The Climate Action Plan (2020) is Iceland's main instrument for living up to its obligations under the Paris Agreement. Furthermore, a climate change act was passed in 2012, which stipulates that a climate action plan needs to be prepared.	Iceland aims to cut greenhouse gas emissions by 40% by 2030 under the Paris Agreement (Ministry of Environment and Natural Resources, 2020). The Climate Action Plan, which was updated in 2020, sets out 48 actions to reach carbon neutrality. Iceland also has an agreement with the EU to reduce greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels (Ministry of Environment and Natural Resources, 2020).	Iceland's ambition is to achieve carbon neutrality before 2040 (Ministry of Environment and Natural Resources, 2020).	Ministry of the Environment, Energy and Climate The Environment Agency of Iceland
NO	The Climate Act sets out Norway's climate goals for 2030 and 2050. The act constitutes the framework for Norwegian climate policy. In 2021, the government presented a Climate Plan for 2021–2030 that set out proposals for policies to meet the climate goals.	The target is that greenhouse gas emissions in 2030 shall be reduced by at least 50% and up to 55% compared to 1990 levels. Under the climate agreement with the EU, Norway will also reduce emissions by at least 40% by 2030 compared to 1990 levels (Miljøstatus, 2022).	The overall goal is for Norway to become a low-emission society by 2050. The target for 2050 is that greenhouse gas emissions are to be reduced by around 90–95% compared to 1990 (Klima-og Miljødepartementet, 2021).	Ministry of Climate and Environment
SE	The climate policy framework was adopted in 2017, and consists of a climate law, climate goals and a climate policy council. The framework sets out a clear and coherent climate policy aimed at ensuring the long-term conditions for business and society to implement the transition required for Sweden to achieve its climate goals.	Sweden has committed to a 63% reduction of greenhouse gas emissions by 2030 compared to the 1990 baseline (Naturvårdsverket, 2017).	Sweden's aim is to produce zero net emissions of greenhouse gases by 2045, and then achieve "negative emissions". The goal implies that emissions of greenhouse gases from Swedish territory must be at least 85% lower in 2045 compared to 1990. The milestone reduction by 2040 is 75% compared to the 1990 baseline (Naturvårdsverket, 2017).	Ministry of the Environment Swedish Environmental Protection Agency

* Unless otherwise noted, all targets reported on the table refer to greenhouse gas emissions outside those covered by the EU ETS.

Table 4. Climate policies and long-term targets in the Nordic countries*

Photo: Tam Vibberstoft, norden.org

6. Impacts of climate mitigation policies

It is widely recognised that climate change mitigation policies may have important socio-economic effects on social groups, not least on the target groups in this research project. This section provides an overview of some of these impacts, as described by the documents reviewed in this work.

The reviewed literature clearly shows how climate change and climate policies can lead to heterogenous impacts on different social groups and also undermine social justice (Markkanen and Anger-Kraavi, 2019; Upham et al., 2022). However, while the research on social vulnerability to climate change has already produced a vast theoretical and empirical corpus (Otto et al., 2017), the literature focusing on the social impacts of climate policies is still in its infancy (Kortetmäki and Järvelä, 2021; Markkanen and Anger-Kraavi, 2019). In particular, there are very few studies of the effects of climate policies on specific social groups (Zimmermann and Pye, 2018), and few studies of climate mitigation policies that consider their direct and indirect impacts on stakeholders and the actions required to mitigate these impacts (Casillas and Kammen, 2012).

To a large extent, the focus of mainstream political discourse and research is on the positive impacts, or co-benefits, of climate policies (Mendez, 2015; Shea et al., 2020). More recently, however, the literature has acknowledged the existence of the potential negative effects of climate policies, which may cause social unrest and intensify pre-existing social inequalities (Kortetmäki and Järvelä, 2021; Markkanen and Anger-Kraavi, 2019). Most works stress that the burden of climate mitigation policies is often unevenly distributed, representing a higher share of expenditure for low-income households.

Kuhl (2021) pinpoints how the lack of information about the impact of climate policies on specific groups may itself exacerbate inequality and social vulnerabilities. Regarding the prevention and mitigation of the negative inequality impacts of climate policies, Markkanen and Anger-Kraavi (2019) underline the importance of integrating inequalities considerations at all steps of policy-making, from inception to implementation. In this context, the literature highlights the potential of income-based strategies, focusing on low-income households, which could alleviate economic inequalities and therefore reduce vulnerabilities (Büchs et al., 2021; Kuhl, 2021; Markkanen and Anger-Kraavi, 2019). However, according to Gasparri (2022) , current climate adaptation and mitigation measures rarely safeguard communities or

promote social justice-oriented solutions aimed at alleviating the existing inequities faced by the vulnerable population.

Similarly, the literature emphasises how social segregation and feelings of being left behind can pose a significant barrier to the effective implementation of climate polices (Kortetmäki and Järvelä, 2021). This explains why an expanding body of research looks at the social acceptability of climate mitigation policies (Bergquist et al., 2020; Høst et al., 2020; Marin and Vona, 2019; Vona, 2019). Social acceptability is connected to the climate policies' ethical implications. These range from the burden-sharing mechanisms available at the international level (Zellentin, 2020), to the consequences of climate policies for social inequality (Owen and Barrett, 2020) and poverty (Malerba and Wiebe, 2021). Therefore, Ivanova and Middlemiss (2021) stress that environmental policies should take account of social differences if they are to successfully address both effectiveness and justice concerns.

In sum, the reviewed literature stresses how policy integration requires a holistic assessment of both the positive and negative effects of climate mitigation policies. In fact, the IPCC clearly states that "addressing climate impacts in isolation is unlikely to achieve equitable, efficient, or effective adaptation outcomes" (IPCC, 2022a). This is considered essential for neutralising socio-political feedback in the economy-climate system (Howard and Livermore, 2019), and for enacting the large-scale changes needed to mitigate climate change and avert climate damage (Geiger et al., 2021).

In the following sections, we explore some of these mechanisms by examining the potential impacts of climate mitigation policies on the specific social groups targeted in this research.

6.1 People who are jobless or at risk of unemployment

There is widespread academic interest in the impact of climate policies on the labour markets. This reflects how the employment effects of climate mitigation have been a research concern since the first international agreements on climate change were adopted in the 1990s. It was during this period that the economics of climate change emerged as an academic sub-discipline within economic science (see e.g. Ackerman, 2008 for an overview of key concepts in this research area). This literature explores how climate change has a direct impact on jobs – the so-called "social cost of carbon" (Pindyck, 2019; Rezai et al., 2018) – but pays little attention to the most vulnerable workers or those already outside the labour market.

Based on the classification developed by the International Labour Organization (ILO), the potential employment effects of transitioning to a low-carbon economy comprise: 1) jobs that will be eliminated without direct replacement (e.g. a proportion of those in the oil industry); 2) jobs that will be substituted (e.g. jobs in biofuel production replacing a share of jobs in conventional refining); 3) jobs that will be created in emerging sectors (e.g. new jobs in renewable energies); and 4) jobs that will be transformed (e.g. jobs requiring new skills related to the use of new materials or processes (ILO, 2015a)). To these, Martinez-Fernandez et al. (2010) add a fifth group of jobs that might be relocated to other regions due to better conditions for green sectors in some areas (e.g. mineral resources or renewable energy potentials) or carbon-leakage processes[2].

2. Carbon leakage occurs when economic activity migrates from one country with strict environmental regulations to another country with a more flexible or softer environmental regulation framework (Martinez-Fernandez et al., 2010)

Even among the few papers that address the challenges and opportunities of climate and energy transitions with regard to unemployed people, little attention is paid to specific categories of jobless persons, like those who have been away from the labour market for a long period, or people with limited employability due to their skills not being aligned with market requirements. Similarly, some papers only superficially mention people at risk of unemployment when referring to precarious, intermittent, or part-time jobs, and do not have a specific focus or clear definitions when framing this group. For these reasons, the findings presented here cover a broad category of persons whose professional prospects might be impacted by the green transition in different ways, not specifically those already outside the labour market or at direct risk of unemployment.

6.1.1 Key impacts

The reviewed papers focus on the net effects of climate policies on labour markets. The literature documents a broad spectrum of impacts. As illustrated by the ILO typology of labour effects presented above, these can have different polarities (positive vs negative) and different implications for people's ability to cope and adapt (replacement vs transformation). Frankhaeser et al. further classify the potential employment impacts of climate policies into short- and long-term effects. In the short run, the biggest effects are expected in the energy-related sectors. Medium-term effects will be felt across the economy, as value chains and production patterns adjust. However, according to the authors, the largest impact is expected in the long term, when climate policies will trigger widespread structural adjustment (Fankhaeser et al., 2008).

Most studies agree that a transition to a low-carbon economy will lead to a modest but net increase in employment levels (Fankhauser et al., 2008; Malerba and Wiebe, 2021; Olsen and International Labour Office, 2009). In fact, there is reasonable evidence that low-carbon energies are more labour-intensive than fossil-based alternatives, in terms of both short-term construction phase jobs and average plant lifetime jobs (Blyth et al., 2014).

The judicious deployment of ad-hoc policy incentives can unlock potential jobs. For example, Yamazaki (2017) examines the employment impact of the revenue-neutral carbon tax introduced in British Columbia in 2008. The author concludes that the carbon tax generated a 0.74% annual increase in employment in the Canadian province during the period 2007–2013. Although the most carbon-intensive and trade-sensitive industries were negatively impacted by the tax, clean service industries saw a significant rise in employment. However, the authors also state that whereas short-term effects lead to net job creation – since low-carbon technologies tend to be more labour-intensive – the long term-effects are more difficult to gauge, particularly if climate efforts are not coordinated internationally (Fankhaeser et al., 2008).

In their comprehensive study on the socioeconomic effects of climate mitigation policies in Germany, Lutz et al. (2021) provide results that are consistent with this interpretation. According to the authors, by 2050 the number of jobs in the German economy will be higher than in the baseline for 2020, but they also emphasise that this effect diminishes over time. All things considered, the net impact of the German climate policy on national employment would be small (0.3–0.5% increase on total employment basis during the 2020s). The construction and service sectors would benefit the most from energy and climate policy measures, but sectors like

manufacturing and process industries, which typically offer good employment conditions in Germany, would be negatively impacted. Nevertheless, according to this study, positive developments on the labour market also lead to higher wages. In 2030, the average wage per hour is expected to exceed the baseline by 2.2–3.2% (Lutz et al., 2021). These patterns are also in alignment with empirical analyses of the ongoing process of phasing out coal in Germany (Oei et al., 2020).

Regardless of the "optimistic narratives" implicit in green investment packages (Geels et al., 2022), the literature is not unanimous on the positive effects on labour of climate mitigation policies. Several studies actually claim that these policies might lead to negative employment consequences, depending on how the mitigation measures are deployed (Rengs et al., 2020). Moreover, many of the papers reviewed emphasise that, even if the aggregated impacts at national level are positive, the employment effects of climate mitigation policies may still be negative for specific regions, sectors and social groups (Malerba and Wiebe, 2021; Marin and Vona, 2019).

Against this background, K. Bohnenberger (2022) analyses the potential effects of eight policy strategies on different aspects of employment, including output, occupation, work-life balance and output efficiency. These strategies are: *conversion of plants and businesses; environmental labour law; climate decommodification; socio-ecological job guarantee; vocational guidance and retraining; distribution of employment time; alternative income sources;* and *equalisation of income*. The author concludes that the eight strategies have potential for greening employment, but also differ in terms of their intensity and implications for labour markets. The diversity of management practices and politics surrounding energy transition can, in fact, lead to more or less socially inclusive outcomes, depending on how they meet the needs of lower income households (Upham et al., 2022).

With regard to the social acceptability of climate policies, several authors stress the undermining capacity of *job-killing arguments*, particularly among blue-collar workers. Marin and Vona (2019) explore the effects of energy prices on the demand for workers with different skills in the EU. They find that climate policies are biased against manual workers, in that they favour a substitution of manual jobs by technical and professional ones. Moreover, the study suggests that the increased energy costs that typically result from climate policies tend to impact manual workers more negatively than technicians and other professional categories, due to their lower wages. The authors conclude that investing in technical skills can significantly reduce the socio-economic consequences of high energy costs and carbon price scenarios by creating new opportunities for workers who bear the bulk of the costs of the low-carbon transition, and by increasing average salaries among the working class (Marin and Vona, 2019). However, there is growing evidence that energy transitions affect all kinds workers, including leaders and key experts in energy industries, like those in the Norwegian oil and gas industry (Rauter, 2022).

