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epa Research

Just Resilience and Adaptation in Ireland (JustAdapt)

Authors: Stefano Ceolotto, Niall Farrell, Pranav Kakkar and Anita Vollmer

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Rialtas na hÉireann
Government of Ireland

Environmental Protection Agency

The EPA is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: Implementing regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.

Knowledge: Providing high quality, targeted and timely environmental data, information and assessment to inform decision making.

Advocacy: Working with others to advocate for a clean, productive and well protected environment and for sustainable environmental practices.

Our Responsibilities Include:

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- Large-scale industrial, waste and petrol storage activities;
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- The contained use and controlled release of Genetically Modified Organisms;
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- Drive the implementation of best practice in regulated activities and facilities;
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- Regulate the quality of public drinking water and enforce urban waste water discharge authorisations;
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- Coordinate a network of public service organisations to support action against environmental crime;
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- Prepare and publish national waste statistics and the National Hazardous Waste Management Plan;
- Develop and implement the National Waste Prevention Programme;
- Implement and report on legislation on the control of chemicals in the environment.

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Climate Science & Climate Change

- Publish Ireland's greenhouse gas emission inventories and projections;
- Provide the Secretariat to the Climate Change Advisory Council and support to the National Dialogue on Climate Action;
- Support National, EU and UN Climate Science and Policy development activities.

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- Design and implement national environmental monitoring systems: technology, data management, analysis and forecasting;
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- Monitor air quality and implement the EU Clean Air for Europe Directive, the Convention on Long Range Transboundary Air Pollution, and the National Emissions Ceiling Directive;
- Oversee the implementation of the Environmental Noise Directive;
- Assess the impact of proposed plans and programmes on the Irish environment.

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- Coordinate and fund national environmental research activity to identify pressures, inform policy and provide solutions;
- Collaborate with national and EU environmental research activity.

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- Monitoring radiation levels and assess public exposure to ionising radiation and electromagnetic fields;
- Assist in developing national plans for emergencies arising from nuclear accidents;
- Monitor developments abroad relating to nuclear installations and radiological safety;
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- Provide independent evidence-based reporting, advice and guidance to Government, industry and the public on environmental and radiological protection topics;
- Promote the link between health and wellbeing, the economy and a clean environment;
- Promote environmental awareness including supporting behaviours for resource efficiency and climate transition;
- Promote radon testing in homes and workplaces and encourage remediation where necessary.

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- Work with international and national agencies, regional and local authorities, non-governmental organisations, representative bodies and government departments to deliver environmental and radiological protection, research coordination and science-based decision making.

Management and Structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

1. Office of Environmental Sustainability
2. Office of Environmental Enforcement
3. Office of Evidence and Assessment
4. Office of Radiation Protection and Environmental Monitoring
5. Office of Communications and Corporate Services

The EPA is assisted by advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

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Lead organisation: The Economic and Social Research Institute

Identifying pressures

Climate change has many impacts on society. Both the impacts of climate change and the policy responses to mitigate emissions affect different sections of society in different ways. The aim of the Just Resilience and Adaptation in Ireland (JustAdapt) project was to develop tools and procedures to better incorporate equity into climate policy decision-making.

Firstly, JustAdapt integrated a spatial microsimulation model with data on extreme weather events to identify hot spots of climate vulnerability, where climate impacts and socioeconomic vulnerability coincide.

Secondly, the project used this spatial microsimulation framework to assess the local economic impacts of climate policy, such as the impacts of fossil fuel plant shutdown.

Finally, JustAdapt identified guidelines for policy to better integrate nature-based solutions, equity and justice into climate policy decision-making.

Informing policy

The findings of JustAdapt may help policymakers incorporate equity into climate adaptation decisions.

JustAdapt investigated the regional economic impacts of climate policies, such as fossil fuel plant shutdown. This may inform just transition policy.

Nature-based solutions present alternative ways to adapt to climate change that are often overlooked in policy decision-making. Through a comprehensive literature review, JustAdapt identifies barriers to adoption and proposes solutions that may overcome these barriers to aid their integration into policy decision-making processes.

Developing solutions

JustAdapt used a number of novel methodological approaches. The project linked climate impacts with spatial profiles of socioeconomic vulnerability. This enabled spatial coincidence of socioeconomic vulnerability and climate impacts at the electoral district level to be quantified. This is the first national-level study to consider socioeconomic vulnerability alongside climate change impacts at the electoral district level in Ireland. Should policymakers wish to incorporate equity in climate adaptation decision-making, this project has demonstrated how this may be carried out.

In addition, spatial microsimulation techniques were used to quantify the effects of climate policy, such as fossil fuel plant shutdown, on household and regional welfare. This has provided insight into the type of policy that may best facilitate a just transition.

Finally, this project developed a suite of recommendations to support policymakers in incorporating just transition measures and nature-based solutions into decision-making processes.

EPA RESEARCH PROGRAMME 2021–2030

Just Resilience and Adaptation in Ireland (JustAdapt)

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EPA Research Report

Prepared for the Environmental Protection Agency

by

The Economic and Social Research Institute

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DISCLAIMER

This report is based on research carried out/data from 2016. The analyses of Chapters 3 ("Social and Spatial Vulnerability to Climate Impacts") and 4 ("Regional Economic Impact of Climate Change Policy") use Census 2016 Small Area Population Statistics. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

This project has four objectives. First, we consider the appropriate definition and application of just resilience in Irish policy decision-making. Second, we consider how policy may consider both climate impacts and socioeconomic vulnerability in adaptation decision-making. Third, we consider the quantification of those affected by climate policies, such as employees in fossil fuel-fired electricity generation, offering lessons for just transition policy. Finally, we consider how nature-based solutions (NbS) may be incorporated into adaptation policy.

Our first objective is to investigate the implementation of just resilience in Irish policy decision-making. We review the concept of justice and provide a definition and framework that policy may follow. The framework is divided into three stages. Stage 1 is the pre-policy stage. At this point, the policymaker must identify all relevant stakeholders and the nature of the impact being considered. Stage 2 is the policy implementation stage. The policies to be implemented may be grouped according to three categories: coping, adaptation and transformation. Policies categorised as “coping” strategies involve those that aid stakeholders to overcome adverse effects in the short term. Adaptation policies occur on an intermediate time horizon, where focus shifts from an immediate response towards an ability to adjust to the additional challenges arising from the given perturbation. Transformative capacity involves crafting institutions that promote individual welfare and sustainable societal robustness against future crises. The final stage is the post-policy review stage, where the impact of the intervention is evaluated relative to the objectives. The policymaker should evaluate the extent to which policy objectives have been met, informing both future interventions and any remedial action needed to correct for the underachievement of policy objectives.

