

Minister Eamon Ryan  
Government Buildings,  
Merrion Street Upper,  
Dublin,  
D02 R583

19<sup>th</sup> July 2022

**RE: CCAC submission to the public consultation of the review of NAF**

Dear Minister Eamon Ryan TD,

The Council has endorsed the recommendations of the Adaptation Committee regarding the review of the National Adaptation Framework and submits them for your consideration.

If considered in tandem with mitigation and sustainable development efforts, planned adaptation to climate change can present opportunities for innovative, inclusive and transformative climate resilient development. However, while the current National Adaptation Framework, and sectoral and local adaptation plans and strategies, provide a solid foundation, overall, adaptation in Ireland has to date too often been marginal, incremental and process-based and this is no longer sufficient.

A revised National Adaptation Framework must therefore provide for further integration with mitigation, sustainable development and disaster risk reduction, all within the context of the National Climate Objective set in the Climate Act. All existing sectoral adaptation plans should then be revised and updated with additional plans required for sectors such as financial services, tourism and sport and the built environment. Coastal resilience also requires much more urgent attention.

The NAF and plans under it should be informed by a regular national risk assessment and they should also clearly prioritise actions and investments. Decision makers at Government, department and national level must be better supported in their adaptation planning so they can take account of the full range of potential changes projected. This includes the provision of adequate financial support for such activities on a sustained basis.

To be effective adaptation governance structures will also need to be revised and restructured to ensure cross cutting issues that go across multiple sectors are addressed. The Government must also urgently set forth and then monitor a set of national resilience indicators to measure our climate resilience and assess progress towards achieving climate resilient development.

Finally, it is imperative that an initial adaptation budget to 2030 be set, following an assessment of what is required to make Ireland resilient by 2050 and beyond. This budget must be determined in light of the social cost of climate change over at least the next 30 years and must reflect the need to prioritise funding for adaptation to a significantly greater degree than is currently the case.

The Council looks forward to providing any further assistance or advice as required.

Regards,



Marie C. Donnelly

Chair of Climate Change Advisory Council



McCumiskey House  
Richview  
Clonskeagh Road  
Dublin 14  
D14 YR62  
Phone: 01 2680180  
Email: [info@climatecouncil.ie](mailto:info@climatecouncil.ie)

# The Climate Change Advisory Council and its Adaptation Committee's input to the review of the National Adaptation Framework

## Key messages

- If considered in tandem with mitigation and sustainable development efforts, planned adaptation to climate change can present opportunities for innovative, inclusive and transformative climate resilient development. However, while the current National Adaptation Framework, and sectoral and local adaptation plans and strategies, provide a solid foundation, overall, adaptation in Ireland has to date too often been marginal, incremental and process-based and this is no longer sufficient.
- A revised National Adaptation Framework must therefore provide for further integration with mitigation, sustainable development and disaster risk reduction, all within the context of the National Climate Objective set in the Climate Act. All existing sectoral adaptation plans should then be revised and updated with additional plans required for sectors such as financial services, tourism and sport and the built environment. Coastal resilience also requires much more urgent attention.
- The NAF and plans under it should be informed by a regular national risk assessment and they should also clearly prioritise actions and investments. Decision makers at Government, department and national level must be better supported in their adaptation planning so they can take account of the full range of potential changes projected. This includes the provision of adequate financial support for such activities on a sustained basis.
- To be effective adaptation governance structures will also need to be revised and restructured to ensure cross cutting issues that go across multiple sectors are addressed. More meaningful leadership and coordination across Government on climate adaptation action is required, but all of society has a role in ensuring our climate resilience.
- The Government must also urgently set forth and then monitor a set of national resilience indicators to measure our climate resilience and assess progress towards achieving climate resilient development.
- Finally, it is critical that an initial adaptation budget to 2030 be set, following an assessment of what is required to make Ireland resilient by 2050 and beyond. This budget must be determined in light of the social cost of climate change over at least the next 30 years, and must reflect the need to prioritise funding for adaptation to a significantly greater degree than is currently the case.

## 1. Introduction

Our climate is already changing, with evidence of higher temperatures, higher rainfall and rising sea levels, while the ocean is becoming warmer and more acidic. It is imperative that we decarbonise our economy and society to limit climate change through mitigation while taking account of the unavoidable impacts of climate change on Ireland's economy, society and environment through commitment to appropriate adaptation and developing our climate resilience. Building on the assessment of progress in key sectors in the Adaptation Scorecard, this chapter discusses Ireland's progress in adapting to its changing climate by reviewing the 2018 National Adaptation Framework (NAF) and giving advice and recommendations on what future climate policy must do to further our climate resilience.

Under Section 5(1)(b) of the Climate Act the Minister 'shall review a national adaptation framework approved by the Government...not less than once in every period of 5 years' and 'may, having regard to that review and the requirements of adaptation in relation to the effects of climate change, make and submit to the Government for approval, a national adaptation framework.' Action 455 of the Climate Action Plan 2021 relates to the review of the NAF, committing to launching a public consultation on the existing NAF in Q1 2022 and 'Report to Minister results of Review Process' in Q3 2022. This public consultation was delayed to Q2 2022 and was launched on the 25<sup>th</sup> of May.