In terms of the methods used, the reviewed literature is rich and varied. Top-down macroeconomic models are typically used to quantify employment effects and develop simulations based on climate policy scenarios. These models describe the labour market effects resulting from the implementation of specific policy measures and the adoption of clean technologies. They include, inter alia, input-output, equilibrium models, econometric, agent-based, and system dynamic models. Some studies apply qualitative methods, such as literature reviews or stakeholder-driven participatory research methods.

6.1.2 Mitigation measures

The literature has evolved over time in its approach to mitigation measures. Earlier works mostly advocated for corrective measures to compensate for the effects of climate mitigation policies on "affected workers", which was in line with the narrower interpretation of the concept of the just transition. Today, most contributions embrace a broader perspective with a higher degree of embeddedness, based on the recognition that "job losses are not an automatic consequence of climate policies, but the consequence of a lack of investment, social policies and anticipation" (Rosemberg, 2010). Mitigation now entails incorporating social protection measures into national response policies to climate change in a more preventive way. This approach is advocated by the International Labour Organization (ILO, 2015b) and supported by the international consensus built into the UNFCCC. The Paris Agreement of 2015 specifically recognised the interlinkages between, on the one hand, actions to address climate change, and on the other, employment and social inclusion (UNCCC, 2015).

Rosemberg (2010) lists the types of mitigation policies required for the transition to a low-carbon economy to occur in a just and effective way. These include: 1) sound investment in low-emission and labour-intensive technologies and sectors; 2) research and early assessment of social and employment impacts; 3) social dialogue and democratic consultation with social partners and stakeholders; 4) training and skills development; 5) social protection, including active labour market policies; and 6) local analysis and economic diversification plans.

The EU adopted some of these principles in the design of certain ad-hoc policy instruments supporting fair transitions – in particular, the Just Transition Mechanism established in 2020 (EC, 2020). The mechanism frames the recovery packages adopted by the member states as a response to the economic consequences of the COVID crisis. Geels et al. (2022) compare the green recovery packages put forward by the German, French and UK governments in response to the economic impact of the pandemic. The authors show how the main aims of these packages were to support sustainable economic growth and preserve or create new jobs, based on a narrative dominated by an optimistic outlook and speculative opportunities. Even if all of the recovery packages included social justice/fairness and territorial cohesion as important strategic considerations, the authors conclude that green recovery responses to the pandemic are path-dependent and deeply shaped by context conditions (Geels et al., 2022).

These policy initiatives are based on the idea that linking climate policy to other economic and social reforms will not only mitigate social impacts, but also increase public support for climate action. According to the reviewed literature, this hypothesis seems to be correct. For instance, Bergquist et al. (2020) show how climate policy packages that include social schemes increase US public support for climate mitigation and make climate policy more popular, particularly among people of colour. Vesa et al. (2020) explore how influential organisations may block ambitious climate change policies in Finland. The authors conclude that a powerful coalition that prioritises economic competitiveness over climate change mitigation – the so-called "pro-economy" lobby – occupies a central position in the policy network, and influences policy processes by means of inside lobbying.

Moreover, there seems to be broad empirical evidence supporting the claim that climate and social policies can go hand in hand – in the form of, for example, a multi-dividend sustainability policy that can simultaneously reduce environmental pressures while improving other social and economic outcomes (Fitzgerald, 2022). Several studies show how climate policies can have a relevant redistributive role and may actively generate social benefits beyond mere job creation. For instance,

Yamazaki illustrates how redistributing revenues from the carbon tax introduced in British Columbia in 2008 positively affects both labour demand and supply, and how employment in all industries appear to benefit from this redistribution (Yamazaki, 2017).

6.1.3 The Nordic perspective

In most economic and labour rankings, the Nordic countries are above the EU average, which indicates strong and productive economies and well-functioning labour markets. One reason for this is the strong collaboration between social partners – government, employers and employees. This is reflected in the degree of collective agreements and the level of trade union membership, both of which are high compared to other countries. Still, the transition to a low-carbon economy has the potential to disrupt the Nordic labour market in similar ways as other regions. The transition will mean changes in labour demand and skills, and also drive sectoral and regional readjustments. However, it is expected that the impacts will be unevenly distributed. In some regions, a proportion of jobs in the energy sector, industry and agriculture sectors could be lost, particularly if workers in this sector are unable to adapt quickly enough to the change (Alsos and Dølvik, 2021).

Climate mitigation policies may also have disproportionate effects on different social groups and genders. Lander Svendsen et al.'s report on the gender effects of climate policies in a Nordic context finds that these policies are not gender-neutral, but tend to create more employment in male-dominated sectors. The study also finds that the Nordic climate action plans aimed at carbon-neutral societies only look at gender aspects to a limited extent. As of 2021, Finland had conducted a gender impact assessment focusing on employment and consumption, Iceland was conducting a gender impact assessment, and Sweden had drafted a gender strategy related to mainstreaming the implementation of the Paris agreement. The Danish and Norwegian climate action plans were largely gender-blind (Lander Svendsen et al., 2021).

In most countries, however, the greatest concern is about potential job losses or increased risk of unemployment, the consequences of labour market adjustments to a green economy, and their impacts on socio-economic inequality. Surveying a heterogeneous group of stakeholders in different areas – from civil society to trade unions and advocacy groups – Høst et al. (2020) found that there is considerable support across all of the Nordic populations for a green transition, but also that people are concerned by the consequences of climate mitigation policies on household finances, welfare and employment. In Norway, Tvinnereim et al. (2020) indicate that, for the general public, the issue of energy transition appears remote compared to the concerns of everyday life and employment.

At the same time, several reports emphasise the job potential of climate transitions. For example, the Council of Nordic Trade Unions (NFS), in partnership with the Friedrich-Ebert Stiftung (FES) and the German Trade Union Confederation (DGB), estimates that investment in carbon capture and storage technologies (CCS) could create 30,000–40,000 new jobs in Norway by 2050, and secure 80,000–90,000 existing jobs (NFS et al., 2021). Similar prospects are envisaged in Sweden, where new industries are being set up to produce carbon-free steel using hydrogen, as well as several battery-manufacturing plants. In Denmark, the green sector has grown, and even in 2019 represented 14% of the Danish exports. Bird (2017) describes how Nordic citizens have a high level of environmental awareness, and how strong climate policies in the region, including green energy initiatives at local community level, contribute to economic growth and job creation.

However, in order to tap into this potential, several reports advise more proactive educational and labour market policies, governmental support, workforce training, and the redesign of existing professional training schemes in order to limit vulnerability risk and the rise in inequality (Alsos and Dølvik, 2021; Høst et al., 2020). This also holds for the bioeconomy and circular economy sectors, both of which have great potential for rural areas. However, many of the new jobs in these sectors require higher education (NFS et al., 2021). The literature also stresses that policy-makers across the Nordics should be more attentive to how the transition to a low-carbon society will impact the division of both paid labour and unpaid household work, by taking into consideration gender and other intersecting identity factors, e.g. ethnicity, age, geographic location, sexuality, indigenous status or disability (Lander Svendsen et al., 2021).

6.2 Older adults

Older adults are often mentioned together with children, people with disabilities and ethnic minorities as a risk group that is potentially vulnerable to both climate change and the impacts of climate change policies. Nonetheless, the academic and grey literature rarely offers in-depth discussion of the impact of climate policies on older adults or their capacity to respond to changing policy contexts. As Hitchings and Day argue, "we still know relatively little about the degree to which different groups of older people are inclined, able, or empowered to adopt more sustainable practices".

In the few publications that deal with the impact of climate policies on older adults, the focus is generally on the decarbonisation of energy and transport (e.g. Byrne and Harris, 2015; Evans, 2013; Hitchings and Day, 2011). The central argument is that if energy and transport costs rise during the green transition, this may increase older people's risk of experiencing transport and energy poverty. These forms of poverty are defined, respectively, as "the inability to attain socially and materially necessitated levels of transport service" and of "domestic energy services such as heating, lighting, and hot water" (Martiskainen et al., 2021, p. 4). In particular, older adults with lower incomes and savings are expected to experience challenges related to maintaining comfortable temperatures in their homes should energy prices rise. Increasing transport prices may limit the ability of some older adults, particularly those in rural areas, to travel for leisure or even to meet basic needs such as healthcare. Overall, however, few publications explicitly discuss the impact of climate policies on older adults.

By contrast, there is a much larger corpus on how climate change affects older people's right to life, health and safety (Filiberto et al., 2010; McDermott-Levy et al., 2019; Pörtner and et al., 2022; United Nations General Assembly, 2021b). Numerous publications point out that older adults are, on average, more vulnerable than other population groups to the effects of climate change. This includes extreme weather events such as heatwaves, cold snaps, floods and droughts, as well as infectious diseases and air pollution, all of which are expected to increase as a result of global warming (Byrne and Harris, 2015; Carter et al., 2016; Leyva et al., 2017; Paavola, n.d.; United Nations General Assembly, 2021b). Older people tend to have slower metabolisms and weaker immune systems, which makes them more sensitive to environmental changes and at more risk from exposure to toxins. Increasing age usually comes with a higher disease burden, which makes the central nervous system and organ systems less able to tolerate stress induced by, for example, heat and dehydration (Carter et al., 2016; Pörtner and et al., 2022). If health and care services are disrupted due to climate emergencies, this also means that older adults,

particularly those with chronic conditions, face greater health risks than other population groups.

Ageism and age discrimination can further aggravate older adults' vulnerabilities towards climate change (United Nations General Assembly, 2021a). For instance, if older people are ignored or marginalised in climate change discussions and policy-making, there is a risk that their interests and perspectives will not be represented. If older adults lack access to climate warnings, alerts and information on services and evacuation procedures, they may be slow in responding to climate emergency situations (United Nations General Assembly, 2021b). These risks are especially pronounced if important information is mainly provided via apps and other digital tools. If older adults do not have access to such digital communication channels, or do not feel comfortable using them, they may miss out on crucial information in a crisis context. Given these challenges, the literature focuses on how to protect older adults from the impacts of climate change and ensure that climate adaptation plans are inclusive and respect their voices.

Although, in general, physiological vulnerabilities towards climate change and extreme weather events tend to increase with age, several publications also stress that older adults constitute a highly diverse group with different levels of resources, health, experiences, skills, agency and adaptive capacities (Huynh et al., 2022; United Nations General Assembly, 2021a; WHO, 2014). These different factors influence the extent to which older adults are vulnerable to climate change and the potential impacts of climate policies. At an individual level, vulnerability is linked to factors such as health status, cognitive abilities, quality of housing, area of residence, mobility, access to services, poverty, ethnicity, gender, age and the existence of social support networks. Older adults who are in poor health, who are housebound, who live alone, who are economically disadvantaged and have few social contacts are considered the most vulnerable among this group (Carter et al., 2016; Haq et al., 2010; WHO, 2014). However, many older adults today are more affluent and mobile than previous generations, and these groups may have substantial resources that enable them to adapt to climate change and policy shifts (Hitchings and Day, 2011).

Three strands of the literature also describe older adults as agents who have influence and capacity in the context of the green transition. The first strand focuses on their sense of responsibility and legacy thinking. These studies argue that many older adults feel an obligation to mitigate climate change and to leave the Earth as intact as possible for future generations (Frumkin et al., 2012; United Nations General Assembly, 2021b). Since older adults account for increasingly large segments of the population, they also constitute an important electoral group with voting power. This represents a potential that could be mobilised to push for more ambitious climate goals (Pillemer et al., 2021; United Nations General Assembly, 2021a). In Norway, for instance, the Grandparents' Climate Campaign supports climate mitigation (United Nations General Assembly 2021). Similarly, AGE Platform Europe, a European network of non-profit organisations representing older adults, has declared its solidarity with young people who are pressing for more ambitious climate goals (AGE Platform Europe, 2019).

The second strand of the literature stresses that older adults often play important roles in their communities, and are valued for their experience and accumulated wisdom, which could be harnessed to deal with climate change. For example, older adults may have lived through times of considerable scarcity, and may remember strategies for reusing, repairing and repurposing existing resources, which they could share with their younger peers and thereby promote the circular economy (Byrne and Harris 2015, United Nations General Assembly 2021a).

Finally, a third literature strand describes older adults as important contributors to climate change, and compares their lifestyle and carbon footprint with that of younger age groups (Haq et al., 2008, 2010). Moody (2017), for instance, contends that older generations profited from the conditions and economic abundance that caused global warming. He argues that they therefore have a moral responsibility to change their lifestyles, where necessary, and contribute to the green transition (see also United Nations General Assembly, 2021a).