The second objective of this work is to develop a modelling framework to elicit the coincidence of climate and socioeconomic vulnerability. The analysis adopts a small area estimation technique to estimate socioeconomic vulnerability profiles for Irish electoral divisions. We combine these profiles with flood maps to identify hot spots of vulnerability, using a case study scenario. The analysis also investigates how the identification of areas of greatest vulnerability depend on societal preferences towards equity and redistribution. This study evaluates the importance of incorporating socioeconomic vulnerability into the quantification of climate impacts. It demonstrates that, while population exposure offers insight into flood risk patterns, the introduction of socioeconomic vulnerability allows a more precise identification of areas of priority, should policy wish to incorporate socioeconomic vulnerability into the targeting of interventions. This work presents a framework that may be applied for many other climate impacts.

The third objective is to consider the impact that changes in production sectors in response to climate policy may have on regional income and the spatial distribution of welfare in Ireland. This provides insight into how policy may respond to a regional change in economic activity as a result of climate policy. We analyse the spatial distribution of changes in household income following the closure of a fossil fuel power plant by considering the hypothetical case study of the Moneypoint coal power plant. Using a spatial microsimulation approach, we quantify the spatially explicit distribution of first-round employment and income effects, the first such Irish study to our knowledge. Using commuting patterns, a spatial interaction model and an income generation model, we simulate the counterfactual distribution of income, net of expected social transfers, due to the power plant closure. We find that, while the expected economic shock is located around the hinterland of plant closure, the effects are small relative to regional incomes. As such, regional indirect and induced effects are likely to be relatively small. A policy response with an emphasis on individual rather than regional measures may be better able to target those affected. This gives policy insight for transitions with a similar spatial concentration of individual effects.

Our fourth objective is to review the current state of knowledge on NbS for climate change adaptation. The discussion first focuses on the barriers that can limit the utilisation and effectiveness of NbS, then on how

these barriers may be overcome to facilitate effective integration into policy decision-making processes. The emphasis of this part of the project is on how policy can enable more effective incorporation of NbS, remove market failures and overcome other barriers to implementation.

1 Introduction

1.1 Objectives

The goal of this project is to assess climate and socioeconomic vulnerability in Ireland and identify guidelines to assist policy decision-making in relation to the implementation of measures for a just climate transition and just climate adaptation. To meet this goal, the objectives of this project are as follows:

- to review the existing literature on just resilience, with the aim of recommending a definition of the concept as appropriate for Ireland and to provide insight into the policy measures that may facilitate a more equitable transition;
- to combine spatial microsimulation with climate impact modelling to identify hot spots of vulnerability to climate change-related extreme weather events for Irish regions;
- to assess the welfare impacts of decarbonisation interventions across Irish regions and population cohorts and to recommend policy interventions to ensure a just transition;
- to provide a review of the existing literature on nature-based solutions (NbS) and propose a framework that identifies the policy, capacity and governance conditions that enable NbS to be successfully implemented.

To deliver on these objectives, this project was structured into six work packages (WPs), listed below:

- WP 1.1 – recommend a definition of just resilience in an Irish context;
- WP 1.2 – identify regions and socioeconomic groups most at risk to climate impacts;
- WP 2.1 – identify production sectors most at risk from climate impacts and policies;
- WP 2.2 – examine measures of just resilience;
- WP 3 – review the potential for NbS as a source of resilience and well-being.

The outcomes of these WPs are summarised in five working papers, to be submitted for peer-reviewed publication:

1. Kakkar, P., Ceolotto, S. and Farrell, N. (2024), *Just Resilience to Climate Impacts: A Framework for Policy Implementation*, ESRI Working Paper.
2. Ceolotto, S. and Farrell, N. (2024a), *Keeping Our Heads Above Water: Spatially Heterogeneous Social Vulnerabilities and Climate Adaptation*, ESRI Working Paper.
3. Farrell, N. (2024), *Small Area Poverty Estimation by Conditional Monte Carlo*, ESRI Working Paper (co-funded by ESRI Energy Policy Research Centre and EU Horizon 2020).
4. Ceolotto, S. and Farrell, N. (2024b), *Production Sectors at Risk from Climate Policy: Regional Income and Power Station Closure in Ireland*, ESRI Working Paper.
5. Vollmer, A., Ceolotto, S. and Farrell, N. (2024), *Nature-based Solutions: Barriers to Adoption and Guidelines for Policymakers*, ESRI Working Paper.

In addition, a stakeholder workshop was held:

- ESRI Workshop: Stakeholder Experience of Climate Impacts in Ireland.

1.2 Structure of the Report

This report reviews each of the constituent papers and is structured as follows:

- Chapter 2 summarises Kakkar *et al*. (2024), where we provide a definition of just resilience in an Irish policy context and review policy measures related to this in an Irish context. We also review the concept of justice, defined as both distributive justice and procedural justice, and provide a framework that policy may follow to effectively incorporate concepts of just resilience in decision-making. This working paper delivers on WPs 1.1 and 2.2.
- Chapter 3 summarises Ceolotto and Farrell (2024a), which elicits the coincidence of climate and socioeconomic vulnerability. The analysis adopts a novel small area estimation (SAE) technique (Farrell, 2024; co-developed by this project and the EU Horizon 2020 project) to estimate socioeconomic vulnerability profiles for Irish electoral divisions (EDs). We combine these profiles with flood maps to identify hot spots of vulnerability. The analysis also investigates how

the identification of areas of greatest vulnerability depends on societal preferences towards equity and redistribution. The working paper summarised in this chapter delivers on WP 1.2.

- Chapter 4 summarises Ceolotto and Farrell (2024b), identifying production sectors at risk from climate change and the impacts this may have on regional income and the spatial distribution of welfare in Ireland. The chapter outlines recommendations for policy interventions to ensure a just transition in the context of this analysis. The working paper summarised in this chapter delivers on WP 2.
- Chapter 5 summarises Vollmer *et al*. (2024). This paper reviews the current state of knowledge on NbS for climate change adaptation. The discussion first focuses on barriers that can limit the utilisation and effectiveness of NbS, then on how these barriers may be overcome to facilitate effective integration into policy decision-making processes. The emphasis of Vollmer *et al*. (2024) is on how policy can enable more effective incorporation of NbS, avoiding market failures and overcoming other barriers to implementation. This working paper delivers on WP 3.
- Chapter 6 provides a summary of the stakeholder workshop “Stakeholder Experience of Climate Impacts in Ireland”, which took place in September 2023. The holding of this workshop informed the work of the preceding deliverables, alongside future ESRI research priorities.
- Chapter 7 concludes the report.

2 Just Resilience of Social Systems: Framework for Irish Policy Decision-making

2.1 Introduction and Overview

This project seeks to identify the most appropriate definition of just resilience in an Irish context, presenting a framework that may aid the incorporation of these concepts into policy decision-making. Just resilience considers the uneven distribution of climate impacts, the uneven ability to adapt and the equitable distribution of adaptation policy. The just resilience of social systems for Irish policy decision-making may be defined as the combination of procedures that allows for the wide inclusion, full recognition and effective participation of all cohorts, especially more vulnerable ones, in decision-making processes. In doing so, the consideration of policies for just resilience should address climate and social threats without shifting vulnerabilities to other constituencies, exacerbating other pre-existing vulnerabilities and creating new ones.