In January 2022 the Council sent a signpost document to the Department of the Environment, Climate and Communications in response to an initial NAF review stakeholder consultation document received in December 2021. This signpost document aimed to highlight relevant key advice and recommendations from previous Council reports and letters. The letter accompanying the signpost document indicated that the Council intends giving further advice and recommendations with respect to the next NAF in its 2022 Annual Review and these are presented in this chapter (which should be read in conjunction with the signpost document). The Council may also decide to comment on any future public consultation on any draft NAF.<sup>1</sup>

---

<sup>1</sup> Under Section 11(1) of the Climate Act the functions of the Advisory Council 'shall be to advise and make recommendations to' the Minister in relation to the 'preparation of a national adaptation framework'. The Minister is required to publish a public consultation draft before submitting a national adaptation framework to Government for approval. In November 2017 the Advisory Council submitted a letter of advice to the Minister based on the consultation draft of the first statutory NAF to fulfil this section. This followed an August 2016 letter on a pre consultation on the NAF. Furthermore, within 3 months of the laying of a NAF before the Oireachtas the Government shall request that identified Ministers prepare a sectoral adaptation plan within a specified period—this period was 18 months for the first round of sectoral adaptation plans (Section 6(1)). A Minister preparing a Sectoral Adaptation Plan shall 'in the preparation of such plan' inter alia consult with the Advisory Council (Section 6(3)). Under Section 11(1) the Advisory Council shall advise and make recommendations to Ministers in relation to 'the making by him or her of a sectoral adaptation plan' and the Government in relation to

The Council and its Adaptation Committee considers that a revised National Adaptation Framework is required, and this chapter presents 34 recommendations for the next NAF based on the experience of the first round of statutory adaptation plan making and developments in knowledge.

The step wise presentation of advice below is in line with the adaptation policy cycle, the advice of previous Annual Reviews and the structure of the Department's public consultation. It builds on, inter alia:

- Ongoing developments in research and science, including the IPCC's Sixth Assessment Report
- Previous Council advice and recommendations, including the [Council's 2019 review of plan making](#) and the [adaptation scorecard process](#)
- The results of [Small Scale Studies](#) commissioned by the Council and Adaptation Committee
- The [report of the 2021 Adaptation Committee coastal workshop](#).

## 2. Priorities for future NAFs and key principles for adaptation

The IPCC's WGII Sixth Assessment Report shows that, given the evidence of observed impacts, projected risks, levels and trends in vulnerability, and adaptation limits, climate resilient development action is more urgent than previously thought. The report showed that climate change poses risks to health and wellbeing, ecosystems, infrastructure, livelihoods and food, and that as these multiple risks interact, they will generate new sources of vulnerability. However, considered and inclusive adaptation can generate multiple benefits such as productivity, innovation, health and well-being, food security, livelihoods and biodiversity as well as the reduction of risks and damage. On the other hand, adaptation that is poorly planned, reactive and not mindful of the needs to those affected can result in negative outcomes for individuals and communities.<sup>1,2</sup>

The core principle of effective adaptation is to shift from incremental and reactive actions towards a transformative and systemic approach.<sup>3</sup> Incremental adaptation does not fundamentally transform the system and can be high-cost, inefficient, and prove insufficient or even maladaptive. For example, in the face of a heatwave, incremental adaptation suggests the installation of cooling systems. A transformative adaptation relies on a systemic approach towards a more resilient and sustainable society. For instance, truly transformative adaptation to heatwaves involves changing thermal and ventilation standards in buildings, adapting spatial planning policies, as well as changing cultural habits (such as working hours, or norms such as typical work attire). Implementing such a framework implies

---

the approval of a sectoral adaptation plan. The Council did this through letters reviewing draft sectoral adaptation plans in 2019. Under Section 11(1) the Advisory Council shall advise and make recommendations to the Government in relation to the approval of a national adaptation framework or a sectoral adaptation plan. No specific advice to Government was sought in 2018 or 2019 in this regard.

a cross sectoral, integrated response. The IPCC's WGII Sixth Assessment Report emphasised the necessity of coordinated, inclusive, innovative and accelerated transformative—rather than incremental—adaptation. It makes clear that political commitment and follow-through across all levels of government are necessary to accelerate the implementation of adaptation actions.

However, as the Council emphasised in its 2021 Annual Review, Irish climate policy has to date given inadequate consideration to adaptation issues and the potential for their integration with mitigation solutions, which could alleviate risks and enable effective climate resilient development. The IPCC confirm that monitoring and evaluation of adaptation is critical to track progress and enable effective adaptation. Again, the Government has not set national resilience indicators to measure our climate resilience or progress towards achieving it.

The sectoral adaptation plans and local adaptation strategies prepared under Ireland's first statutory National Adaptation Framework (2018) provide a foundation for our adaptation planning and climate resilience. Adaptation is a continuous learning and improvement process and the lessons from the preparation, implementation and evaluation of the NAF and subsequent plans and strategies can ensure Ireland continues to move from adaptation planning and process-based, incremental efforts to more transformative adaptation action.

Incremental, sector-specific responses are no longer sufficient. Ireland, along with the rest of the world, must prepare for the long-term risks of a changing climate by integrating considerations for all interlinked sectors and taking a systemic approach to risk assessment and resulting actions, while also protecting and enhancing biodiversity and ecosystems. Successful adaptation to climate change requires far more meaningful leadership and coordination across Government and its agencies than heretofore but must also make sure to involve local communities from the outset of the planning process, and to integrate funding, provision of information, and other socio-economic planning supports to involve those communities. A central message for Irish policy makers from the IPCC report must be that reinvigorated action towards climate change adaptation is now critical.