Over the next few decades, the number of older adults is projected to increase substantially, both globally and in the Nordic Region (Heleniak and Sanchez Gassen, 2019; United Nations, 2019). This means that climate goals cannot be reached without including and mobilising adults. Since ageing populations, climate change and the green transition are occurring concurrently, organisations such as the World Health Organization (2014) urge that the interconnections between them must be better understood.

6.2.1 Key impacts

Older people are, on average, more sensitive to extreme temperatures than their younger peers. For example, they are less likely to tolerate heat and are at greater risk of dehydration. At the same time, they find it harder to maintain their core body temperature, which makes them more vulnerable to cold conditions. Older people are therefore, on average, more dependent than other age groups on heating their homes during winter and maintaining cool environments during the summer (Hitchings and Day, 2011). Older people also tend to spend more time at home than their younger peers, making the home environment even more important (Byrne and Harris, 2015). If the costs of heating and ventilation increase during the green transition, this may affect their ability to maintain suitable temperatures in their home, and may ultimately increase health and mortality risks. Low-income older people, as well as those living in older homes with poor energy efficiency, will be the hardest hit in these contexts (Byrne and Harris, 2015; United Nations General Assembly, 2021a). Older adults who are more affluent, by contrast, may be able to keep their homes well heated over winter or may even be able to travel to warmer climates to avoid the cold, and in doing so further contribute to ongoing climate change. Hitchings and Day (2011) assert that this side of the of the topic is often overlooked in the literature, which too often offers a simplistic portrayal of older adults as passive and vulnerable, with limited financial means.

Climate policies often overlook the fact that many older adults, particularly those living in rural areas, are also car-dependent (Government of Finland, 2020; United Nations General Assembly, 2021a). Increasing fuel prices may therefore limit their ability to participate in public life and move around. While many climate policy measures focus on the use of more environmentally friendly transportation modes, such as electric vehicles, public transport and cycling, these may not always be accessible to older adults. For example, those with lower incomes may not have the means to invest in new electric cars, even if they are cheaper to use in the longer term (Evans, 2013; Martiskainen et al., 2021). For older generations, upfront purchasing costs of durable goods such as cars are of more pressing concern than use costs. At the same time, for older adults experiencing frailty or other health issues, cycling may not be an option. Even in urban areas where public transport is available, older adults may face barriers to using it, in terms of accessibility or safety (Evans, 2013).

In sum, access to affordable energy and transport services is important for older

people's wellbeing and their ability to participate in society (Martiskainen et al., 2021). Policy-makers must take care to ensure that ambitious climate policies do not disproportionately affect older people, amplify existing inequalities and increase their risks of energy and transport poverty.

6.2.2 Mitigation measures

The existing literature does not in general recommend specific policies for mitigating climate policy impacts on older adults. Instead, the focus is more on how policies are discussed, adopted and implemented. Researchers, interest groups and international organisations alike stress the need to include older adults in policy-making processes to ensure that climate policies and measures take into account their diverse needs, capacities and resources (Hitchings and Day, 2011; United Nations General Assembly, 2021b). It is argued that increasing the involvement of older adults in policy-making would decrease the risk of unintended and adverse effects (Government of Finland, 2020; Haq, 2016).

Several commentators see a great potential for the future mobilisation and empowerment of older adults (Pillemer et al., 2021). Ageing populations in the Nordic Region and the rest of Europe mean that they have considerable political power, even beyond voting. Indeed, older adults in Europe are already forming interest groups and volunteer associations that focus on climate change and the green transition. Nonetheless, Haq and colleagues (2010) as well as Hitchings and Day (2011) argue that there is room to extend older adults' participation and engagement in discussion and activities around these issues. This is especially relevant at a local level to address older adults' needs and interests in the context of their own community. Hitchings and Day (2011) suggest that the wider participation of older adults could be achieved by abandoning stereotypes that describe older adults as passive, disinterested or incapable, by engaging them in peer-to-peer communication and learning, by using positive language and avoiding messages of guilt and fear, by collaborating with established charities and social networks, and by providing real-life examples and stories on how to make an impact. Further research is needed to identify any additional obstacles that prevent older adults from fully participating as active citizens in climate action and policy-making processes, and determine how these could be removed.

In addition to mobilising older people, Haq and colleagues (2010) argue that more efforts are needed to inform them about their personal vulnerabilities and how they can adapt to changes in both climate and policy context. For example, in climate emergency situations, information, alerts and warnings must be available through a variety of means, e.g. radio, TV, phone calls and digital tools, in order to reach all groups. Haq and colleagues (2010) also assert the need for clear messaging directed at more affluent older adults with high consumption levels on how to change their behaviour and lower their carbon footprint. Finally, it is important that information on public funds and schemes to implement green solutions or adaptations (e.g. improvements of housing insulation, subsidies to buy electric cars, etc.) must be accessible to older people so that they do not miss out on these opportunities.

The years 2021–2030 have been named the United Nations Decade of Healthy Ageing. The goal of this initiative is to foster global cooperation between governments, civil society actors, academia and other key actors in order to improve the lives of older people, their families and communities. According to the UN, this initiative also constitutes an important opportunity to highlight older people's human rights and promote discussion on how these rights can be protected in the

context of climate change and the green transition (United Nations General Assembly, 2021a).

6.2.3 The Nordic perspective

As mentioned above, the literature on the impact of climate policies on older adults is limited, and there is no specific strand in the reviewed literature that focuses specifically on the Nordic Region. Nonetheless, many of the findings and arguments in the broader literature corpus apply to the Nordic context. For example, discussions around how higher energy and fuel prices would impact older adults' lives are highly relevant in a Nordic context. Given the relatively cold climate, the heating season tends to be longer than in Central or Southern European countries, which means that changes in heating prices can strongly influence household expenditure (Byrne and Harris, 2015). In addition, the Nordic Region comprises a vast territory, large parts of which are sparsely populated. A large proportion of people living in more remote and rural areas are car-dependent. As such, changes in fuel prices may be more significant to them than to people living in more densely populated regions. In the Nordic context, a spatial lens is therefore useful to analyse the impact of green transition policies on older adults (Frøshaug and Andreasson, 2020; Høst et al., 2020). This would allow for an elucidation of the potentially higher vulnerability of older adults in more sparsely populated areas with regard to the impact of specific types of policies.

According to the Finnish government, the Nordic countries have well-functioning heating systems and established practices to support and evacuate people in need during power outages caused by extreme cold. However, similar practices for heat waves are much less defined (Government of Finland, 2020), and therefore adaptation and emergency plans for such conditions must be elaborated in the future. This will ultimately – and especially – benefit older people, who are at greater risk of experiencing health issues during hot temperatures than their younger peers.

6.3 Children

The literature exploring the impact of climate policies on children seems to be limited and fragmented. The discussion is framed by an unclear characterisation of *children* as a vulnerable category, which includes different age groups, ranging from *infants* to *youth* (Hosking et al., 2011; Perera, 2017). Most of the works convey that vulnerability to climate change and to the impacts of climate policies are primarily driven by people's socioeconomic conditions, rather than their age (Shea et al., 2020; Sovacool et al., 2021; Yang et al., 2021).

The literature states that children – and especially the most vulnerable within this group – lack both agency and explicit recognition as important stakeholders in climate policy-making (Pegram and Colon, 2020; Sovacool et al., 2021; Yang et al., 2021). In its 2018 Youth Stocktaking Report, OECD clearly stated that "young people have the least influence on policies that affect them the most", specifically with regard to "climate change and rising inequality" (OECD, 2018). Even if around 47% of the NCDs consider children or young people as a "vulnerable group" (UNICEF, 2021b), children are systematically neglected by climate policies. Only slightly over 40% of NDCs make explicit reference to children or young people, and nearly 23% do not mention basic wellbeing pillars for children, such as education (Pegram and Colon, 2020). Along these lines, as part of a statistical analysis of how vulnerable

groups influenced adaptation plans in 902 European cities, Yang, Lee and Juhola (2021) found that even if children are indeed identified as a sizeable portion of the vulnerable groups, they are not equally represented in the cities' climate-adaptation strategies.

This contrasts with the increasing role and engagement of different *youth leaders* in climate activism and policy (Stoecklin, 2021). A range of youth movements and organisations have been quite active in demanding more youth participation in long-term policy-making, especially in the definition of climate mitigation policies and strategies (European Youth Forum, 2006, 2019, 2020; Stoecklin, 2021).

Regardless of recognitional aspects, the academic literature seldom elaborates on the impact of climate mitigation policies on this age group. The focus is instead on the negative consequences of climate change on children's health (e.g. extreme weather events, water and sanitation-related health conditions, respiratory diseases, etc.), and on the health co-benefits of policies that tackle pollution and climate change (Hosking et al., 2011; Perera, 2017; Shea et al., 2020).

One important strand of research approaches the issue from a human rights perspective (Heiskanen, 2018; UN - OHCHR, 1989; UNICEF, 2021a). Here, the discussion is framed by the impacts of climate change on children's right to live in a healthy environment, as well as children and young people's right to be heard when decisions are being made that will impact them (UNICEF, 2021b). The implications of climate policy for the safeguarding of children's rights are also addressed. This involves questioning the extent to which climate policies are child-sensitive, and whether climate policies take into consideration the specific risks and needs of children and young people (Pegram and Colon, 2020; UNICEF, 2021b). The lack of participation of children and young people in policy design, alongside a lack of confidence in government, are considered the main hindrances to policy implementation (OECD, 2018). It is recommended that climate policies take into consideration the UN Convention on the Rights of the Child, and include explicit references to children and young people, recognising them as stakeholders in their own right (Pegram and Colon, 2020; Sovacool et al., 2021)

6.3.1 Key impacts

The literature pays little attention to second-tier impacts on children and young people triggered by climate change and climate mitigation policies (Sovacool et al., 2021; Yang et al., 2021). In general, the assumption is that climate mitigation policies have a positive effect on children's health (Gasparri et al., 2022; Shea et al., 2020; Yang et al., 2021), even if the benefits can vary significantly between low- and high-income countries (Hosking et al., 2011; Perera, 2017). However, some studies stress the indirect impacts that climate policies can have on children, through their parents' working conditions. These impacts are channelled to children via loss of income, the parents' emotional distress related to job loss, etc. (Sovacool et al., 2021).

Other studies focus on the role that climate mitigation policies may play in aggravating pre-existing vulnerabilities. One example of how climate-related policies can have a negative impact on children's wellbeing is e-waste recycling. The largest share of e-waste is generated in affluent countries that have a greater per-capita consumption of personal electronics. This waste is then sorted and exported to different countries in the Global South for recycling. This activity can be an important source of income in less affluent countries, but it is often associated with high levels of pollution and exposure to harmful chemicals among workers. Moreover, the activity may also have negative social effects on vulnerable populations,

including child labour and school abandonment (Heacock et al., 2016). These social externalities have been documented in case studies from several African countries, including recent examples in Ghana and the Democratic Republic of Congo (Sovacool et al., 2021).

Most of these works use qualitative methods to explore the impacts of climate mitigation policies on children. These methods range from interviews (Sovacool et al., 2021) to literature reviews (Hosking et al., 2011; Perera, 2017; Shea et al., 2020). The quantitative research in this area is less extensive.

6.3.2 Mitigation measures

The main recommendation from this body of literature is for a coordinated policy mix that addresses children's biological vulnerability to pollution and climate change (Pegram and Colon, 2020; Perera, 2017). According to this principle, child-sensitive sectoral interventions, in areas such as water, health and education, should be mainstreamed into climate policies (UNICEF, 2021a). The literature also stresses the importance of addressing the specific needs of the most vulnerable within the group, given that the disparity in the impact of climate policies is a consequence of co-occurring socioeconomic factors (UNICEF, 2021a).

Another general recommendation calls for empowering children and young people in climate processes. Pegram and Colon (2020) claim that children should be *meaningfully* included in climate-related decision-making processes. The literature stresses the importance of promoting initiatives that support young people's participation, network-building and civic engagement in sustainable development (European Youth Forum, 2018; UNICEF, 2021a). Such processes should enable diversity and take into consideration different perspectives and sensitivities among children and young people (e.g. based on differences in age, gender, socioeconomic level, ethnic background, etc.). Finally, it is also considered important to deploy child-sensitive data-gathering and modelling procedures in order to improve the design of climate policies that affect children and young people (UNICEF, 2021a).

Drawing on the UN Convention on the Rights of the Child, it is recommended that climate policies strengthen and support the implementation of child-sensitive climate actions and approaches in both national and sub-national climate policies and plans, including national adaptation plans, disaster risk-reduction policies, water, sanitation and hygiene, air pollution, climate finance, and country-specific strategies pertaining to children, adolescents, young people, gender, disability, education, health, nutrition and sustainable energy (Pegram and Colon, 2020; UNICEF, 2021a).