We consider the factors of importance for Irish policy when designing a just resilience strategy. In doing so, we consider many aspects that are particular to the impacts of climate adaptation, such as ensuring resilience to extreme weather events and literacy with respect to the impacts of climate change. This addresses a gap in the understanding of the policy measures that may be put in place, exploring just resilience through the lens of policy decision-making.

2.2 What Is Just Resilience?

One must clearly define concepts of justice before considering their incorporation into a definition of just resilience in an Irish context. Justice, when applied in the context of policy decision-making, can encompass what are known as “procedural” and “distributive” justice. Procedural justice encompasses the inputs to policy decision-making, while distributive justice refers to the outputs. Procedural justice suggests that a decision-making process should incorporate all relevant stakeholder groups; that these groups are recognised and allowed to participate; and that there is a balanced distribution of influence (Tyler *et al*., 1997; Young, 2002; Fraser, 2013). Only when all those affected by the impacts of a decision are included in the decision-making process and have the power to influence the outcome can the decision be considered legitimate (Young, 2002). Including a wide range of representation in the decision-making process (Pieraccini, 2019) aids external inclusion (Young, 2002), with meaningful involvement of all people in both decision-making and implementation processes of importance (Agyeman and Evans, 2003; Coggins *et al*., 2021). Internal exclusion considers the fact that inclusion does not guarantee contribution, and one should ensure that all participants have the resources available such that their voice is heard and given the same weight as those of other groups (Breil *et al*., 2021).

At a sub-national level, distributive justice often entails the consideration of which groups are most vulnerable to the negative impacts of climate change and associated policies. Designing policies such that impacts do not exacerbate existing inequalities is a central facet of distributive justice (Paavola and Adger, 2002; Schlosberg, 2012; Coggins *et al*., 2021; Amorim-Maia *et al*., 2022). To this end, Sovacool *et al*. (2015) consider the concept of “leaving nobody behind”, whereby climate change policy should focus on the needs of the vulnerable without disregarding other segments of society.

The concept of social vulnerability is at the heart of distributive justice, relating to both climate impacts and adaptation responses. Impacts and vulnerabilities can vary according to income, region, geographical location, demographic characteristics, socioeconomic characteristics and health status. While measures are designed to address certain social vulnerabilities (Schlosberg, 2007; Fraser, 2013), they also have the potential to affect or create other vulnerabilities, which policy must account for.

2.3 Proposed Framework for Policy Decision-making

Building on these concepts, Figure 2.1 presents a decision-making framework for just resilience,

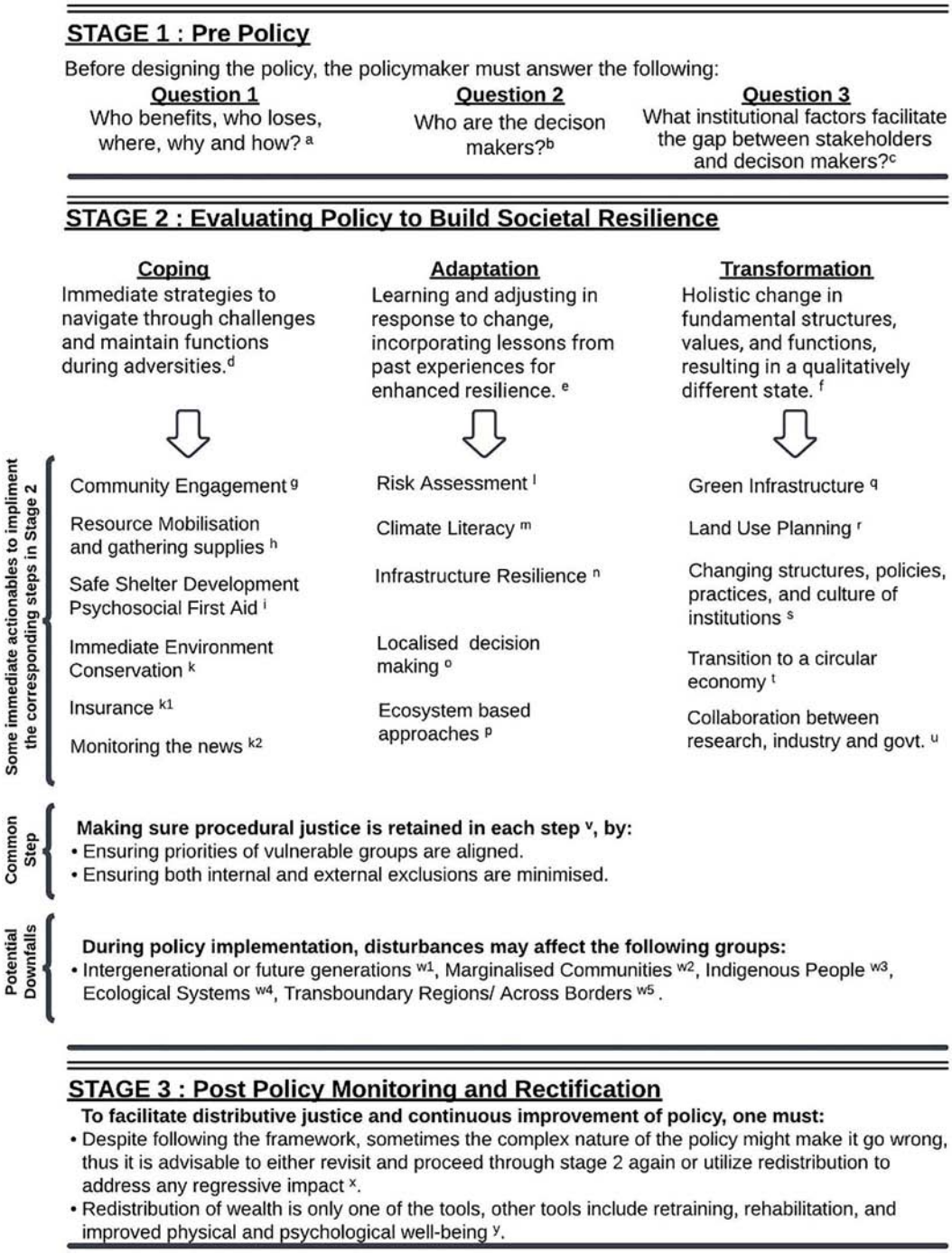

Figure 2.1. Just resilience policy measure decision-making framework. Source: reproduced from Kakkar *et al*. (2024).

identifying the procedures that would enable procedural and distributive justice to be incorporated into policy decision-making processes in a self-reinforcing manner. This builds on a number of existing contributions in the literature. Frameworks exist to consider physical attributes of resilience, with some paying considerable attention to the characteristics of an urban space that is resilient to climate change (e.g. Tyler and Moench, 2012; Dastjerdi *et al.*, 2021). While many of these approaches are effective in identifying what a resilient community may look like, the policy response to achieve this, and the steps required in the decision-making process, is not the primary focus. This framework aims to provide this contribution. By integrating the political, social and ecological elements of existing frameworks, and bringing in literature

from disaster management, we formulate a policy framework to guide policy design.