**Recommendation 1. A revised National Adaptation Framework is required. The nine guiding principles for adaptation planning in the 2018 NAF should be further developed as follows:**

- **Firstly, they should reflect the impetus for transformational, rather than incremental adaptation.**
- **Secondly, a tenth guiding principle, just resilience, should be added.**
- **Thirdly, the 'monitoring progress' principle should be updated to explicitly consider effectiveness and outcomes for those affected.**

- **Fourthly, the importance of ecosystem-based adaptation should be included as a principle and overall they should reflect the integrated ambition of the National Climate Objective.**
- **Finally, that the guiding principles be given more attention so that the next NAF expands on these and that future sectoral and local plans and strategies must demonstrate how they have been taken into account.**

**Recommendation 2. The next NAF should provide greater clarity for the relationship between mitigation and adaptation, but also their relationship with sustainable development and Disaster Risk Reduction.**

### 3. Preparing the ground for adaptation

#### 3.1 Approaches to decision making

Even with scientific advances, uncertainty will remain inherent to the adaptation decision-making process and should be considered by both knowledge providers and decision-makers. This is key given that significant decisions and investments across society, sectors, local, regional and national government must be resilient to uncertain climate impacts. To achieve this requires an adaptive management approach that maximises flexibility and phasing options in response to uncertain climate risks and evolving socio-economic priorities in an open-ended and iterative way.<sup>4</sup>

**Recommendation 3. In their adaptation planning all levels of Government should map options, appropriately consider uncertainties, identify trade-offs and trigger points and develop and apply robust climate resilient development pathways in decision making under uncertainty to a much greater extent than they have done to date, supported by a revised NAF.**

#### 3.2 How to maximise/address weaknesses of the sectoral approach

As noted in Chapter 3, the sectoral approach has potential benefits and risks. Both the EU Adaptation Strategy and IPCC WGII report confirm the need for a systemic approach to adaptation and resilience. However, the Council is aware of examples of cross sectoral incoherence (likely compounded by the shared deadline for completed plans where differing capacities and approval processes caused practical difficulties with limited time to share early drafts etc.<sup>5</sup>) and where departments are not proactively ensuring the actions and priorities of their adaptation plans, and synergies and complementarities with others are not being considered, implemented and monitored.

The IPCC emphasises the risks to coastal settlements and infrastructure caused by sea-level rise and the cascading impacts of coastal flooding, to which Ireland is particularly vulnerable, and for the long-term risks which Ireland is not planning for to the same extent as some other European countries. Coastal adaptation will be of vital importance to Ireland due to the large (and growing) percentage of the Irish population living on and near the coast, the high cultural and heritage value, and the range of Irish infrastructure vulnerable to sea-level rise, coastal flooding and erosion. The vulnerability of Ireland's many coastal settlements and its coastal infrastructure to storms will be exacerbated both by sea-level rise and the cascading impacts associated with it.<sup>6</sup> Sea-level rise will compromise coastal livelihoods and ecosystems.<sup>7,8</sup>

Indeed, the OPW's 2019 Flood Risk Management Climate Adaptation Plan shows that the cost of coastal flood damage in Limerick City and Environs for a 1 in 200-year event would rise from €83 million to over €1 billion under sea-level rise of 1 metre. A total of 1.9 million people in Ireland live within 5km of the coast, representing 40% of the population, while 40,000 people live less than 100m from the coast.

Adapting our coastal areas, including our islands, will require more than coordinating the actions of different sectors.<sup>9,10</sup> Ireland has no integrated and holistic national coastal management policy. While many other policies have implications for coastal areas the implementation of climate change adaptation policy affecting coastal areas is not coherent. Furthermore the principles for coherence advocated in higher-level policies can become lost in local strategies and plans.**Error! Bookmark not defined.** It has been found that climate considerations for planning coastal infrastructure in Ireland also prioritise mitigation over adaptation.**Error! Bookmark not defined.** We require flexibility in our approach to coastal adaptation, so that we may respond effectively to future developments.

Though some topics may not fit neatly into sectoral bounds, with implications for all sectors and all levels of decision-making (e.g. health, biodiversity), this does not diminish the responsibilities of the Minister responsible for the plan for such a sector to consider what actions they can put in place to increase Ireland's climate resilience, while underlining the need for coordination and cross sectoral cooperation in plan implementation and preparation.

**Recommendation 4. Coordination, reporting and prioritisation in the preparation and implementation of the sectoral plans and in mainstreaming adaptation measures across all sectors must significantly improve under the next iteration of the NAF.**

While there have been both achievements and challenges in the preparation and implementation of the nine sectoral adaptation plans addressing the 12 priority sectors identified in the 2018 NAF, gaps in our sectoral adaptation planning remain.

The role of spatial planning in ensuring development does not occur in inappropriate locations remains essential. There remains substantial scope to further enhance and promote adaptation within the forward planning process and it is still not clear how climate risks and action are going to be reflected in development management decisions, driving, for example, the adoption of appropriate water management actions such as Sustainable Urban Drainage Systems (SuDS) and wider catchment-based approaches.