In addition, more transparency and accountability is required regarding the disproportional impact of the Global North's environmental policies on low-income countries, specifically with regard to raw materials and waste-management supply chains, in order to account for life-cycle externalities (Sovacool et al., 2021).

6.3.3 The Nordic perspective

The literature focusing on Nordic climate policies highlights the influence of these policies and regulations for low-income countries (Calmfors et al., 2019). The electrification of the transport sector in Norway is one example of a policy framework designed in a Nordic context that may have important consequences for

children and socially vulnerable groups in the Global South. As Sovacool et al. (2021: 9) put it, "electric vehicles are only *green* and *clean* in Norway because they are made somewhere else" (Sovacool et al., 2021: 9). Fråne (2021) elaborates on how Nordic households' consumption of commodities like food, electronics and clothing have mixed impacts on other countries during the extraction and production stages. On the one hand, Nordic demand for these commodities leads to direct positive impacts in terms of employment, wealth, knowledge-sharing and innovation. On the other hand, Nordic consumption can aggravate pre-existing vulnerabilities and increase the risk of displacement, potential human rights violations, etc.

The limited participation and engagement of children and young people in the definition of Nordic climate policies is also considered a limiting factor for the successful implementation of climate change mitigation plans in the region (Laine et al., 2018; Mellin et al., 2021). Along these lines, Mellin et al. (2021) emphasise that Nordic research on youth perspectives on mobility and participation in public transport policy has been rather limited, especially considering that this group is a major user of public transport services, and therefore ought to be given central consideration in the design of future transport systems.

6.4 People with disabilities

The Convention on the Rights of Persons with Disabilities proposes the following delimitation of this social group: "*those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others*" (Article 1 - UN, 2006).

Most studies of the impacts of climate and environmental change on persons with disabilities are based on the assumption that these challenges put these persons at a social and economic disadvantage compared to other social groups (Kosanic et al., 2022). However, there are few studies that explore the impacts of climate mitigation policy on people with disabilities (Ivanova and Middlemiss, 2021). This narrow strand of literature pays particular attention to the synergies and co-benefits generated by coordinating environmental policies with public health objectives (Liu et al., 2017; McCollum et al., 2013; Springmann et al., 2018).

Led by a number of international organisations under the United Nations umbrella, the policy discussion tends to focus on the impact of climate change on the human rights of persons with disabilities, including the right to life, health, food, water and sanitation, housing, decent work, freedom of movement, and personal development (UN, 2020). One key issue raised by the literature is this group's lack of participation and low level of engagement in the definition and implementation of climate policies (Jodoin et al., 2020). Limitations concerning access to knowledge, resources and services are deemed to affect their ability to adapt both to climate change and to climate mitigation policies. Similarly, there is a lack of awareness and data on the specific needs of persons with disabilities, which is considered a major obstacle for evidence-based decision-making processes in this field (UN, 2020).

6.4.1 Key impacts

This literature highlights how climate change policies can represent an opportunity to improve different health-related goals (McCollum et al., 2013) and create substantial health co-benefits in addition to their primary, climate-related aims

(Vandenberghe and Albrecht, 2018). The emphasis is on the reduction of avoided disability-adjusted life years (DALY[3]) and associated economic cost savings (Liu et al., 2017; McCollum et al., 2013; Springmann et al., 2018).

Among the few studies exploring the negative externalities of climate mitigation policies on people with disabilities, the focus seems to be on how these policies affect household finances. For instance, Ivanova and Middlemiss (2021) compare the energy use, income, risk of poverty and energy poverty, and other socio-demographic indicators of "disabled households" with those of other households in the European Union. The authors find that households that include people with disabilities have reduced access to resources, and in general have lower expenditure than other households in most consumption categories, except for basic commodities such as food, home energy use (gas and electricity), water and waste services. This makes disabled households more vulnerable to potential increases in the prices of these resources. In particular, disabled households are more likely to experience energy poverty, and have lower energy use and higher energy needs than other households (Gillard et al., 2017; Ivanova and Middlemiss, 2021).

Other works explore the impact of certain types of environmental regulations on people with disabilities. The issues raised by this strand of research range from practical complications arising from environmental policies, such as the banning of certain types of plastics (Jenks and Obringer, 2020), to the ways in which climate mitigation policies, programmes and projects – including public transport systems – may be incompatible with the rights of persons with disabilities (Jodoin et al., 2020).

The exclusion of individuals with disabilities from environmental policy processes is seen as a major challenge, as it limits the share of the population that can contribute to the transition to a low-carbon economy through behavioural change and proposing ideas. For instance, Fenney Salkeld (2016) finds that policies targeting individual or household actions often neglect and exclude people with disabilities, thereby undermining both their political citizenship and the policies' capacity to achieve the desired environmental goals. Most contributions look at these issues from the perspective of environmental justice, on the grounds that persons with disabilities and their rights are often neglected in the design of environmental policies (Jodoin et al., 2020).

The methodologies used by this literature are primarily quantitative in nature, and include comparative risk assessment frameworks (Springmann et al., 2018), assessment models (Liu et al., 2017; McCollum et al., 2013) and linear programming methods (Nguyen et al., 2018, 2019). These methods are used to analyse different trade-offs between environmental and economic priorities, with a particular emphasis on the health sector.

6.4.2 Mitigation measures

The 2020 report from the United Nations High Commissioner for Human Rights (2020) examines the impacts of climate change on the rights of people with disabilities, and identifies a set of recommendations about national human rights obligations in the context of climate action. One of its main conclusions is that there is a need to integrate the rights of persons with disabilities into climate policies and

3. DALY is one of the most common indicators for overall disease burden. It is defined as years of life lost to early death, and years of life with disability or a limiting condition (Nguyen et al., 2019; Vandenberghe and Albrecht, 2018).

projects. After addressing the specific impacts of climate policies on this target group, the report suggests two ways to limit potential negative impacts: First, all policies and national programmes focusing on climate change should incorporate explicit principles and standards from international core human rights treaties, in order to ensure disability-inclusive climate action; second, ensuring the participation of persons with disabilities, as well as organisations representing persons with disabilities, in all levels of decision-making and implementation would limit the negative impacts on this group (UN, 2020).

6.4.3 The Nordic perspective

In general, the challenges mentioned above also hold in a Nordic context. For instance, in a study focusing on the social consequences of Nordic green transitions, Høst et al. (2020) explore the impact of Nordic environmental consumption regulations on people with disabilities. The authors conclude that some regulations, such as those affecting single-use plastics, may have a disproportionate effect on this group. In their review of transport policies in the Nordic context, Mellin et al. (2021) stress the importance of including several perspectives at an early stage in policy design and implementation. According to the authors, the transition to sustainable and climate-smart mobility requires a reliable, safe and affordable public transport system that, among other things, is responsive to the specific needs of people with different types of disabilities.

In their 2020 report, the United Nations High Commissioner for Human Rights mentions some examples of actions at Nordic state level to foster the participation of people with disabilities in the climate action agenda. In the Swedish work programme for climate adaptation, the public health authority identified health and climate change as relevant action areas, and persons with disabilities as a vulnerable group. Along similar lines, the Finnish Ministry of Transport and Communication launched several communications in sign language, including on several sites with information on climate change, as well as the IPCC's Special Report on the Ocean and Cryosphere in a Changing Climate (UN, 2020).

7. Conclusions

This report has elaborated the potential impacts of climate change mitigation policies on a set of target groups. The work is largely based on a detailed literature review that covers academic publications, research reports and legal documents. Our review shows that the definition and delimitation of these groups must be context-specific. Their vulnerability to climate policies depends on a combination of individual/group-internal characteristics that go beyond group belonging, by e.g. ethnicity, sex, age, health status, and other socioeconomic aspects such as income level, education, or employment.

The literature points out the complexity and variety of social impacts that can emerge from pursuing ambitious climate goals. Table 5 presents an overview of the key impacts of climate mitigation policies on the target groups.

Target Groups	Key impacts	References	Nordic considerations
People who are jobless or at risk of unemployment	New job opportunities, particularly in green sectors (new energy systems, electrification of transport, building and construction, etc.).	(Blyth et al., 2014; Fankhauser et al., 2008; Olsen and International Labour Office, 2009)	Employment potentials in the Nordic green economy are largely attributable to natural assets, innovation capacity and a long-standing tradition of social co-operation (Bird, 2017; NFS et al., 2021)
	Jobs will be lost in carbon-intensive industries and sectors, as these are replaced by alternative systems and products.	(Lutz et al., 2021; Malerba and Wiebe, 2021; Marin and Vona, 2019; Rengs et al., 2020)	Particularly exposed sectors in a Nordic context include oil extraction in Norway, animal agriculture in Denmark, peat production in Finland, and process industries (pulp, cement, oil refining) across the Region (Alsos and Dølvik, 2021).
	Distributional impacts may be important. Transitions will be beneficial for some people (e.g. in white-collar and male-dominated sectors), and detrimental for others (e.g. blue collar workers, women, etc.).	(Berkhout et al., 2004; Malerba and Wiebe, 2021; Marin and Vona, 2019; Markkanen and Anger-Kraavi, 2019; Rengs et al., 2020; Upham et al., 2022)	Labour market effects will be unevenly distributed across the Nordic regions, sectors and occupations, leading to different social impacts (Alsos and Dølvik, 2021; Høst et al., 2020; Lander Svendsen et al., 2021).
	Distal effects of climate mitigation policies on labour markets are difficult to predict, but the net effects of energy transitions are expected to be positive, since renewables are more labour-intensive than other energy sources.	(Blyth et al., 2014; Fankhauser et al., 2008; Rosemberg, 2010; Upham et al., 2022; Yamazaki, 2017)	Long-term effects of Nordic green transitions are still uncertain when it comes to factors such as gender, ethnicity, age, geography, sexuality, indigenous status or disabilities (Lander Svendsen et al., 2021).
	Indirect and extraterritorial impacts (including potential job effects in other areas via industrial relocation).	(Malerba and Wiebe, 2021; Marin and Vona, 2019).	
	The social acceptability of climate policies may be compromised by perceptions regarding unemployment or lower welfare levels.	(Bergquist et al., 2020; Marin and Vona, 2019)	"Job-killing" arguments continue to prevail in certain areas of Nordic public opinion (Høst et al., 2020). The "pro-economy" narrative still occupies a central position in policy discourse (Vesa et al., 2020)
Older adults	Older adults with lower incomes and savings are expected to experience challenges in keeping their homes at a comfortable temperature if energy	(Byrne and Harris, 2015; Evans, 2013; Hitchings and Day, 2011; Martiskainen et al., 2021)	Given the cold Nordic climate, the heating season tends to be long, and heating prices can severely affect household finances (Byrne

	prices rise.		and Harris, 2015).
	Increasing transport prices may limit the ability of some older adults to travel for leisure, or even to meet basic needs such as healthcare.		Nordic rural areas have a higher share of older inhabitants, as well as a higher proportion of people with a lower education level (Frøshaug and Andreasson, 2020; Høst et al., 2020).
	Older adults bear a moral responsibility for and feel committed to climate change mitigation. However, they are not always included in climate debates.	(Frumkin et al., 2012, 2012; Moody, 2017; Pillemer et al., 2021; United Nations General Assembly, 2021a, 2021b)	
Children	Climate mitigation policies are assumed to have positive impacts on children's health	Gasparri et al., 2022; Shea et al., 2020; Yang et al., 2021	
	Vulnerability to climate mitigation policies within this group is driven primarily by socioeconomic conditions rather than age. In particular, climate policies can indirectly affect children's wellbeing through their parents' working conditions.	Shea et al., 2020; Sovacool et al., 2021; Yang et al., 2021	
	The green transition may impact on children in the Global South through international supply chains (e.g. e-recycling).	Heacock et al., 2016; Sovacool et al., 2021	Nordic climate policies and regulations affect societies and children in low-income regions in different ways (Calmfors et al., 2019; Sovacool et al., 2021). Nordic consumption leads to mixed impacts on vulnerable societies (Fråne et al., 2021).
	Children lack recognition as important stakeholders in climate policies. This undermines climate policy action and challenges the credibility of policies.	OECD, 2018; Pegram and Colon, 2020; Sovacool et al., 2021; Stoecklin, 2021; Yang et al., 2021	It may undermine the effectiveness of Nordic climate policies if children and young people are not actively engaged in their design (Laine et al., 2018; Mellin et al., 2021).
People with disabilities	Limited participation, lack of access to knowledge, resources and services, and limited awareness among policy-makers result in policies that reinforce existing social, economic, and institutional discrimination of people with disabilities.	Fenney Salkeld, 2016; Jodoin et al., 2020; UN, 2020	Mellin et al. (2021) provide an example of how lack of awareness of this group's specific needs may undermine climate-smart transport planning in Nordic cities.
	Disabled households are more sensitive to increases in the price of basic commodities. In particular, this group is more likely to experience energy poverty.	Ivanova and Middlemiss, 2021	
	Ableist environmental and climate policies, like banning single-use plastics, neglect the specific needs of people with disabilities.	Jenks and Obringer, 2020	Nordic environmental consumption regulations, such as single-use plastics, may have a disproportional effect on people with disabilities (Høst et al., 2020).
	Health and economic co-benefits of coordinated climate and public health policies.	Liu et al., 2017; McCollum et al., 2013; Springmann et al., 2018; Vandenberghe and Albrecht, 2018	

Table 5. Overview of the key impacts of climate mitigation policies on the target groups

In general, the literature shows widespread interest in the positive effects or co-benefits of climate mitigation policies with regard to social wellbeing. Many papers, particularly older ones, emphasise the co-benefits that such policies could bring to society, ranging from green jobs to improved health and wellbeing, cost savings in the health sector, etc.