The framework is divided into three stages.

- Stage 1 is the pre-policy stage. At this point in the process, the policymaker must identify all relevant stakeholders and the nature of the impact that is being considered (Davoudi *et al*., 2012; Davoudi, 2018). In addition, policy must ensure procedural justice.
- Stage 2 is the policy implementation stage. The policies to be implemented may be grouped according to three categories: coping, adaptation and transformation. Policies categorised as "coping" strategies include those that aid stakeholders to overcome adverse effects in the short term (Adger, 2000; Smit and Wandel, 2006; Keck and Sakdapolrak, 2013), as outlined in Figure 2.1. The second category of policy involves adaptation. Such policies occur on an intermediate time horizon, where focus shifts from an immediate response towards an ability to adjust to the additional challenges arising from the given perturbation (Folke, 2006; Keck and Sakdapolrak, 2013). In addition, adaptation incorporates learning and adjusting in response to change and incorporating lessons from past experiences for enhanced resilience. The third category is transformation. Building transformative capacity involves crafting institutions that promote individual welfare and resilience against future crises (Keck and Sakdapolrak, 2013).
- Stage 3 is the post-policy review stage, where the impact of the intervention is evaluated relative to the objectives. The policymaker should evaluate the extent to which policy objectives have been met, informing both future intervention and any remedial action needed to correct for the underachievement of policy objectives.

2.4 Conclusion

We have provided a definition and framework with which policy may apply just resilience in policy decision-making. In doing so, we have provided an overview of both procedural and distributive justice, and the roles they play in building resilience. A number of frameworks for effective just resilience policy have been considered in the literature, and these have also been reviewed. Considering these concepts, we have proposed a decision-making tool for policy to follow such that just resilience can be effectively incorporated into the decision-making process.

3 Social and Spatial Vulnerability to Climate Impacts

3.1 Introduction

The issue of just resilience to climate impacts is further investigated under the second objective of this project, which aims to identify the coincidence of climate impacts and socioeconomic vulnerability, such that adaptation measures can be effectively targeted towards vulnerable households, if desired, through policy. This feeds into the concept of distributive justice in particular, by identifying the distribution of impacts across society, but may also aid procedural justice, by enabling those affected to be identified and introduced into decision-making processes. This study applies spatial microsimulation methods to identify the spatial distribution of socioeconomic vulnerability and poverty rates[1] at the electoral division (ED) level. These are subsequently combined with spatial profiles of flood hazard across Irish EDs.

A spatial microsimulation algorithm is employed to combine the spatial insight from Central Statistics Office Small Area Population Statistics with the micro-level insight offered by EU Survey on Income and Living Conditions. This modelling framework provides insight into the spatial distribution of income and poverty rates at the local ED level. This spatial profile of welfare is overlaid with a spatial profile of flood hazard. Many flood scenarios may be examined. We examine fluvial and coastal flooding (i.e. rivers and estuaries) for much of the analysis. The scenario chosen influences the pattern of flooding observed. Other flooding hot spots, such as flooding events in areas such as Galway or Cork, are identifiable through other flood scenarios. These data are provided by the Irish Office of Public Works Catchment Flood Risk Assessment Management (CFRAM) flood extent maps.

The methods employed to calculate the hot spots of flood hazard and flood risk are outlined in full in Ceolotto and Farrell (2024a). Figure 3.1A displays the flood hazard hot spots for the case study analysed. The main hot spots are located on the course and estuary of the Shannon river, on the high course of the Barrow river, on the north-eastern coast in the cities of Dublin and Dundalk, on the western coast on the estuary of the Feale river and in the city of Galway, and in the Lough Conn area. The most affected areas are the cities of Dublin, Dundalk and Limerick.

Incorporating population exposure and socioeconomic vulnerability profiles considerably changes the distribution of hot spots. Figure 3.1B displays the flood risk hot spots, that is, exposure among vulnerable populations. As outlined in Ceolotto and Farrell (2024a), a number of metrics of vulnerability are used to identify the spatial incidence of vulnerability according to the desired socioeconomic variable. Figure 3.1B presents results derived using the percentage of an ED's households that are at risk of poverty as the measure of social vulnerability. Ceolotto and Farrell (2024a) also present results derived using different measures of socioeconomic vulnerability, such as the proportion of households that are in receipt of the old age pension. One may identify an ordinal ranking of socioeconomic vulnerability to flooding events using the identified methodology. Should the number of climate impacts exceed adaptive capacity, this may aid pro-poor intervention prioritisation.

3.2 Conclusion

This study evaluates the importance of incorporating socioeconomic vulnerability into the quantification of climate impacts. It demonstrates that, while population hazard offers insight into flood risk patterns, the introduction of socioeconomic vulnerability allows a more precise identification of areas of priority. Such prioritisation varies with societal preferences towards justice and equity. This result highlights the importance of both spatial profiles of climate impacts and socioeconomic vulnerabilities in effectively targeting climate adaptation interventions.

1 We follow the Eurostat definition, which classifies a household as being at risk of poverty if its annual equivalised disposable income falls below 60% of the national median annual equivalised disposable income.