The financial sector in Ireland must understand, assess and communicate its climate-related risks in a coordinated way. Climate change will have significant implications for the financial system in areas such as insurance, mortgages and investment funds. The existing adaptation deficit and increasing severity and/or frequency of climate and weather-related events can damage property and infrastructure, impact on agricultural output and lead to loss of life while also impacting on productivity. These are in addition to the transition risks, including the risk of stranded assets. Other areas which have a significant dependence on weather and climate, such as tourism and sport, also do not have a sectoral adaptation plan.

**Recommendation 5. Under the next NAF all existing sectoral adaptation plans should be revised and updated. Utilising the Climate Amendment Act's provision for joint sectoral plans where required, statutory sectoral adaptation plans should also be developed for the following: financial services, tourism and sport, and the built environment. A coastal management plan for Ireland is also required which considers adaptation along with other coastal pressures.**

**Recommendation 6. The thematic approach (Natural and Cultural Capital, Critical Infrastructure, Water Resource and Flood Risk Management, Public Health) should be retained but expanded. This may be a way to facilitate joint plans and also encourage cooperation on specific cross cutting issues such as coastal change.**

### 3.3 Governance, Coordination and coherence issues

When updating or developing sectoral adaptation plans there is a need to balance urgency with cross sectoral and vertical coherence and coordination.

The chapter on implementation and governance in the 2018 NAF now appears to be largely obsolete. A range of actors and mechanisms presented (e.g. regional adaptation strategies, the Citizens' Assembly, High Level Climate Action Steering Group) either were not fully developed or are no longer in place. It must be ensured that the structures to oversee the development of the next NAF are fit for purpose. The Council's Annual Review 2021 noted the need for a strategy to address any data and knowledge gaps necessary for the preparation and implementation of the next NAF and it must be ensured this is in place. Given the complexity of implementing adaptation there is also likely a role for experimental governance approaches.

**Recommendation 7. Existing adaptation governance structures should be revised to ensure a revised NAF, and sectoral adaptation plans under it, are developed as quickly as possible while ensuring cross cutting issues are adequately addressed. This was not the case in the first round of sectoral and local plans and strategies. Similarly, how adaptation is considered in national climate governance structures is not sufficient. Existing structures should be more effectively leveraged rather than setting up new ones to try to ensure adaptation is adequately considered across wider policy.**

**Recommendation 8. A statement is required at the beginning of the next NAF and sectoral adaptation plans demonstrating how the Climate Act, NAF and its guiding principles for adaptation, advice, and guidelines (as appropriate) have been considered.**

**Recommendation 9. More meaningful leadership and coordination across Government on climate adaptation action is required. Instigation of focal points for adaptation in each public body working together could help to address this.**

### 3.4 Role of adaptation in national policy

The IPCC's WGII Sixth Assessment report makes clear that political commitment and follow-through across all levels of government are necessary to accelerate the implementation of adaptation actions. However, as the Council emphasised in its 2021 Annual Review, Irish climate policy has not placed a sufficient emphasis on adaptation and has shown inadequate consideration of adaptation issues and limited integration and recognition of the potential for win-win solutions. So far, adaptation has been fragmented and dominated by incremental, sector-specific responses.

The Council have not seen evidence of the development of a distinct vision for adaptation in climate action policy. A strategic vision for adaptation/resilience in sectors has not been present. This is

despite the IPCC highlighting that there is a ‘rapidly narrowing window of opportunity to enable climate resilient development’.<sup>11</sup>

**Recommendation 10. A distinct vision of Ireland’s climate resilience, expanding on that in the current NAF, and the resourcing needs for its achievement are required, alongside a better understanding of the societal and economic implications of not addressing current and future vulnerabilities.**

**Recommendation 11. The discussion of how adaptation planning integrates with Project Ireland 2040 and also the delivery of the Sustainable Development Goals must be significantly more developed in the next iteration of the NAF.**

### 3.5 Identifying key research priorities/knowledge gaps that should be addressed

Access to relevant and useable data and research remains an issue but it cannot be a barrier to ‘no regrets’ adaptation action. It is also a concern that despite considerable research investment, adaptation skillsets and capacities are still seen as being in short supply. The Council’s Annual Review 2021 noted the need for a strategy to address any data and knowledge gaps necessary for the preparation and implementation of the next NAF but it is not clear if this is in place.

To ensure that the full range of possible outcomes are accounted for it will be critical that adaptation decisions are made in the light of the full range of potential future climate outcomes projected by the full multi-model ensemble and socio-economic projections including a comprehensive accounting for both scenario and model uncertainty. It is key that practitioners get relevant training in how to use and account for such uncertainties and that the Climate Ireland platform be evolved to include the full range of possible projected outcomes arising from the CMIP and CORDEX ensembles and guidance on how to use these to inform risk assessments and resulting decisions and their implementation. The TRANSLATE project offers the potential for improved tools in this regard for users. It is importance to provide understanding of, and provide guidance on, the full range of scenarios available and how different projections and scenarios should be used to enhance the robustness of decision making in different decision contexts. Robustness and resilience of the decisions we make will be contingent on the diversity of the information we use to make those decisions.

The Council notes that delivery of the Climate Ireland information platform is within the remit of the EPA as of 2021, with an external technical advisory group in place to support its work, and that work is underway to redevelop the platform to meet current and future user needs.