When it comes to the negative impacts, the main channels through which climate mitigation policies may impact vulnerable households seem to be income and expenditure. Due to a mismatch between skills and market demand, or income dependence on directly exposed sectors (e.g. large industrial emitters), some households are vulnerable to unemployment and therefore loss of income. Increased expenditure associated with higher costs for basic products, including energy, may potentially affect all households. However, those already in a vulnerable situation may be affected more than others. In addition, specific environmental regulations may affect certain groups with special needs.

In general, the reviewed literature acknowledges that the social impacts of climate mitigation policies can be highly asymmetric. The same climate policies may disproportionally affect some social groups while barely affecting others. Moreover, the impacts can be verified at various levels, in the form of both direct effects and indirect consequences. The interactions between these different levels may lead to situations in which all of the expected impacts are of a similar nature (i.e. all consequences are considered either positive or negative), or otherwise lead to trade-offs. For instance, some of the references suggest that climate policies may create jobs while also undermining working conditions. Hence, climate change mitigation policy can influence vulnerable social groups either positively or negatively, depending on how such policies are designed and implemented.

Hybrid outcomes can also be expected at the territorial level. The literature pinpoints how some mechanisms in the propagation of the social effects of climate mitigation policies may cause territorial spill-overs and externalities. The latter are of particular concern, since some of the climate mitigation policies entail profound changes on our economic systems at a global level. In particular, the replacement of energy carriers (from fossil fuels to metals) is already having far-reaching consequences for local communities and social groups worldwide, including in the Nordic Region. In addition, international supply chains and business models are being transformed in response to climate mitigation policies, which further amplifies these impacts.

There is broad consensus that the effects of climate change are most keenly felt by the most vulnerable social groups, and that addressing climate impacts in isolation is unlikely to achieve equitable, efficient or effective adaptation outcomes. For these reasons, it is recommended that climate mitigation policies should go hand in hand with other measures, to ensure that pursuing climate targets does not result in negative impacts on vulnerable groups. Well-designed climate policies require a holistic assessment of not only their positive effects, but also their negative consequences, in order to minimise socioeconomic inequalities. Several works also emphasise the importance of policy awareness and sensitivity towards gender aspects and specific social groups. A proactive, horizontal consideration of these issues is required when drafting climate policies.

It is also important to explore the social implications of climate policies, because this knowledge may help to remove some of the existing barriers to the adoption of the climate agenda. Social acceptance of climate policies requires consensus-building through increased participation. Most works underline that this is a cross-cutting priority. The literature emphasises the importance of inclusive and comprehensive

processes in the policy design, implementation and evaluation phases. At each stage of the policy cycle, there must be a prioritisation of broad social participation, taking into consideration stakeholder concerns, minority voices, and the involvement of the communities that will be primarily affected by the transitions.

Government support is also considered essential. This support includes providing funding, incentives for investors and coherent strategies for diversification, targeted at, e.g. the repurposing of obsolete infrastructures, reskilling or talent-retention programmes.

In sum, it is essential that climate mitigation policies take account of social differences in order to address both effectiveness and justice concerns. They must take into consideration the specific needs of disadvantaged or vulnerable social groups who may be further marginalised by ill-designed climate policies.

8. References

Abraham J (2017) Just Transitions for the Miners: Labor Environmentalism in the Ruhr and Appalachian Coalfields. *New Political Science* 39(2): 218–240. DOI: 10.1080/07393148.2017.1301313.

Ackerman F (2008) Climate economics in four easy pieces. *Development (Cambridge, England)* 51(3): 325–331. DOI: 10.1057/dev.2008.34.

AGE Platform Europe (2019) *Environment matters to everyone, including older persons.* Available at: https://www.age-platform.eu/policy-work/news/environment-matters-everyone-including-older-persons.

Alsos K and Dølvik JE (2021) *The Future of Work in the Nordic Countries: Opportunities and Challenges for the Nordic Life Models*. TemaNord. Nordic Council of Ministers. DOI: 10.6027/temanord2021-520.

Bailie A, Tellus Institute, MRG & Associates, et al. (2002) *The Bottom Line on Kyoto: Economic Benefits of Canadian Action*. Ottawa: Canadian Centre for Policy Alternatives.

Barkraft (2017) Development and Sustainability Agenda for Åland. Available at: https://www.barkraft.ax/.

Batini N, Parry I and Wingender P (2020) *Climate Mitigation Policy in Denmark: A Prototype for Other Countries*. WP/20/235, IMF Working Paper. Washington D.C.: International Monetary Fund. Available at: https://www.imf.org/-/media/Files/Publications/WP/2020/English/wpiea2020235-print-pdf.ashx (accessed 12 April 2022).

Bennett NJ, Blythe J, Cisneros-Montemayor AM, et al. (2019) Just Transformations to Sustainability. *Sustainability* 11(14): 3881. DOI: 10.3390/su11143881.

Bergquist P, Mildenberger M and Stokes LC (2020) Combining climate, economic, and social policy builds public support for climate action in the US. *Environmental Research Letters* 15(5): 054019. DOI: 10.1088/1748-9326/ab81c1.

Berkhout F, Smith A and Stirling A (2004) Socio-technological Regimes and Transition Contexts. In: *System Innovation and the Transition to Sustainability*. Edward Elgar Publishing, p. 3335. DOI: 10.4337/9781845423421.00013.

Bird T (2017) *Nordic Action on Climate Change*. Nordic Council of Ministers. DOI: 10.6027/ANP2017-766.

Blyth DW, Speirs J and Gross DR (2014) Low carbon jobs: the evidence for net job creation from policy support for energy efficiency and renewable energy.: 31.

Bohnenberger K (2022) Greening work: labor market policies for the environment. *Empirica*. Springer. DOI: 10.1007/s10663-021-09530-9.

Büchs M, Ivanova D and Schnepf SV (2021) Fairness, effectiveness, and needs satisfaction: New options for designing climate policies. *Environmental Research Letters* 16(12). DOI: 10.1088/1748-9326/ac2cb1.

Byrne C and Harris C (2015) *Climate Change in an Ageing World*. HelpAge position paper. London (UK). Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/COP21_HelpAge_PositionPaper_Final_0.pdf.

Calmfors L, Hassler J, Nasiritousi N, et al. (2019) *Climate Policies in the Nordics – Nordic Economic Policy Review 2019*. Nordic Council of Ministers. DOI: 10.6027/Nord2019-012.

Cambou D (2020) Uncovering Injustices in the Green Transition: Sámi Rights in the Development of Wind Energy in Sweden. *Arctic Review on Law and Politics* 11(0): 310. DOI: 10.23865/arctic.v11.2293.

Cardona OD, van Aalst MK, Birkmann J, et al. (2012) Determinants of risk: exposure and vulnerability. In: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, USA, pp. 65–108. Available at: https://www.ipcc.ch/report/managing-the-risks-of-extreme-events-and-disasters-to-advance-climate-change-adaptation/ (accessed 24 February 2022).

Carter T, Fronzek S, Inkinen A, et al. (2016) Characterising vulnerability of the elderly to climate change in the Nordic region. *Regional Environmental Change* 16: 43–58.

Casillas CE and Kammen DM (2012) Quantifying the social equity of carbon mitigation strategies. *Climate Policy* 12(6): 690–703. DOI: 10.1080/14693062.2012.669097.

Cedergren E, Lundgren A, Tapia C, et al. (Forthcoming) *Just Green Transition: Key concepts and implications in the Nordic Region*.

CSIS and CIF (2020) *JUST TRANSITION CONCEPTS AND RELEVANCE FOR CLIMATE ACTION: A Preliminary Framework*. June. Available at: https://www.climateinvestmentfunds.org/sites/cif_enc/files/knowledge-documents/justtransition_final.pdf.

Dikeç M (2001) Justice and the Spatial Imagination. *Environment and Planning A: Economy and Space* 33(10): 1785–1805. DOI: 10.1068/a3467.

Duvali R (2008) *A Taxonomy of Instruments to Reduce Greenhouse Gas Emissions and their Interactions*. OECD Economics Department Working Papers 636, OECD Economics Department Working Papers, 17 September. DOI: 10.1787/236846121450.

EC (2017) Initiative for coal regions in transition. Available at: https://energy.ec.europa.eu/topics/oil-gas-and-coal/eu-coal-regions/initiative-coal-regions-transition_en (accessed 13 May 2022).

EC (2020) COM(2020) 22 final. Proposal for a Regulation of the European Parliament and of the Council establishing the Just Transition Fund.

EC (2021a) *COM(2021) 550 final. 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality*. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0550 (accessed 1 June 2022).

EC (2021b) *Taxation in Support of Green Transition: An Overview and Assessment of Existing Tax Practices to Reduce Greenhouse Gas Emissions : Country Fiches*. LU: Publications Office. Available at: https://data.europa.eu/doi/10.2778/034100 (accessed 27 May 2022).

EC (2022a) EU Emissions Trading System (EU ETS). Available at: https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets_en (accessed 12 January 2022).

EC (2022b) REPowerEU: affordable, secure and sustainable energy for Europe. Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en (accessed 1 June 2022).

EEA Joint Committee (2019) Decision of the EEA Joint Committee No 269/2019 of 25 October 2019 amending Protocol 31 to the EEA Agreement, on cooperation in specific fields outside the four freedoms.

Energi- og Forsyningsministeriet (2016) Dansk klimapolitik. In: Energistyrelsen. https://ens.dk/ansvarsomraader/energi-klimapolitik/fakta-om-dansk-energi-klimapolitik/dansk-klimapolitik. Accessed 27 May 2022

EU (2018) Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance). *OJ L*. Available at: http://data.europa.eu/eli/reg/2018/842/oj/eng (accessed 20 January 2022).

EU (2020) Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council (Text with EEA relevance). *OJ L*. Available at: http://data.europa.eu/eli/dec_impl/2020/2126/oj/eng (accessed 20 January 2022).

EU Council (2014) European Council 23/24 October 2014 - Conclusions. *EUCO 169/14*.

European Commission (2021) The Just Transition Mechanism: making sure no one is left behind. Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en.

European Council (2021) Fit for 55: The EU's plan for a green transition. Available at: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/ (accessed 1 June 2022).

European Youth Forum (2006) *Policy paper on sustainable development European Youth Forum*. 0182-06-FINAL COMEM. European Youth Forum. Available at: https://www.youthforum.org/news/policy-paper-on-sustainable-development-2 (accessed 31 May 2022).

European Youth Forum (2018) *Position on the Comprehensive Implementation of the 2030 Agenda for Sustainable Development in Europe European Youth Forum*. European Youth Forum. Available at: https://www.youthforum.org/news/position-on-the-comprehensive-implementation-of-the-2030-agenda-for-sustainable-development-in-europe (accessed 31 May 2022).

European Youth Forum (2019) *Resolution in support of youth demanding urgent climate action*. COMEM 0052-19-FINAL. Brussels: European Youth Forum.

European Youth Forum (2020) *Policy Paper on Quality Youth Participation and Representation in Institutions European Youth Forum*. European Youth Forum. Available at: https://www.youthforum.org/news/policy-paper-on-quality-youth-participation-and-representation-in-institutions (accessed 31 May 2022).

Evans G (2013) Ageing and climate change: A society-technology-design discourse. *The Design Journal* 16(2): 239–258.

Fankhaeser S, Sehlleier F and Stern N (2008) Climate change, innovation and jobs. *Climate Policy* 8(4): 421–429. DOI: 10.3763/cpol.2008.0513.