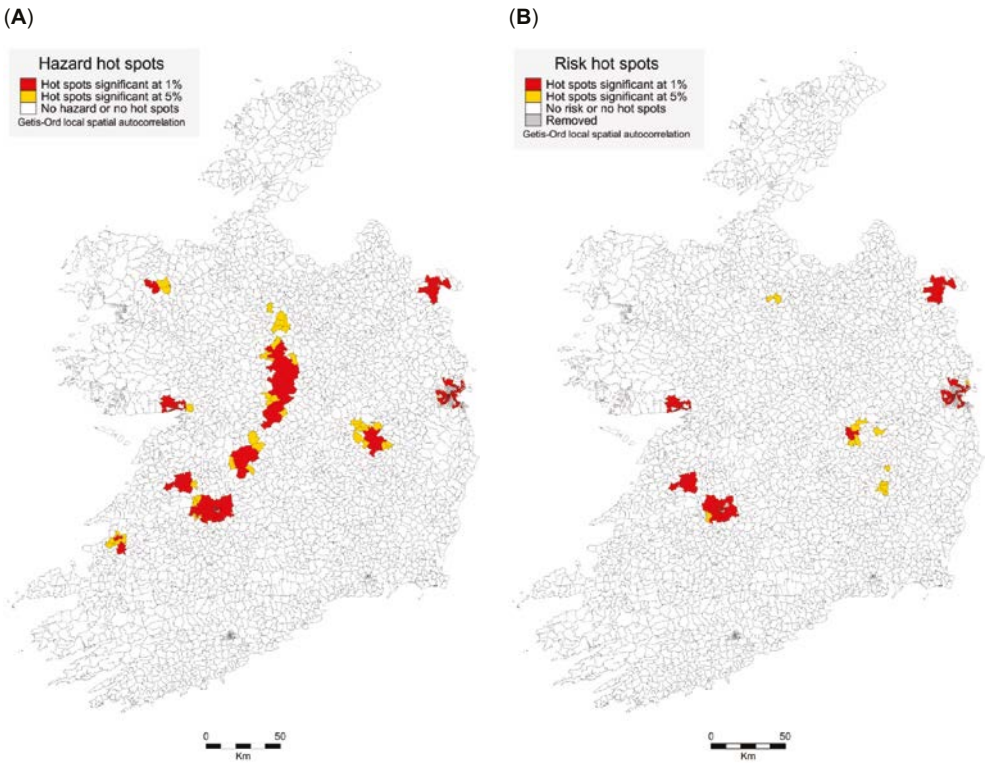

Figure 3.1. (A) Flood hazard hot spots; (B) flood risk hot spots. This figure displays the flood hazard and risk hot spots according to the Getis-Ord $G^*_i(d)$ local spatial autocorrelation method. The classification of EDs according to the flood hazard index is derived from Ceolotto and Farrell (2024a). The social vulnerability measure used to compute social weights is the percentage of ED households at risk of poverty. EDs where the percentage of the population affected by flooding is >1 and the percentage of area affected by flooding is <0.9 have been removed. Source: reproduced from Ceolotto and Farrell (2024a).

4 Regional Economic Impact of Climate Change Policy

4.1 Introduction

While the preceding chapters focus on just resilience and climate adaptation policy, this chapter deals with a separate, yet related, issue: the just transition away from fossil fuel-based electricity generation. Decarbonisation will negatively affect certain production sectors, with certain impacts being concentrated among communities that depend on fossil fuel-based activities. Workers employed in these industries might struggle to find a new job and could have to relocate. This creates economic costs (e.g. unemployment benefits, higher travel costs, lower consumption) and social costs (e.g. loss of cultural and community identity). The decarbonisation transition will affect certain areas and communities more severely than others. The equitable distribution of positive and negative effects resulting from this transition is often termed the "just transition", a corollary to just resilience but in the context of the effects of climate policies on the transition from fossil fuels. This study considers the impacts of such climate change policy on the workforce, considering the change in labour supply, sectors affected and the policy measures that may be employed to ensure a just transition according to these effects. Using a spatial microsimulation-based framework, this chapter provides spatially explicit estimates of household-level welfare changes associated with a transition away from fossil fuels through a case study examination. We consider the closure of the Moneypoint power station to provide this insight.

This investigation builds on much literature that has identified sectors affected by climate change impacts, most notably de Bruin *et al*. (2019) and de Bruin and Yakut (2023). In particular, the analysis of de Bruin *et al*. (2019) shows the regional macroeconomic impacts of climate policy on certain locations and industrial sectors. As such, we do not wish to repeat this analysis, but rather we provide complementary insight. Garvey *et al*. (2022) highlight the importance of the spatial dimension for a just low-carbon transition, to the point where "the choice of scale influences whether injustices are found" (Lawhon and Patel, 2013). As such, this analysis considers the spatial distribution of impacts associated with a given shock. We focus on this to answer a policy-relevant question: what should a just transition policy look like? Should it be a regional policy initiative or an individual-centred policy intervention? Ceolotto and Farrell (2024b) builds on these preceding analyses to further investigate the socioeconomic effects of a subset of the negative economic shocks and labour market impacts. This provides important insight for better understanding the implications for a just transition policy.

We employ the spatial microsimulation methodology outlined in Chapter 3 to estimate the distribution of welfare at the electoral district level. We combine these simulated households with a place of work using the Place of Work, School or College Census of Anonymised Records (POWSCAR). We use 2016 census data for this purpose, which is the most recent census for which full results were available at the time of the analysis.

A macroeconomic shock is modelled. We consider a case study, namely the closure of the Moneypoint coal power station. This power station is located on the Shannon, in the ED of Kilrush Rural (Co. Clare), and it employs a 194-strong workforce (Deegan, 2019). ESB, the state-owned electricity company that manages Moneypoint power station, has long signalled the intention to stop burning coal at the site. This case study gives insight into the potential impacts of an employment shock in this location, but also in other locations where local employment would be affected by a site closure to a similar degree. We link employment at the plant with a likely place of residence using the POWSCAR data (for further information, see Ceolotto and Farrell, 2024b). We then simulate the overnight changes to regional employment and income. For each ED, we simulate the likely counterfactual distribution of income and employment using an income generation model.

Figure 4.1 displays the spatial distribution of the expected changes in household income. In absolute terms (Figure 4.1A), the reduction ranges from a

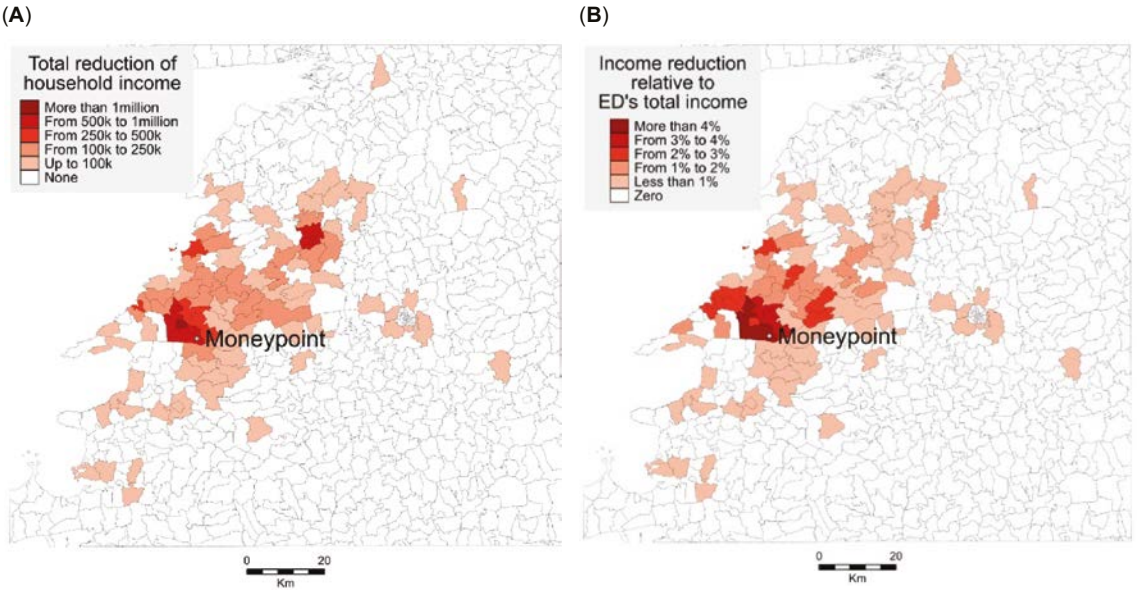

Figure 4.1. Distribution of income following Moneypoint shutdown. (A) Total reduction in household income; (B) income reduction relative to ED's total income. This figure displays the spatial distribution of the expected change in income resulting from the closure of the Moneypoint power station.

minimum of *c.*€35,000 to a maximum of *c.*€1,250,000. Most EDs experience a total reduction of less than €250,000. And, in all apart from the three EDs with the highest number of commuters, total household gross income declines by less than €400,000. Proportionally, the areas most affected are those immediately surrounding Moneypoint (Figure 4.1B), especially Kilrush Rural, the EDs to the east and north, and, to a lesser extent, to the north-west. Kilrush Rural itself experiences a reduction in total household gross income of roughly 6.2%.