**Recommendation 12.** In the 2018 NAF, significant space was given to outlining climate observations and projections for Ireland. Given the rapid developments in climate and adaptation science, it is recommended that in the next NAF a shorter section be provided to give policy makers and the public the necessary context while directing them to platforms—such as Climate Ireland—databases and supports where they can access up to date information in an interactive way. Decision makers must be supported to get on with the business of adaptation within their area of policy expertise by being provided with knowledge, information and data suitable for their needs.

**Recommendation 13.** For the next NAF, and in keeping with the Met Éireann TRANSLATE project, a set of climate change storylines for Ireland—including low likelihood, high-impact scenarios (High++)—with cross-sector relevance should be developed for testing adaptation actions and communicating key risks to diverse audiences.

**Recommendation 14.** It is important to note that projections of future climate are not perfect and are subject to varying levels of uncertainty. Use of high resolution modelling needs to be accompanied by sufficient levels of expert guidance, advice and interpretation to ensure due regard is given to such uncertainties which are evident in the range of all models available. Decisions should consider the potential for warming of 2°C and beyond, taking account of the need for resilience to the full range of potential changes projected.

**Recommendation 15.** Climate research must more closely consider the requirements of decision makers, with long-term planning and capacity building needed to deliver the necessary knowledge and innovations regarding adaptation and resilience. In addition to TRANSLATE there is also a need for continued, long-term coordinated efforts at a national level on the interface between science and policy and aligning outputs to end-user needs, particularly in light of the differing capacities and resources available to sectors and local authorities.

### 3.6 Priorities from the European Adaptation Strategy

‘Forging a climate-resilient Europe—The new EU Strategy on Adaptation to Climate Change’ published in February 2021 will shape the next iteration of the NAF, and the action to ‘stimulate cooperation regionally and across borders and enhance the guidelines on national adaptation strategies in cooperation with the Member States’ will have implications for how adaptation on an all-island basis is considered. How the strategy’s focus on more and better climate related risk and losses data to avoid ‘climate blind’ decisions and policies and dialogue with insurers is applied in Ireland will be key. Also, how the Commission’s ambitions for nature-based adaptation interact with the ‘biodiversity rich’

and ‘environmentally sustainable’ components of the National Climate Objective set out under the amended climate legislation should be clear in the next NAF. Furthermore, the relationship between sectors, the CAROs and the Covenant of Mayors should be explicit in the NAF, reflecting the European Strategy's focus on local adaptation.

**Recommendation 16. The EU Adaptation Strategy will likely significantly inform the next NAF and while our policies must align with it, given the context specific nature of adaptation a ‘wait and see’ approach is not necessarily appropriate for long standing priorities which require urgent progress. Ireland should continue to learn from the adaptation experiences of other countries, including in the developing world: particularly in the areas of locally-led adaptation, coastal adaptation, innovation, monitoring and evaluation and climate and gender justice in adaptation.**

### 3.7 Lessons from other jurisdictions and from Ireland’s adaptation finance

Other countries have adopted an approach similar to that followed in Ireland. For instance, France’s adaptation plans are developed separately by the different ministries, and thus organised by sector. However, there the assessment of climate risks varies across ministries making the identification of adaptation options unequal across sectors. Furthermore, the methods used for cost benefit assessments differ across sectors. Thus, France’s High Council for Climate Change also recommends the development of an integrated approach, which can identify synergies and conflicts across sectors and systematically integrating adaptation to climate change into policies at national and territorial level.<sup>12</sup> Sweden also has disaggregated its adaptation plan at the sectoral level, and the Ministry of the Environment and Energy coordinates the work on adaptation. However, the plan as of 2018, and currently in revision, lacks local implementation. Recent legislative changes, which require municipalities to take further actions on adaptation, should allow greater responsibilities and detailed planning to implement adaptation locally. In addition to a national adaptation plan coordinated by the Ministry of Agriculture and Forestry, Finland has developed decentralised adaptation plans, where at a local level, most municipalities have adopted a climate strategy concerning both mitigation and adaptation. Adaptation options are usually selected using expert judgement and participatory processes. The relevant ministries are then responsible for providing funding to increase climate resilience in their administrative branches.

Through a more systemic approach, the UK builds an adaptation plan with clear objectives to reduce risks (exposure and vulnerability), with specific actions, as well as a monitoring plan to link the actions and the outcomes.<sup>13</sup> The Netherlands have adopted an integrated approach, by gathering several institutional bodies and stakeholders to build an adaptation programme concerning some key

impacts. This ongoing programme, titled Delta, is structured around flood risk management (e.g. improving dykes, maintaining the coast through sand replenishment, and more room for rivers), freshwater supply (e.g. securing a sufficient supply of fresh water) and spatial adaptation (e.g. redesigning the Netherlands to cope with natural extremes). This programme involves regional water authorities, local authorities, stakeholders such as industries and transport infrastructure institutions.<sup>14</sup>

The IPCC finds that though adaptation is happening across Europe, it is not implemented at the scale, depth and speed needed to avoid the risks, with forward looking adaptation planning required to avoid path-dependencies, maladaptation, and ensure timely action. Systemic barriers to adaptation include limited resources, lack of private sector and citizens engagement, insufficient mobilisation of finance, lack of political leadership, and a low sense of urgency. Adaptation policy must avoid creating competition and trade-offs between limited water and land resources and also with mitigation options and socioeconomic development, but examples of transformative adaptation often remain policy experiments and prove challenging to upscale. Human and knowledge resources are also central to successful, proactive adaptation but institutional and behavioural lock in that prevent systemic change and hamper the transition to climate resilience must be addressed. Closing the adaptation gap requires moving beyond short-term planning and ensuring timely and adequate implementation.<sup>15</sup> Systemic and cascading risks are often recognised in policy, but most conventional risk assessment methods that inform adaptation planning are ill-equipped to deal with these effects.<sup>16</sup>