Fankhauser S, Sehlleier F and Stern N (2008) Climate change, innovation and jobs. *Climate Policy* 8(4). Earthscan: 421–429. DOI: 10.3763/cpol.2008.0513.

Fenney Salkeld D (2016) Sustainable lifestyles for all? Disability equality, sustainability and the limitations of current UK policy. *Disability & Society* 31(4). Routledge: 447–464. DOI: 10.1080/09687599.2016.1182011.

Filiberto D, Wells N, Wethington E, et al. (2010) *Climate Change, Vulnerability and Health Effects: Implications for the Older Population*. Available at: https://www.researchgate.net/profile/Nancy-Wells-3/publication/265265398_Climate_Change_Vulnerability_and_Health_Effects_Implications_for_the

_Older_Population_Contributing_authors/links/54b3db2b0cf28ebe92e4308a/Climate-Change-Vulnerability-and-Health-Effects-Implications-for-the-Older-Population-Contributing-authors.pdf.

Finnish Government (2017) National land use guidelines of Finland. Available at: https://www.ymparisto.fi/en-us/living_environment_and_planning/Land_use_planning_system/National_land_use_guidelines.

Fitzgerald JB (2022) Working time, inequality and carbon emissions in the United States: A multi-dividend approach to climate change mitigation. *Energy Research & Social Science* 84: 102385. DOI: 10.1016/j.erss.2021.102385.

Fråne A, Dahlbom M, Sanctuary M, et al. (2021) *Towards Sustainable Consumption in the Nordic Region*. Nordic Council of Ministers. Available at: http://dx.doi.org/10.6027/nord2021-024.

Frøshaug AS and Andreasson U (2020) *Democracy and climate engagement in the Nordic region: same direction, different solutions*. Nordic Council of Ministers. Available at: http://doi.org/10.6027/nord2020-035.

Frumkin H, Fried L and Moody R (2012) Aging, climate change, and legacy thinking. *American Journal of Public Health* 102(8): 1434–1438.

Gasparri G, Tcholakov Y, Gepp S, et al. (2022) Integrating Youth Perspectives: Adopting a Human Rights and Public Health Approach to Climate Action. *International Journal of Environmental Research and Public Health* 19(8). 8. Multidisciplinary Digital Publishing Institute: 4840. DOI: 10.3390/ijerph19084840.

Geels FW, Kern F, Fuchs G, et al. (2016) The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014). *Research Policy* 45(4): 896–913. DOI: 10.1016/j.respol.2016.01.015.

Geels FW, Pereira GI and Pinkse J (2022) Moving beyond opportunity narratives in COVID-19 green recoveries: A comparative analysis of public investment plans in France, Germany, and the United Kingdom. *Energy Research and Social Science* 84. Elsevier Ltd. DOI: 10.1016/j.erss.2021.102368.

Geiger N, Swim JK and Benson L (2021) Using the three-pillar model of sustainability to understand lay reactions to climate policy: A multilevel approach. *Environmental Science and Policy* 126: 132–141. DOI: 10.1016/j.envsci.2021.09.023.

Gillard R, Snell C, Bevan M (2017) Advancing an energy justice perspective of fuel poverty: Household vulnerability and domestic retrofit policy in the United Kingdom. Energy Res Soc Sci 29:53–61. https://doi.org/10.1016/j.erss.2017.05.012

Government of Åland (2017) Energi- och klimatstrategi för Åland till år 2030. Available at: https://www.regeringen.ax/sites/www.regeringen.ax/files/attachments/page/lr_energi_klimatstrat_2030.pdf.

Government of Finland (2020) *Replies by the Government of Finland to the Questionnaire by the Office of the United Nations High Commissioner for Human Rights on the Promotion and the Protection of the Rights of Older Persons in the Context of Climate Change*. Available at: https://www.ohchr.org/EN/Issues/HRAndClimateChange/Pages/RightsOlderPersons.aspx.

Grantham Research Institute on Climate Change and the Environment (2022) Climate Change Laws of the World. Available at: https://climate-laws.org/ (accessed 9 May 2022).

Haq G (2016) *'Win-Win' Strategies to Help Older People Face Climate Change*. Stockholm: Stockholm Environment Institute. Available at: https://www.sei.org/perspectives/older-people-climate-change/.

Haq G, Whitelegg J and Kohler M (2008) *Growing Old in a Changing Climate. Meeting the Challenges of an Ageing Population and Climate Change*. SEI project report. Stockholm: Stockholm Environment Institute.

Haq G, Brown D and Hards S (2010) *Older People and Climate Change: The Case for Better Engagement*. Stockholm: Stockholm Environment Institute.

Heacock M, Kelly CB, Asante KA, et al. (2016) E-Waste and Harm to Vulnerable Populations: A Growing Global Problem. *Environmental Health Perspectives* 124(5). Environmental Health Perspectives: 550–555. DOI: 10.1289/ehp.1509699.

Heiskanen H-E (2018) *Towards Greener Human Rights Protection : Rewriting the Environmental Case Law of the European Court of Human Rights*. University of Tampere, Finland. Available at: https://researchportal.tuni.fi/en/publications/towards-greener-human-rights-protection-rewriting-the-environment (accessed 2 March 2022).

Heleniak T and Sanchez Gassen N (2019) *The Nordic Population 2040 – Analysis of Past and future demographic trends*. 18 June. Nordregio. DOI: 10.6027/R2019:6.1403-2503.

Hitchings R and Day R (2011) How Older People Relate to the Private Winter Warmth Practices of Their Peers and Why We Should Be Interested. *Environment and Planning A: Economy and Space* 43(10): 2452–2467. DOI: 10.1068/a44107.

Hosking J, Jones R, Percival T, et al. (2011) Climate change: The implications for child health in Australasia. *Journal of Paediatrics and Child Health* 47(8): 493–496. DOI: 10.1111/j.1440-1754.2010.01699.x.

Høst J, Lauritzen F and Popp S (2020) *A socially sustainable green transition in the nordic region.* Nordic Council of Ministers. Available at: ISBN 978-92-893-6837.

Howard P and Livermore MA (2019) *Sociopolitical Feedbacks and Climate Change*. ID 3348046, SSRN Scholarly Paper, 6 March. Rochester, NY: Social Science Research Network. Available at: https://papers.ssrn.com/abstract=3348046 (accessed 21 February 2022).

Huynh D, Stjernberg M and Cuadrado A (2022) *Active and Healthy Ageing: Heterogenous perspectives and Nordic indicators*. Nordic Welfare Centre. DOI: 10.52746/MRQY4037.

ILO (2015a) Frequently Asked Questions on Climate Change and Jobs. Available at: http://www.ilo.org/global/topics/green-jobs/WCMS_371589/lang--en/index.htm (accessed 9 February 2022).

ILO (2015b) *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All*. Geneva, Switzerland. Available at: https://www.ilo.org/.

IMO (2020) *Fourth IMO Greenhouse Gas Study*. International Maritime Organization.

IPCC (2007) *Climate Change 2007 - Mitigation of Climate Change: Working Group III Contribution to the Fourth Assessment Report of the IPCC*.

IPCC (2014) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Final Draft IPCC WGII AR5. Technical Summary*. October 2013. IPCC.

IPCC (2022a) *Climate Change 2022: Impacts, Adaptation and Vulnerability. WGII Sixth Assessment Report. Chapter 18. Climate resilient development pathways*.

IPCC (2022b) *Climate Change 2022: Impacts, Adaptation and Vulnerability. WGII Sixth Assessment Report. Summary for Policymakers*.

IPCC, Field CB, Barros VR, et al. (2014) *Fifth Assessment Report (AR5): Climate Change 2013/2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability ; Part B [Volume 2] [Volume 2*. New York, NY, USA: Cambridge University Press.

Ivanova D and Middlemiss L (2021) Characterizing the energy use of disabled people in the European Union towards inclusion in the energy transition. *Nature Energy* 6(12). 12. Nature Publishing Group: 1188–1197. DOI: 10.1038/s41560-021-00932-4.

Jackson B (2005) The Conceptual History of Social Justice. Polit Stud Rev 3:356–373. https://doi.org/10.1111/j.1478-9299.2005.00028.x

Jenks AB and Obringer KM (2020) The poverty of plastics bans: Environmentalism's win is a loss for disabled people. *Critical Social Policy* 40(1): 151–161. DOI: 10.1177/0261018319868362.

Jodoin S, Ananthamoorthy N and Lofts K (2020) A Disability Rights Approach to Climate Governance. *Ecology Law Quarterly* 47: 73.

Klima-og Miljødepartementet (2021) Klimaendringer og norsk klimapolitikk. In: Regjeringen.no. https://www.regjeringen.no/no/tema/klima-og-miljo/innsiktsartikler-klima-miljo/klimaendringer-og-norsk-klimapolitikk/id2636812/. Accessed 27 May 2022

Kortetmäki T and Järvelä M (2021) Social vulnerability to climate policies: Building a matrix to assess policy impacts on well-being. *Environmental Science and Policy* 123: 220–228. DOI: 10.1016/j.envsci.2021.05.018.

Kosanic A, Petzold J, Martín-López B, et al. (2022) An inclusive future: disabled populations in the context of climate and environmental change. *Current Opinion in Environmental Sustainability* 55: 101159. DOI: 10.1016/j.cosust.2022.101159.

Krogstrup S and Oman W (2019) Macroeconomic and Financial Policies for Climate Change Mitigation: A Review of the Literature. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.3463780.

Kuhl L (2021) Policy making under scarcity: reflections for designing socially just climate adaptation policy. *One Earth* 4(2): 202–212. DOI: 10.1016/j.oneear.2021.01.008.

Laine A, Lampikoski T, Rautiainen T, et al. (2018) *Mobility as a Service and Greener Transportation Systems in a Nordic context*. Nordic Council of Ministers. Available at: http://dx.doi.org/10.6027/TN2018-558.

Lander Svendsen N, Weber K, Factor G, et al. (2021) *Policy Brief: Climate Policies Are Not Gender Neutral : How Climate Policies Impact Gender and Vice Versa in a Nordic Context*. Nordisk Ministerråd. Available at: http://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-12262 (accessed 27 May 2022).

Leinonen T, Haanperä O, Kohl A, et al. (2020) *Turpeen Käytöstä Luopuminen: Keinoja Suomelle Reilun Siirtymän Tukemiseen*. Sitra työpaperi. Available at: https://www.sitra.fi/app/uploads/2020/06/turpeen-kaytosta-luopuminen.pdf (accessed 12 April 2022).

Leyva E, Beaman A and Davidson P (2017) Health impact of climate change in older people: An integrative review and implications for nursing. *Journal of Nursing Scholarship* 49(6): 670–678.

Liu M, Huang Y, Jin Z, et al. (2017) Estimating health co-benefits of greenhouse gas reduction strategies with a simplified energy balance based model: The Suzhou City case. *Journal of Cleaner Production* 142: 3332–3342. DOI: 10.1016/j.jclepro.2016.10.137.

Lutz C, Becker L and Kemmler A (2021) Socioeconomic effects of ambitious climate mitigation policies in germany. *Sustainability (Switzerland)* 13(11). MDPI AG. DOI:

10.3390/su13116247.

Mäkitie T, Normann HE, Thune TM, et al. (2019) The green flings: Norwegian oil and gas industry's engagement in offshore wind power. *Energy Policy* 127: 269–279. DOI: 10.1016/j.enpol.2018.12.015.

Malerba D and Wiebe KS (2021) Analysing the effect of climate policies on poverty through employment channels. *Environmental Research Letters* 16(3). IOP Publishing Ltd. DOI: 10.1088/1748-9326/abd3d3.

Marin G and Vona F (2019) Climate policies and skill-biased employment dynamics: Evidence from EU countries. *Journal of Environmental Economics and Management* 98. Academic Press Inc. DOI: 10.1016/j.jeem.2019.102253.

Markkanen S and Anger-Kraavi A (2019) Social impacts of climate change mitigation policies and their implications for inequality. *Climate Policy* 19(7): 827–844. DOI: 10.1080/14693062.2019.1596873.

Martinez-Fernandez C, Hinojosa C and Miranda G (2010) *Greening Jobs and Skills: Labour Market Implications of Addressing Climate Change*. OECD Local Economic and Employment Development (LEED) Working Papers 2010/02, OECD Local Economic and Employment Development (LEED) Working Papers, 1 July. DOI: 10.1787/5kmbjgl8sd0r-en.

Martiskainen M, Sovacool B, Lacey-Barnacle M, et al. (2021) New dimensions of vulnerability to energy and transport poverty. *Joule* 5(1): 3–7.