It is useful to recall some of the measures put in place after the decision to close the two peat power plants in the Midlands by the Irish Government and Bord na Móna. The policy response included (i) an €11 million just transition fund for re-training and re-skilling and to assist local communities; (ii) €5 million for the restoration of non-Bord na Móna bogs; and (iii) €20 million to deliver housing and local transport upgrades (Department of the Environment, Climate and Communications, 2019). In addition, the project received €84 million from the EU Just Transition Fund, which the Irish Government committed to complementing with Exchequer resources (Department of the Environment, Climate and Communications, 2021).

Future just transition policies may involve a similar portfolio of measures. The findings presented in this paper may support a greater emphasis on individual-focused policies in the suite of measures. We demonstrate that, despite the spatial concentration around the Moneypoint hinterland, employment and income changes are small relative to local incomes. Therefore, while the Moneypoint closure may be a salient regional shock, the direct and indirect impacts are likely to be small relative to total economic activity in the locality, and therefore indirect and induced effects are of less concern than the effects for those individuals directly employed. Policymakers should then tailor interventions to the affected individuals and their communities, to ensure that the interventions suit their skill sets and needs.

4.2 Conclusion

In this paper, we analyse the spatial distribution of changes in household income following the closure of a fossil fuel power plant, considering the case study of the Moneypoint coal power plant in Ireland. Using a novel spatial microsimulation approach, we quantify the spatially explicit distribution of first-round employment and income effects, the first such study to do so to our knowledge. Using commuting patterns, a spatial interaction model and an income generation model, we simulate the counterfactual distribution of income, net of expected social transfers, due to power plant closure. We find that, while the expected

economic shock is located around the hinterland of the plant closure, the effects are small relative to regional incomes. As such, individual- rather than region-focused policies may be more effective in targeting the negative social and economic effects of the transition away from fossil fuels.

The findings of this paper suggest that the nature of a policy response should be considered carefully. If the economic shock is likely to be small relative to local economic activity, policy should be primarily concerned with direct impacts and the social implications of the transition for affected employees. Individual-based, as opposed to region- or sector-based, policies may be most appropriate for ensuring that interventions are targeted at those most affected.

This paper provides novel insight into the distribution of welfare resulting from climate policy, demonstrating that knowledge of the relative impact of a climate transition can be important in guiding an appropriate policy response. We demonstrate the novel use of spatial microsimulation in gaining this insight, providing a platform for further work to consider the distributional impacts of other climate and economic shocks. When considering just transition policy, the application of this insight with respect to distributive justice is apparent, identifying who is affecting and informing policies that may counter negative distributional effects. This insight may also promote the consideration of procedural justice in policymaking, identifying the cohorts affected by a given intervention and the relative magnitude of these effects. The perspectives of those affected may then be incorporated into policy decision-making.

5 Nature-based Solutions: Barriers to Adoption and Guidelines for Policymakers

The final component of this project considers the use of NbS in climate adaptation decision-making, as detailed in Vollmer *et al*. (2024). While this is not directly related to the issues of social justice and equity that the preceding chapters focus on, it relates to climate adaptation more broadly and to the topics of Chapters 1 and 2 in this regard.

NbS for climate adaptation encompass a range of approaches that draw on nature to increase resilience to climate change, whilst often bringing a number of ecological, economic and social co-benefits. Many of these co-benefits are external to the adaptation intervention and often go underappreciated by traditional decision-making processes (Table 5.1). Seddon *et al*. (2020) and the Intergovernmental Panel on Climate Change (2022) provide comprehensive reviews. Commonly proposed applications of NbS include protection from both inland and coastal flooding and related hazards (Vermaat *et al*., 2016; Seddon *et al*., 2020; Geukes *et al*., 2024), protection from soil erosion (Brown *et al*., 2011; Jia *et al*., 2017) and the moderation of urban heatwaves and heat island effects (Bowler *et al*., 2010; Seddon *et al*., 2020), but many other applications exist. This project component reviews the literature to identify the barriers that NbS face as well as the policy solutions that have been put forward to overcome these barriers.

We review the literature discussing factors that may lead to an underappreciation of these co-benefits in decision-making processes, highlighting the issues that policymakers must consider to adequately capture NbS in their decision-making. These factors are outlined in Table 5.2 and categorised according to the step of the policy decision-making process to which they relate. For an outline of the mechanisms that lead to NbS being underutilised for each factor, see Vollmer *et al*. (2024). In addition, we review the literature to identify methods to “internalise” these co-benefits into decision-making processes and otherwise adapt governance and decision-making processes and environments such that NbS form a natural element of the climate adaptation choice set (Table 5.3). In so doing, we both complement and update existing frameworks, providing guidance for policymakers on implementing the proposed assessment steps.

As shown by Vollmer *et al*. (2024) and summarised in Table 5.2, NbS implementation still faces many barriers at each step of the decision-making process, preventing NbS from being evaluated on equal footing with technical climate adaptation interventions. Some of the changes needed to overcome these barriers go beyond individual decision-making processes and require an institutional shift. Policy solutions include fostering an environment for truly participatory public policymaking, addressing drivers of existing inequalities and creating a legal and regulatory framework that can accommodate NbS (Table 5.3). The creation of a legal and regulatory framework is of particular importance for mitigating the myopic decision-making and silo mentality that result from the disconnect between short-term costs and long-term benefits.

Other recommendations will have to be implemented at the level of individual projects. For example, it is important to include a diverse range of experts and stakeholders in the process to prevent a silo mentality and ensure that different values are represented. This must be done from the first step of the decision-making process, namely the identification of the problem or opportunity, and continue throughout the whole process, including during the implementation and monitoring of the chosen solution. In addition, social justice considerations need to permeate the entire decision-making process, to ensure that NbS remedy rather than exacerbate existing inequalities. This affects the choice of where NbS are placed and how they are implemented, for example to avoid (eco-) gentrification resulting from the creation of new green spaces in underserved communities. To address the uncertainty of which climate impacts will come to pass, different possible scenarios need to be considered and desired outcomes need to be formulated as ranges, not individual target values.