Adaptation and adaptation finance were given significant attention at COP26 in Glasgow, as were the limits to adaptation and the topic of Loss and Damage. Eighty countries submitted either Adaptation Communications or National Adaptation Plans by the time COP26 began, and a global commitment was made to double climate finance by 2025. The Adaptation Research Alliance (ARA) was formally launched, and, by committing €5 million, Ireland was one of the first funders of the Santiago Network on Loss and Damage, which was formally established at COP26. Significant financial contributions, far surpassing previous collective mobilisations, were pledged to a number of other causes, including the UNFCCC Adaptation Fund, the Least Developed Countries Fund, the Least Developed Countries Initiative for Effective Adaptation and Resilience, and the Champions Group on Adaptation Finance.

The majority of Ireland's climate finance to the developing world goes towards adaptation,<sup>17</sup> which suggests the potential for Ireland to learn from the projects that it finances. Research into internationally-funded adaptation interventions shows that many such projects end up inadvertently reinforcing, redistributing or creating new sources of vulnerability through a variety of mechanisms, and that the most fool-proof way of avoiding such maladaptation is for adaptation practitioners to

engage more meaningfully with the local populations the interventions are designed to help, so as to harness their expertise and understanding of the specific environmental and political context being dealt with<sup>18,19</sup>. Irish adaptation policy may therefore learn important lessons from these projects in the fields of locally-led and context-specific adaptation, but it may also have lessons to learn in the areas of coastal adaptation, innovative adaptation, monitoring and evaluation, and climate and gender justice.

### 3.8 Identifying vulnerable people and places, just resilience and participative adaptation

The impacts of climate change will not be equally distributed, neither geographically nor socially. How persons are affected by climate change impacts, and what ability they have to deal with those impacts, is largely dependent on their social and economic situation.<sup>20</sup> The EU Green Deal and the revised EU Adaptation Strategy both highlight the importance of achieving resilience in a just and fair way in order for adaptation benefits to be shared equitably. The EU Adaptation Strategy also elaborates the concept of ‘just resilience’ which highlights the need for greater awareness of social vulnerability to climate change, and the conditions which prevent members of society from benefitting from adaptation measures to the same extent as others (such as being priced out of a housing area due to the gentrification caused by the implementation of green, attractive Nature-based Adaptation).

In a further example, low-income groups are less likely to have adequate home insurance, or renters may have less influence on timely building repairs. Therefore, households with different characteristics living in the same area and in similar dwellings, may have different levels of exposure and variable capacity to act. The role of mapping socioeconomic vulnerability will be essential here. Critical in evaluating the potential impacts and exposure to risk is to understand social vulnerability related to individual and household characteristics, including income, age, social networks, physical ability etc. These same characteristics also impact on an individual or household’s capacity to adapt.<sup>21</sup> The UK’s Climate Change Committee have also recently published a report highlighting the implications of a just transition for climate change adaptation.<sup>22</sup>

Transposing the concept of just resilience to an Irish context, effective adaptation policy must not only target regions and sectors with high risks of climate impacts but must also prioritise households and sectors with low resilience to impacts. Societally and economically vulnerable households lack the capacity to absorb climate change impacts. Furthermore, households will also face unequal challenges in the face of a transition to a net zero economy. There are likely to be interconnections between economic, climate and transition impacts resulting in households and sectors facing immense difficulties in overcoming the multitude of these impacts.

Frameworks to understand these impacts in the Irish context, to identify vulnerable populations, and to inform policy decisions are scarce. In March 2022, DCU researchers published a report outlining the barriers to poorer and vulnerable communities being involved in decisions regarding the environment and climate change in Ireland, and the need for greater resourcing of community engagement and access to environmental justice.<sup>23</sup> The report also highlights the fact that no national study has ever been conducted in Ireland correlating data on environmental quality with spatial representation of disadvantage and marginalisation, and that this lack of information is a significant inhibitor of our understanding regarding the overlap between environmental impacts and social inequalities.

An ESRI research project funded by the EPA will further study the vulnerabilities of Irish households arising from their economic standing and the low carbon transition and how they interconnect with climate impacts.<sup>24</sup> Using spatial microsimulation modelling, it aims at identifying regions and socio-economic groups most at risk to climate impacts, and in particular to fluvial and coastal flooding. This will be done by matching spatially referenced measures of multidimensional deprivation data with flood maps. Then, applying a macroeconomic model (I3E) representative of the functioning of the Irish economy and its low-carbon transition, the project will consider sectors most at risk of being climate affected and what policy measures may be required for those working in vulnerable sectors to achieve just resilience. Specifically, Nature-based Solutions can be a source of resilience and wellbeing. The project will review and assess their potential by simulating the effects of adaptation interventions.