McCauley D and Heffron R (2018) Just transition: Integrating climate, energy and environmental justice. *Energy Policy* 119: 1–7. DOI: 10.1016/j.enpol.2018.04.014.

McCauley D, Ramasar V, Heffron RJ, et al. (2019) Energy justice in the transition to low carbon energy systems: Exploring key themes in interdisciplinary research. *Applied Energy* 233–234: 916–921. DOI: 10.1016/j.apenergy.2018.10.005.

McCollum DL, Krey V, Riahi K, et al. (2013) Climate policies can help resolve energy security and air pollution challenges. *Climatic Change* 119(2): 479–494. DOI: 10.1007/s10584-013-0710-y.

McDermott-Levy R, Kolanowski A, Fick D, et al. (2019) Addressing the health risks of climate change in older adults. *Journal of Gerontological Nursing* 45(11).

Mellin A, Dahlstrand A, Lewald A, et al. (2021) *Sustainable Nordic cities with focus on climate smart mobility*. Nordic Council of Ministers. Available at: ISBN 978-92-893-6924-4.

Mendez MA (2015) Assessing local climate action plans for public health co-benefits in environmental justice communities. Local Environ 20:637–663. https://doi.org/10.1080/13549839.2015.1038227

Miljøstatus (2022) Klima. In: Miljøstatus. https://miljostatus.miljodirektoratet.no/miljomal/klima/. Accessed 27 May 2022

Ministry for the Environment and Natural Resources (2018) *Iceland's Seventh National Communication and Third Biennial Report Under the United Nations Framework Convention on Climate Chance*.

Ministry of Climate and Environment (2021a) Meld. St. 13 (2020–2021). regjeringen.no. Available at: https://www.regjeringen.no/nn/dokumenter/meld.-st.-13-20202021/id2827405/ (accessed 12 April 2022).

Ministry of Climate and Environment (2021b) Norway's comprehensive climate action plan. regjeringen.no. Available at: https://www.regjeringen.no/en/historical-archive/solbergs-government/Ministries/kld/news/2021/heilskapeleg-plan-for-a-na-klimamalet/id2827600/ (accessed 12 April 2022).

Ministry of Employment and the Economy (2014) *Energy and Climate Roadmap 2050 - Report of the Parliamentary committee on Energy and Climate Issues on 16 October 2014*.

Ministry of Environment and Natural Resources (2020) Iceland's 2020 Climate Action Plan. Government of Iceland.

Ministry of the Environment (2021) Finland's national climate change policy. Available at: https://ym.fi/en/finland-s-national-climate-change-policy (accessed 27 May 2022).

Ministry of the Environment (2022a) Medium-term climate change policy plan. Available at: https://ym.fi/en/medium-term-climate-change-policy-plan (accessed 27 May 2022).

Ministry of the Environment (2022b) The reform of the Climate Change Act. Available at: https://ym.fi/en/the-reform-of-the-climate-change-act (accessed 27 May 2022).

Moody R (2017) Elders and climate change: No excuses. Public Policy Aging Rep 27:22–26

Naturvårdsverket (2017) Sveriges klimatmål och klimatpolitiska ramverk. https://www.naturvardsverket.se/amnesomraden/klimatomstallningen/sveriges-klimatarbete/sveriges-klimatmal-och-klimatpolitiska-ramverk/. Accessed 27 May 2022

NFS, FES, DGB (2021) The Road Towards a Carbon-Free Society: A Nordic-German Trade Union Cooperation on Just Transition. Council of Nordic Trade Unions (NFS), the Friedrich-Ebert Stiftung (FES) and the German Trade Union Confederation (DGB).

Nguyen HT, Aviso KB, Le DQ, et al. (2018) A linear programming input–output model for mapping low-carbon scenarios for Vietnam in 2030. *Sustainable Production and Consumption* 16: 134–140. DOI: 10.1016/j.spc.2018.07.004.

Nguyen HT, Kojima N and Tokai A (2019) An input–output linear programming model for assessing climate policy considering economic growth. *Environment Systems and Decisions* 39(1): 34–48. DOI: 10.1007/s10669-018-9699-0.

Nordic Council of Ministers (2021) *Nordic Co-Operation Programme on Energy Policy 2022–2024*. Nordic Council of Ministers. DOI: 10.6027/politiknord2021-731.

Nordic Energy Research (2021) *Renewable Energy in the Nordics 2021.* Nordic Energy Research. DOI: 10.6027/NER2021-03.

OECD (2018) *Engaging and empowering youth across the OECD- A youthful summary of the 2018 stocktaking report*. Available at: https://www.oecd.org/gov/engaging-and-empowering-youth-across-the-oecd.pdf.

Oei P-Y, Hermann H, Herpich P, et al. (2020) Coal phase-out in Germany – Implications and policies for affected regions. *Energy* 196. Elsevier Ltd. DOI: 10.1016/j.energy.2020.117004.

Olsen L and International Labour Office (2009) *The Employment Effects of Climate Change and Climate Change Responses: A Role for International Labour Standards?* Geneva: ILO.

Otto IM, Reckien D, Reyer CPO, et al. (2017) Social vulnerability to climate change: a review of concepts and evidence. *Regional Environmental Change* 17(6): 1651–1662. DOI: 10.1007/s10113-017-1105-9.

Owen A and Barrett J (2020) Reducing inequality resulting from UK low-carbon policy. *Climate Policy* 20(10). Taylor and Francis Ltd.: 1193–1208. DOI: 10.1080/

14693062.2020.1773754.

Paavola J (n.d.) Health impacts of climate change and health and social inequalities in the UK. *Environmental Health* 16(113).

Pegram J and Colon C (2020) *Are climate change policies child-sensitive?* UNICEF Office of Global Insight and Policy. Available at: https://www.unicef.org/documents/are-climate-change-policies-child-sensitive (accessed 11 February 2022).

Perera FP (2017) Multiple threats to child health from fossil fuel combustion: Impacts of air pollution and climate change. *Environmental Health Perspectives* 125(2): 141–148. DOI: 10.1289/EHP299.

Pillemer K, Tillema Cope M and Nolte J (2021) *Older People and Action on Climate Change: A Powerful but Underutilized Resource*. Commissioned report for HelpAge International. Available at: https://www.unescap.org/sites/default/d8files/event-documents/KPillemer_paper.pdf.

Pindyck RS (2019) The social cost of carbon revisited. J Environ Econ Manag 94:140–160. https://doi.org/10.1016/j.jeem.2019.02.003

Pörtner H-O, et al. (2022) Climate change 2022. Impact, adaptation and vulnerability. Summary for policymakers. Intergovernmental panel on climate change

Rauter ARKK (2022) Elite energy transitions: Leaders and experts promoting renewable energy futures in Norway. *Energy Research & Social Science* 88: 102509. DOI: 10.1016/j.erss.2022.102509.

Rawls J (1971) *A Theory of Justice*. Cambridge: MA: Belnap Press.

RCI (2021) Greenland to join Paris climate agreement – Eye on the Arctic. Available at: https://www.rcinet.ca/eye-on-the-arctic/2021/11/02/greenland-to-join-paris-climate-agreement/ (accessed 27 May 2022).

Regeringskansliet R och (2021) Sweden's climate policy framework. In: Regeringskansliet. https://www.government.se/articles/2021/03/swedens-climate-policy-framework/. Accessed 27 May 2022

Regeringskansliet R och (2018) Sweden's carbon tax. In: Regeringskansliet. https://www.government.se/government-policy/swedens-carbon-tax/swedens-carbon-tax/. Accessed 27 May 2022

Rengs B, Scholz-Wäckerle M and van den Bergh J (2020) Evolutionary macroeconomic assessment of employment and innovation impacts of climate policy packages. *Journal of Economic Behavior and Organization* 169. Elsevier B.V.: 332–368. DOI: 10.1016/j.jebo.2019.11.025.

Rezai A, Taylor L and Foley D (2018) Economic growth, income distribution, and climate change. *Ecological Economics* 146. Elsevier B.V.: 164–172. DOI: 10.1016/j.ecolecon.2017.10.020.

Rosemberg A (2010) Building a Just Transition: The linkages between climate change and employment. *International Journal of Labour Research* 2(2).

Sauer A and Stieß I (2021) Accounting for gender in climate policy advice: adapting a gender impact assessment tool to issues of climate change. *Impact Assessment and Project Appraisal* 39(3). Taylor & Francis: 262–273. DOI: 10.1080/14615517.2021.1904710.

Shea E, Perera F and Mills D (2020) Towards a fuller assessment of the economic benefits of reducing air pollution from fossil fuel combustion: Per-case monetary estimates for children's health outcomes. *Environmental Research* 182: 109019. DOI: 10.1016/j.envres.2019.109019.

Silbye F, Sørensen PB, Bäckstrand K, et al. (2019) National Climate Policies and the European Emissions Trading System. In: Calmfors L (ed.) *Climate Policies in the Nordics*. Nordic Economic Policy Review 2019. Nordic Council of Ministers. DOI: 10.6027/Nord2019-012.

Smith S (2017) *Just Transition: A Report for the OECD*. Just Transition Centre. Available at: https://www.ituc-csi.org/just-transition-centre.

Sovacool BK, Turnheim B, Hook A, et al. (2021) Dispossessed by decarbonisation: Reducing vulnerability, injustice, and inequality in the lived experience of low-carbon pathways. *World Development* 137: 105116. DOI: 10.1016/j.worlddev.2020.105116.

Springmann M, Sacks G, Ananthapavan J, et al. (2018) Carbon pricing of food in Australia: an analysis of the health, environmental and public finance impacts. *Australian and New Zealand Journal of Public Health* 42(6): 523–529. DOI: 10.1111/1753-6405.12830.

Stoecklin D (2021) The Transactional Horizons of Greta Thunberg. *Societies* 11(2). 2. Multidisciplinary Digital Publishing Institute: 36. DOI: 10.3390/soc11020036.

Swennenhuis F, Mabon L, Flach TA, et al. (2020) What role for CCS in delivering just transitions? An evaluation in the North Sea region. *International Journal of Greenhouse Gas Control* 94: 102903. DOI: 10.1016/j.ijggc.2019.102903.

Sygna L, Eriksen S, O'Brien K, et al. (2004) Climate change in Norway: Analysis of economic and social impacts and adaptations. *Research Council of Norway and CICERO*.

The Danish Ministry of Climate, Energy and Utilities (2020) *A Green and Sustainable World: The Danish Government's Long-Term Strategy for Global Climate Action*.

The Government of the Faroe Islands. (2022) Faroese Energy – On the Sustainability Track. Available at: https://www.faroeislands.fo/economy-business/energy/ (accessed 6 June 2022).

Tvinnereim E, Lægreid OM and Fløttum K (2020) Who cares about Norway's energy transition? A survey experiment about citizen associations and petroleum. *Energy Research & Social Science* 62: 101357. DOI: 10.1016/j.erss.2019.101357.

UN (2006) *Convention on the Rights of Persons with Disabilities (CRPD)*. Available at: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html (accessed 15 February 2022).

UN (2020) *Analytical study on the promotion and protection of the rights of persons with disabilities in the context of climate change - Report of the Office of the United Nations High Commissioner for Human Rights A/HRC/44/30*. Annual report of the United Nations High Commissioner for Human Rights and reports of the Office of the High Commissioner and the Secretary-General Promotion and protection of all human rights, civil, political, economic, social, and cultural rights, including the right to development. Available at: https://www.ohchr.org/EN/PublicationsResources/Pages/AnnualReportAppeal.aspx (accessed 1 March 2022).

UN - OHCHR (1989) *Convention on the Rights of the Child - Adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20 November 1989 entry into force 2 September 1990. OHCHR*. Available at: https://www.ohchr.org/en/professionalinterest/pages/crc.aspx (accessed 3 March 2022).

UNCCC (2015) Paris Agreement under the United Nations Framework Convention on Climate Change. Available at: https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

UNFCCC (2015) *ADOPTION OF THE PARIS AGREEMENT: Proposal by the President*.

December. Paris: UNFCCC. Available at: http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

UNFCCC (n.d.) Decision -/CP.26: Glasgow Climate Pact. Available at: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf.

UNICEF (2021a) *Making Climate and Environment Policies for & with Children and Young People*. Climate&Environment Discussion Paper, November. Available at: https://www.unicef.org/media/109701/file/Making-Climate-Policies-for-and-with-Children-and-Young-People.pdf.

UNICEF (2021b) *The Climate Crisis is a Child Rights Crisis. Introducing the Children's Climate Risk Index*. New York: United Nations Children's Fund. Available at: https://www.unicef.org/reports/climate-crisis-child-rights-crisis (accessed 1 March 2022).