Similarly, a wide range of alternative interventions should be considered, explicitly including NbS to mitigate path dependence, which favours more

Table 5.1. Ecosystem services categorised according to the Common International Classification of Ecosystem Services (CICES) v5.2 (draft version as at 27 November 2023)

Ecosystem services	Examples
Provisioning	
Biomass provision	Crops, cattle, biogas from waste, wild berries, fish, animal skins
Provision of genetic material	Seeds, spores, plant and animal species used for breeding
Regulation and maintenance	
Transformation of biochemical or physical inputs to ecosystems	Reduced nutrient run-off from agroecosystems, dust filtration by urban trees
Mediation of nuisances of anthropogenic origin	Noise reduction through trees and shrubs along motorways, visual screening of industrial structures through trees
Regulation of baseline flows and extreme events	Biogenic reefs reducing water erosion rates, forest cover reducing the force of an avalanche, hedgerows as wind breaks
Regulation of physical, chemical, biological conditions	Seed dispersal by birds, providing habitat for native pest control species, nitrogen fixation by legumes, cooling effect from urban trees
Cultural	
Enabling of interaction with the environment for leisure, cultural and intellectual purposes	Private gardens, birdwatching opportunities, sites of special scientific interest, panoramic sites
Spiritual and symbolic value of nature	Bald eagle, totemic species, endangered species or habitats, areas designated as wilderness

Only biotic/biophysical ecosystem services are included.

established solutions. For evaluation, it is important to use a multi-scalar valuation approach that includes the co-benefits (and costs) that NbS provide but are external to the specific aim of the project. This may require an expansion of existing evaluation techniques to include non-monetary costs and benefits, for instance through a multi-criteria analysis. To overcome risk aversion and lack of popular support, pilot projects or previous successful projects, even where they are not primarily put in place as nature-based climate adaptation measures, can be a way to demonstrate the potential of NbS, as can reinforcing the visible benefits they provide, such as aesthetic value. This can also help to attract funding, for example through alternative mechanisms such as co-financing across government departments or crowdfunding, as can a clear communication of the multiple benefits that NbS provide.

Finally, preparing for the monitoring process early on and implementing it in a similarly holistic way to the decision-making process itself facilitates scaling up and allows others to learn from successful examples. These measures are not intended to favour NbS over technical solutions. Rather, they aim to support the inclusion of NbS in the decision-making process to ensure that NbS are not systematically overlooked and that all relevant benefits and costs are effectively taken into consideration. This will enable better policy decision-making in relation to climate change adaptation measures and in any other situations where NbS might improve social welfare.

While this review presents a holistic and practical overview, climate adaptation, in particular through NbS, is always site specific. Further research should assess the effectiveness of the recommendations developed here by providing context-specific guidance for individual projects. Such place-based, transdisciplinary research can be beneficial to researchers, decision-makers and stakeholders alike. In the long run, this can help identify which recommendations are relevant under which conditions and how the different decision-making steps are interlinked. This will help expand the understanding that policymakers and stakeholders have of the socioecological systems in which we interact with nature, and, ultimately, lead to better policy decisions.[2]

2 There are synergies between the outputs of this work and those of other WPs, particularly the outputs of Chapter 2. While the use of NbS for climate adaptation in its own right is of importance, effective incorporation into public decision-making, alongside the concept of just resilience, would result in decision-making processes that capture both of these concepts, where appropriate, in a natural and self-reinforcing manner.

Table 5.2. Barriers to the implementation of NbS, categorised by step of the policy decision-making process

Step	Barriers to NbS implementation
Step 1:	**Identifying objectives and possible intervention options**
	Uncertainty about climate impacts and resulting adaptation needs
	Compartmentalised problem-solving leading to a narrow view of problems and objectives
	Path dependence favouring established intervention options
	Myopic decision-making resulting from a disconnect between short-term decision-making cycles and the long-term benefits provided by NbS with a time lag
	Necessity of adapting NbS to the local context
	Uncertainty about the effectiveness of NbS
Step 2:	**Evaluating possible interventions**
	Undervaluation of multifunctionality
	Exclusion of criteria that are less easily quantified
	Disregarding of trade-offs and synergies
	Choice of ill-suited evaluation methods
Step 3:	**Implementing the chosen intervention**
	Lack of public awareness and support
	Social justice issues not considered, leading to exacerbation of existing inequalities
	Greater space and time requirements
	Difficulty in procuring funding: • positive externalities, multifunctionality and uncertainty make it difficult to convince investors • credit rationing due to uncertainty of climate impacts • NbS projects seen as high cost • few funding opportunities specifically targeting NbS
Step 4:	**Monitoring, maintaining and scaling up interventions**
	Implementation, maintenance and monitoring needs are not secured in the long term after the official end of the project
	Difficulty identifying, evaluating and comparing effectiveness across projects because interventions are embedded locally
	Lack of supportive regulation presenting a structural barrier to the scaling up of NbS
	Economic growth paradigm favouring extractive land uses and undervaluing nature

See Vollmer *et al*. (2024) for a table that includes the sources for each barrier.

Table 5.3. Policy solutions for the implementation of NbS at each step of the decision-making process

Step	Policy solution
Across all steps	
	Implement a participatory approach that involves a diverse range of stakeholders to ensure that all knowledge and value types are represented throughout the entire decision-making process
	Involve a wide range of experts, including policymakers from various areas of focus and experts on socioecological systems
	Explicitly include social justice considerations at each step of the decision-making process
	Create a legal and regulatory framework that can accommodate NbS
Step 1	**Identifying objectives and possible intervention options**
	Consider a variety of future scenarios to identify the range of adaptation needs and how NbS might respond to a changing climate
	Explicitly consider NbS as intervention options alongside more established solutions to mitigate path dependence, and include a “do nothing” option
	Disincentivise myopic decision-making in both the private and the public sector, for example through awareness campaigns or regulatory/legal frameworks
Step 2	**Evaluating possible interventions**
	Expand valuation techniques beyond monetary valuation where all relevant costs and benefits cannot be captured monetarily. This can be done, for example, by expanding from a cost–benefit analysis to other methods such as a multi-criteria analysis
	Apply a multi-scalar valuation approach, including different spatial and temporal scales as well as co-benefits and costs
	Draw on past examples of successful nature-based interventions, even if they are not explicitly designated as NbS, to inform insights into long-term benefits and costs
Step 3	**Implementing the chosen intervention**
	Reinforce the visible benefits of NbS to support social acceptance
	Implement pilot projects and learn from the implementation process of previous successful projects
	Support financing by seeking out alternative financing mechanisms, for example co-financing across government departments, and by communicating the multiple benefits of NbS, among other measures
Step 4	**Monitoring, maintaining and scaling up interventions**
	Prepare the monitoring process as early as the design phase, with a specific focus on causal links
	Conduct behaviour and experience mapping to assess how an NbS is being experienced and taken up by citizens in practice
	Ensure that monitoring and maintenance take place in the long run, accompanying the NbS through various phases of development

See Vollmer *et al*. (2024) for a table that includes the sources for each policy solution.

6 Stakeholder Experience of Climate Change

On 8 September 2023, the Economic and Social Research Institute (ESRI) held a workshop with stakeholders to discuss their experiences of climate impacts in Ireland. Twenty-five stakeholders participated, including political representatives, representatives from public bodies (e.g. IDA Ireland, Office of Public Works, National Economic and Social Council, EPA, Department of Agriculture, Food and the Marine, Teagasc, Fáilte Ireland), representative bodies for affected cohorts (e.g. National Women's Council of Ireland, Community Work Ireland, Royal Institute of the Architects of Ireland) and industry representatives (e.g. Bord Gáis Energy, Sisk). The workshop provided insight into the lived experiences and expertise of those directly or indirectly impacted by climate change. There were a number of objectives of this workshop. Primarily, information was gathered to inform the specification of the research questions of this project, discussed in the preceding chapters. In addition, information was gathered to inform future research projects and model specifications at ESRI.