**Recommendation 17. Socioeconomic vulnerability and just resilience have not been adequately considered in national, sectoral and local policy to date and must be a key focus of future national adaptation policy and planning.**

A key message, stressed in the IPCC WGII Sixth Assessment Report, but also across international adaptation research, is the importance of local participation during adaptation planning and implementation. Adaptation aligned with local knowledge and cultural values proves far more effective, while maladaptation often arises from implementation of adaptation measures without local buy-in.<sup>18</sup>**Error! Bookmark not defined.****Error! Bookmark not defined.** Inclusive governance and co-production of knowledge are required in order to reduce vulnerabilities and climate risks through policies and interventions designed to address context-specific inequities such as disability, ethnicity, gender, age, income and location<sup>25,26</sup>. Such approaches would ensure meaningful participation of the most vulnerable groups, and provide them with access to the resources they need to adapt, which is something being called for by Irish coastal communities experiencing coastal change, such as the Maharees Conservation Association who call for deeper integration of funding and other socio-economic planning provisions between government and coastal communities to support them. It has

also been argued that such funding should allow space for creativity, such that the adaptation actions taken should be prescribed by stakeholders on the ground.<sup>27</sup>

**Recommendation 18. Lessons from local action and the importance of participative adaptation planning and action should underpin the next NAF to a far greater extent than the previous NAF.**

**Recommendation 19. Research into spatial socioeconomic vulnerability to climate change in an Irish context must be considered in future adaptation policy development and planning from the outset. Such research should include an investigation into the variability of risk perception and behavioural responses to vulnerabilities. Greater use of public consultations during the process of developing adaptation strategies, greater collaboration between adaptation policy decision-makers and social policy decision-makers, in order to visualise the full breadth of climate-social feedback loops and achieve just resilience are needed. These should also continue efforts towards achieving gender equality, and to address gender mainstreaming within adaptation.**

#### 4. Assessing climate change risks and vulnerabilities

**Recommendation 20. In the preparation and communication of adaptation planning, clarity should be provided on the assessment of risk, exposure, vulnerability, resilience and adaptive capacity, and the decision-making framework under which options are considered. This should include criteria for prioritisation, implementation, monitoring and evaluation. These would bring forward for consideration of the types of options to develop and the need for a robust and credible portfolio of measures.**

**Recommendation 21. A regular national climate risk assessment by Government, which considers cross sectoral risks, should inform future National Adaptation Frameworks and any plans and strategies prepared under them.**

##### 4.1 Socioeconomic dimensions/non-climate pressures and avoiding maladaptation

As discussed in the IPCC AR6 WGII report, avoiding maladaptation must be a key concern of policy. Maladaptation can arise when just considering climate change not socioeconomic factors and vulnerability and not taking a systemic perspective when considering risks and required responses. Maladaptation can be infrastructural, institutional or behavioural and it can shift vulnerability, 'rebound' vulnerability (increasing current or future vulnerability) or erode sustainable development through increasing emissions for example or having impacts for biodiversity, water and catchment resilience. Avoiding it requires a strong understanding of what drives vulnerability to climate change.<sup>28</sup>

**Recommendation 22.** It is important when undertaking a risk assessment and identifying and implementing adaptation actions to also consider pressures in addition to climate change (e.g. demographic, societal change stressors such as urbanisation, as well as environmental legislative frameworks such as the Water Framework Directive) and how climate change compares and relates to these pressures both positively and negatively.

**Recommendation 23.** It is important that adaptation actions and planning do not happen in a vacuum and that other pressures are also taken into account, recognising that climate action can be synergistic or complementary but also conflicting. This may be useful in the identification of adaptation options whereby 'win-win' measures can be pursued.

#### 4.2 Transboundary issues

Climate change impacts are nationally and internationally interconnected through the integration of markets. Geographically distant regions and different economic sectors interact on international markets for goods or resources. Also, economic integration within global value chains potentially makes separated regions or sectors vulnerable to outside risks, such as the price shocks resulting from the Ukraine crisis. This will even be more the case as biophysical impacts of climate change intensify.<sup>29</sup> Simply put, climate change will impact various sectors, changing prices across both the Irish and global economy, these price changes will also impact production costs of seemingly climate resilient sectors.

Some evidence underlines that these market interdependencies can play a buffering role in climate risks.<sup>30,31</sup> Indeed, economic integration can facilitate the substitution between different products, or streamline the reallocation of inputs from one sector to another. In other words, if an input becomes unavailable due to climate change, other inputs can be sourced from the market, or if jobs become vulnerable in a sector due to climate change impacts, economic integration can facilitate a transition of that labour and its expertise to another sector. However, this buffering capacity needs to be weighed against the associated adjustment and transition costs. Furthermore, the capacity of the market to buffer impacts will depend on their available resource capacity which in turn will be affected by the costs to economic sectors of the transition to a low carbon economy. There will be need for resources to both adapt to climate change and to mitigate emissions and they will need to compete for sectors' resource availability. Specific macroeconomic tools for assessing the impacts of climate change can account for these interdependencies within economy but often ignore or minimise the adjustment and transaction costs.