United Nations (2019) *World Population Ageing 2019: Highlights*. New York: United Nations. Available at: https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Highlights.pdf.

United Nations General Assembly (2021a) *Analytical Study on the Promotion and Protection of the Rights of Older Persons in the Context of Climate Change*. Report of the Office of the United Nations High Commissioner for Human Rights. Available at: https://digitallibrary.un.org/record/3927180.

United Nations General Assembly (2021b) *Summary of the Panel Discussion on the Human Rights of Older Persons in the Context of Climate Change*. Report of the Office of the United Nations High Commissioner for Human Rights, Human Rights Council, Forty-ninth session, 28 February – 1 April 2022. Available at: https://undocs.org/A/HRC/49/61.

Upham P, Sovacool BK and Monyei CG (2022) Energy and transport poverty amidst plenty: Exploring just transition, lived experiences and policy implications in Iceland. *Renewable and Sustainable Energy Reviews* 163: 112533. DOI: 10.1016/j.rser.2022.112533.

Vandenberghe D and Albrecht J (2018) Tackling the chronic disease burden: Are there co-benefits from climate policy measures? *European Journal of Health Economics* 19(9): 1259–1283. DOI: 10.1007/s10198-018-0972-4.

Vesa J, Gronow A and Ylä-Anttila T (2020) The quiet opposition: How the pro-economy lobby influences climate policy. *Global Environmental Change* 63: 102117. DOI: 10.1016/j.gloenvcha.2020.102117.

Vona F (2019) Job losses and political acceptability of climate policies: why the 'job-killing' argument is so persistent and how to overturn it. *Climate Policy* 19(4). Taylor and Francis Ltd.: 524–532. DOI: 10.1080/14693062.2018.1532871.

WHO (2014) *The UN Decade of Healthy Ageing 2021-2030 in a Climate-Changing World*. Connection series: 3. Available at: https://cdn.who.int/media/docs/default-source/decade-of-healthy-ageing/decade-connection-series-climatechange.pdf?sfvrsn=e926d220_1&download=true.

Yamazaki A (2017) Jobs and climate policy: Evidence from British Columbia's revenue-neutral carbon tax. *Journal of Environmental Economics and Management* 83. Academic Press Inc.: 197–216. DOI: 10.1016/j.jeem.2017.03.003.

Yang H, Lee T and Juhola S (2021) The old and the climate adaptation: Climate justice, risks, and urban adaptation plan. *Sustainable Cities and Society* 67: 102755. DOI: 10.1016/j.scs.2021.102755.

Zellentin A (2020) Climate change and international ethics 1. In: Schippers B (ed.) *The Routledge Handbook to Rethinking Ethics in International Relations*. 1st ed.

Routledge, pp. 195–205. DOI: 10.4324/9781315613529-18.

Zimmermann M and Pye S (2018) Inequality in energy and climate policies: Assessing distributional impact consideration in UK policy appraisal. *Energy Policy* 123: 594–601. DOI: 10.1016/j.enpol.2018.08.062.

Appendix: Bibliometric analysis

This appendix presents an overview of the results included in the literature review of academic papers in the Scopus abstracts and citation database. The review is based on the bibliometric information provided by that search platform's analysis tool. Most of the documents reviewed are articles, with smaller presence of book chapters and conference papers (Figure 5).

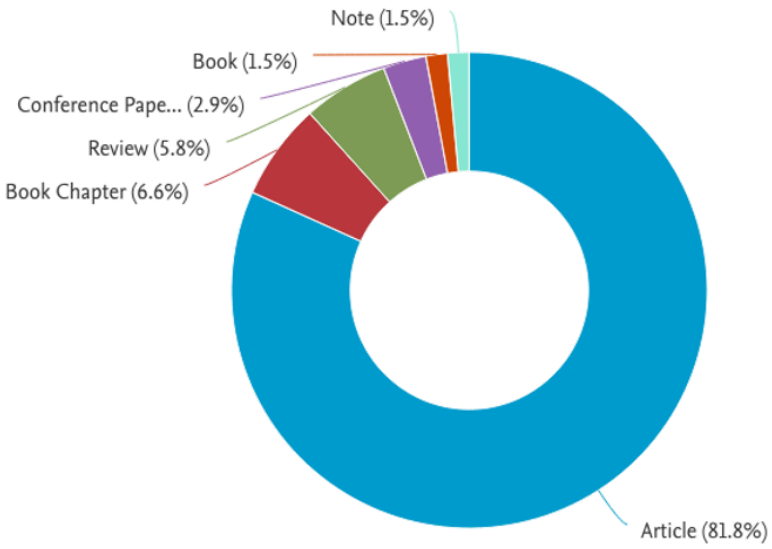


Figure 5. Documents by type

In terms of temporal distribution, Figure 6 shows a neat increase in the academic attention paid to this topic after 2006. This coincides with the period during which most countries established the first generation of climate policies. This peak can also be loosely linked to the period in which policies to meet the binding targets established in the Kyoto Protocol were first applied.[4] For example, the EU ETS was launched in 2005. In addition, at this time, governments were under increasing pressure from international campaigns to make more serious attempts to address climate change. The first Global Day of Action took place during the UN climate talks in Montreal in 2005.[5]

4. The Kyoto Protocol established that the countries included in Appendix 1 should reduce greenhouse gas emissions by 5% compared to 1990 levels between 2008 and 2012.
5. https://www.campaigncc.org/international/GDA/GDA_history

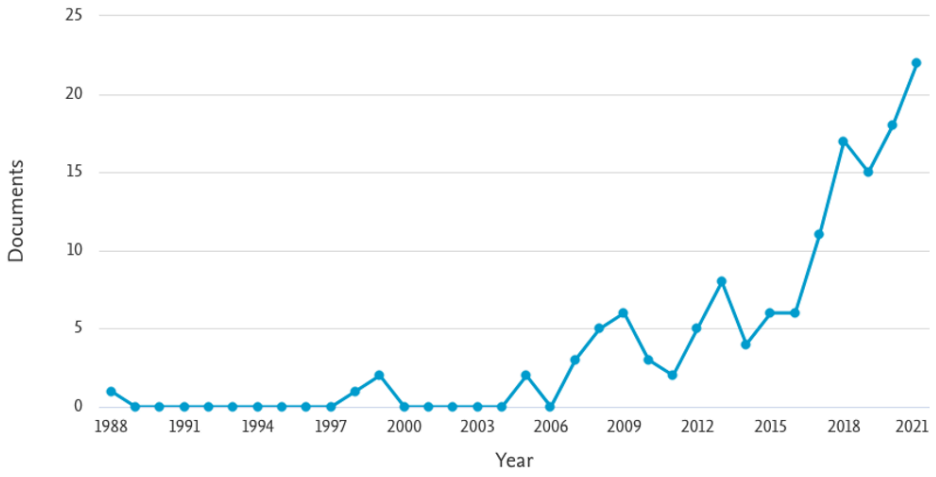


Figure 6. Documents by year

In terms of author affiliations and funding sources, the topic is particularly relevant in the European context. This is the case despite the fact that the United States is responsible for the largest number of published documents, with 45 references, followed by the United Kingdom (25) and Germany (20). Figure 7 provides an overview of the affiliation of researchers in this research community. It shows that researchers in Europe have paid more attention to this topic than those affiliated to research centres elsewhere. This may be related to the more stringent and comprehensive climate packages approved in Europe, compared to other regions with binding greenhouse gas targets.

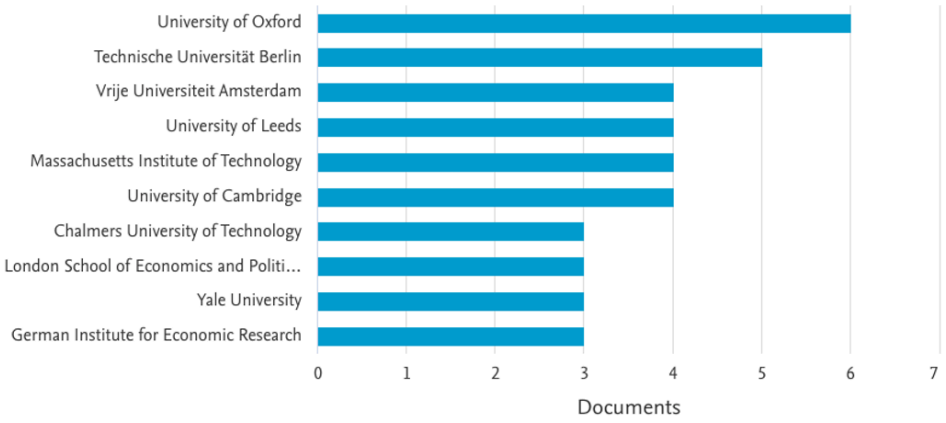


Figure 7. Documents by affiliation

Figure 8 corroborates the observed pattern from the perspective of funding organisations. The figure clearly shows that the largest share of contributions have been funded by EU research programmes, including Horizon 2020 and previous Framework Programmes. Other than these, the only non-European funding source in the list is the International Cooperation Agency of Japan.

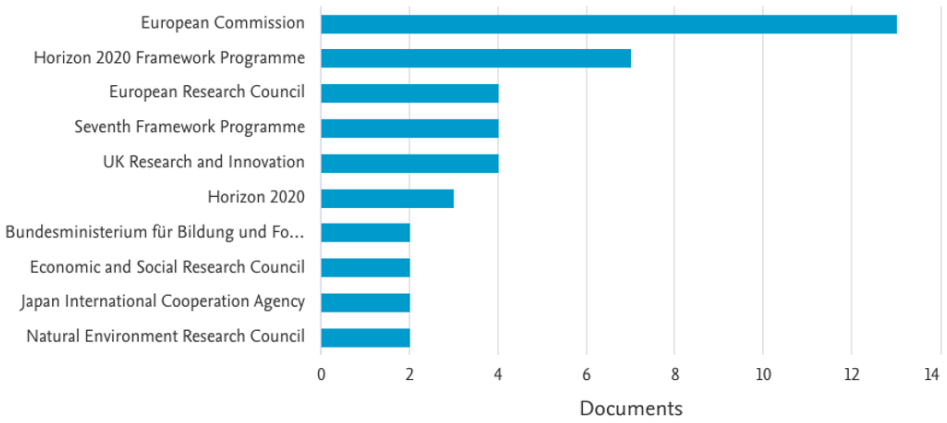


Figure 8. Documents by funding source

In terms of subject areas, the vast majority of research was developed by researchers working on environmental science and earth sciences. Combined, these disciplines represent 37.8% of research contributions. The second category by number of papers published is social sciences, including economics and business management, which contributed 28.4% of the documents. In third position, we group together energy and engineering studies, including chemical engineering and mathematics, with 24.3% of the entries. Finally, all other disciplines combined contributed 9.5% of the documents (Figure 9).

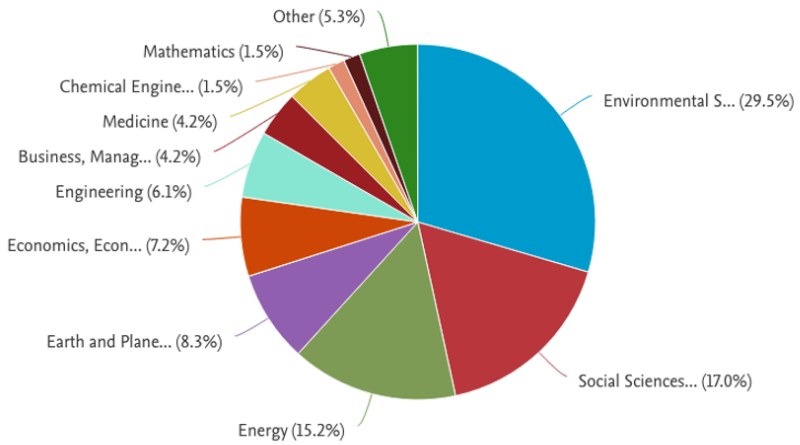


Figure 9. Documents by subject area

About this discussion paper

The social impacts of climate mitigation policies on vulnerable groups in the Nordic Region

Authors: Carlos Tapia, Ana de Jesus, Elin Cedergren, Nora Sánchez Gassen and Anna Lundgren

Cover picture: Tam Vibberstoft, norden org
Layout: Nordregio

Nordregio discussion paper 2022:3
ISBN: 978-91-8001-026-9
ISSN: 1403-2511
DOI: http://doi.org/10.6027/WP2022:3.1403-2511

www.nordregio.org

P.O. Box 1658
SE-111 86 Stockholm, Sweden
nordregio@nordregio.org
www.nordregio.org
www.norden.org