To focus the discussions, participants were split across five different tables according to the groups they represented, with around five stakeholders at each table. The five areas represented were infrastructure, communities, construction, business and agriculture. The discussions at each table were led by an ESRI moderator and divided into three sessions, with the first enquiring into the climate impacts experienced or anticipated by the group, the second looking at possible adaptation options and the third debating what role (if any) each group might play in governance and policy decision-making around climate change adaptation.

This workshop recorded a number of important points relating to the lived experiences of climate impacts across various economic sectors and socioeconomic cohorts, and most notably differences across gender. There were a number of representatives from the construction and business sectors who provided insight into the challenges faced.

A number of the key objectives of this project were achieved through this stakeholder workshop, such as exploring the impact of overheating on the construction sector, the impact of increased flooding and the impact of climate change on the planning system. Discussions with communities and disadvantaged groups provided key insight into which types of socioeconomic policies might be effective in catering for disadvantaged cohorts.

7 Conclusion and Recommendations

This project investigates just resilience and climate adaptation policy in Ireland, providing a number of contributions to help inform policy decision-making. First, we consider the appropriate definition and application of just resilience in Irish policy decision-making. Second, we consider how policy may incorporate both climate impacts and socioeconomic vulnerability into adaptation decision-making. Third, we consider the quantification of those affected by climate policies, offering lessons for just transition policy. Finally, we consider how NbS might be incorporated into adaptation policy. There are a number of takeaway findings that policymakers may wish to incorporate into their decision-making on foot of this research.

Chapter 2 outlines a policy decision-making framework relating to just resilience. We demonstrate that policy should consider aspects of just resilience at many stages of the policy formulation process, from pre-implementation to post implementation. The design of policy requires the consideration of all relevant stakeholders, such that procedural justice is accounted for. During policy implementation, resilience may be achieved along various timelines, from quick-response coping interventions to long-term transformative interventions. We outline how policy may incorporate these facets.

Chapter 3 outlines how flood extent modelling may be combined with socioeconomic profiles of poverty and deprivation to identify hot spots of both climate impact and socioeconomic vulnerability. This was, to our knowledge, the first such analysis at a national level in an Irish context. The findings demonstrate that, while population exposure offers insight into flood risk patterns, the introduction of socioeconomic vulnerability allows the more precise identification of areas of priority, should policymakers wish to consider socioeconomic vulnerability in the targeting of interventions. This work presents a framework that may be applied in relation to many other climate impacts.

Chapter 4 identifies the impact that changes in production sectors, in response to climate policy, may have on regional income and the spatial distribution of welfare in Ireland. In recent years, much focus has been placed on just transition, with much policy effort being targeted at interventions that ensure that no one is left behind. While this is an equitable objective, the means by which this is to be achieved is subject to uncertainty. Much funding has been set aside for policy interventions but little evidence exists as to the most appropriate means of ensuring that the stated objectives are achieved.

This study provides some insight that may help inform this response. We compare the extent of the first-round economic shock with local economic activity. We find that, while the expected economic shock is located around the hinterland of plant closure, the effects are small relative to regional incomes. As such, regional indirect and induced effects are likely to be relatively small and therefore an individual-focused rather than a region-focused policy response would best target those affected. In a general sense, this suggests that, should policy expect the negative economic impacts of the climate transition to have a relatively small impact on local economic activity, then the policy response should place a greater weight on the effects at the individual level. If impacts are large relative to local activity, then policy should consider regional interventions.

Chapter 5 outlines a review of the current state of knowledge on NbS for climate change adaptation. NbS are climate adaptation interventions that are not necessarily manufactured but that incorporate organic interventions. Often, underappreciated ecosystem services are provided by such interventions. This component of the project has collated information on many of the barriers that limit the consideration of NbS on a level playing field with engineered interventions, and identifies ways in which these barriers can be overcome. The contribution of this analysis is not to demonstrate how policy may implement these interventions, but rather how policy can remove the barriers that prohibit the consideration of NbS as an option.

Chapter 6 outlines the stakeholder workshop held by ESRI in September 2023. This workshop identified priority areas of potential research relating to climate adaptation. These areas include the impact of

overheating on the construction sector, the impact of increased flooding and the impact of climate change on the planning system. Discussions with communities and disadvantaged groups provided key insight into which types of socioeconomic policies might be effective in catering for disadvantaged cohorts. The findings of this workshop will inform the specification of climate models at ESRI, while also identifying important future research priorities for ESRI in this field.

Policy must anticipate additional climate adaptation measures, resulting in distributional consequences. This necessitates a policy response that ensures an equitable distribution of impacts. This project provides evidence to aid the policy decision-making process in this regard. There are many conceivable extensions to this work, most notably with respect to the distributional analysis of climate and socioeconomic vulnerability, including the distributional impacts of agricultural output and how this relates to climate shocks. In addition, gaining insight related to additional climate shocks and the incorporation of adaptation measures into a cost–benefit analysis are further natural extensions of this work.

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Abbreviations

ED	Electoral division
ESRI	Economic and Social Research Institute
NbS	Nature-based solutions
POWSCAR	Place of Work, School or College Census of Anonymised Records
WP	Work package

An Ghníomhaireacht Um Chaomhnú Comhshaoil

Tá an GCC freagrach as an gcomhshaol a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialáil: Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.

Eolas: Sonraí, eolas agus measúnú ardchaighdeáin, spriocdhírithe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.

Abhcóideacht: Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.

I measc ár gcuid freagrachtaí tá:

Ceadúnú

- Gníomhaíochtaí tionscail, dramhaíola agus stórála peitril ar scála mór;
- Sceitheadh fuíolluisce uirbigh;
- Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- Foinsí radaíochta ianúcháin;
- Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Dramhaíola agus Ceimiceáin sa Chomhshaol

- Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- Reachtaíocht ar rialú ceimiceán sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

Bainistíocht Uisce

- Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéil uisce agus sreabhadh abhann.

Eolaíocht Aeráide & Athrú Aeráide

- Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Ghníomhú ar son na hAeráide;
- Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

Monatóireacht & Measúnú ar an gComhshaol

- Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaol na hÉireann.

Taighde agus Forbairt Comhshaoil

- Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha;
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta;
- Sainseirbhísí um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Ardú Feasachta agus Faisnéis Inrochtana

- Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

Comhpháirtíocht agus Líonrú

- Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíocha agus ranna rialtais chun cosaint chomhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an GCC á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóir. Déantar an obair ar fud cúig cinn d'Oifigí:

1. An Oifig um Inbhunaitheacht i leith Cúrsaí Comhshaoil
2. An Oifig Forfheidhmithe i leith Cúrsaí Comhshaoil
3. An Oifig um Fhianaise agus Measúnú
4. An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
5. An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Ghníomhaireacht agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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