The EPA-funded Transboundary Climate Risks for Island of Ireland (TCRII) project is taking a risk-based approach to explore the key cross-border, transboundary and international impacts of climate change for the Island of Ireland. It will consider how transboundary climate risks can flow through shared ecosystems and resources (through biophysical connections); trade links (through the flow of goods and services, such as commodities like wheat, rice or coffee); financial interdependencies (such as the flow of capital and other assets); and people (through migration or forced displacement).<sup>32</sup> These risks can be managed through a variety of management responses that can be categorised into three main approaches: (1) management at source; (2) management along the risk pathway; and (3) management at point of impact.<sup>33,34,35,36</sup> In practice the best way to manage for transboundary climate risks is through a combination of all three approaches. The project is identifying transboundary synergies that can be developed in terms of information and policy solutions to build the resilience of mutually significant sectors that face similar challenges and opportunities.<sup>37</sup>

## 5. Identifying and assessing adaptation options

### 5.1 Financial and economic considerations

Recent European Environment Agency (EEA) research has shown total economic losses from climate and weather-related events across the 32 EEA member countries between 1980 and 2020 amounted to the equivalent of €450-520 billion today, and that only a one quarter to a third of these losses were insured. The same research also estimated that climate and weather-related fatalities during the same period amounted to between 85,000 and 145,000 deaths. For Ireland, the economic losses were estimated to be between €2,968,000,000 and €4,600,000,000 with between 62 and 71 fatalities caused by weather and climate related extreme events in the period.<sup>38</sup> According to a recent study conducted by the Central Bank of Ireland, the extreme-weather-related economic losses for this period were close to 2.3% of Irish GNI\*.<sup>39</sup> The EEA report stressed that while 60% of economic losses were caused by only 3% of events, it remains important to record smaller-scale events in order to fully evaluate the impacts of climate change on society, the economy and the environment and thereby better inform adaptation action. Indeed, the new EU Adaptation Strategy calls for better and more standardised climate-related risk and loss data across Member States in order to develop the best possible database from which to make climate risk assessments.<sup>40</sup>

The current NAF lays out the economic basis for adaptation with cost-effectiveness amongst the criteria for prioritising adaptation options (alongside efficiency, risk and urgency, and distributional impacts). Internationally, it is recognised that benchmarking costs and establishing the relative economic benefits of different adaptation options are far from straightforward tasks.<sup>41</sup> The current

approach to adaptation in Ireland anticipates that sectors will reflect their key priorities within the annual budgetary and estimates processes. This sector-focused approach will lead to fragmentation, lack of synergies and complementarities or even conflicts, when coherence to resourcing our adaptation transition is required. Instead, there is a need for an assessment of the prioritised investment needs of adaptation for Ireland, quantifying what is required to make Ireland resilient by 2050 and beyond, based on integrated consideration of the commitments contained in sectoral and local plans and strategies. The assessment should consider the monies that will be required to adapt to climate change, consideration of the costs of inaction, and also the costs related to the damage associated with climate change that cannot be prevented. This will require delineating what constitutes ‘adaptation’ as distinct from other forms of investment/spending that also bring adaptation benefits.

The cost-effectiveness of all adaptation actions needs to be monitored. This requires the availability of quantitative data on adaptation. There is a lack of data, especially from the private sector, which is critical to assess the outcomes from adaptation action and their effectiveness. Simply identifying actions for adaptation is not enough, we must be able to assess the contributions of every action in reaching an adaptation objective and our long-term resilience. Ultimately, monitoring aims at distinguishing year to year variability from long-term trends and to attribute the changes in impacts to different drivers—for example whether the driver is a change in hazard or the result of adaptation actions. Developing metrics of adaptation with long time series can partly address this challenge. For instance, regarding the adaptation to climate change of the agricultural sector, we know little about soil quality. Also, the exposure of flood risks can be evaluated by assessing indicators on the number, types and location of infrastructure in areas which are exposed to flooding, and by collecting data on whether properties have or do not have flood insurances.

**Recommendation 24. The discussion on capital investment requirements and the evaluation of public expenditure in the next NAF must be significantly more detailed, indicating workflows for proportionate and transparent economic appraisal of adaptation options that can be applied to project- and sector-level actions.**

**Recommendation 25. Data sharing for adaptation monitoring (including climate related risk and losses data) must be advanced and should be driven by the Department of the Environment, Climate and Communications, with the input of other departments and agencies including in particular the CSO.**

## 5.2 Prioritisation

Early action on adaptation may be a priority where there is an identified need to: (1) address an existing vulnerability with respect to present climate variability and changes, while adapting to build future climate resilience; (2) intervene early to embed adaptation in near-term decisions with long lifetimes, thereby reducing the risk of 'lock-in'; (3) fast-track early adaptive management actions for decisions with long lead times or requiring transformative change;<sup>42</sup> or (4) building adaptive capacity and provision of data, knowledge and tools to support adaptation decision-making and implementation today and in the future. However, the urgency of action should be assessed in a systematic and consistent way.<sup>42</sup> To select the most cost-effective transformative actions, actions must be specific, with measurable outcomes, a detailed timescale, and clear ownership of the actions. Greater clarity is required regarding the decision framework which should be used to determine adaptation priorities and how ownership for adaptation actions is to be assigned in areas where there are multiple actors, fragmentation of responsibilities, and potentially conflicting objectives. Economic appraisal of investments should also capture ecosystem goods and services. It is also important to consider no-regret actions (that is to say, relevant adaptation actions whatever the climate scenario) and socioeconomic dynamics. Nature-based Adaptation is amongst these: restoring ecosystems can limit natural risks, provide food security, and water security. Also, no-regret actions can also encompass those actions generating co-benefits on mitigation, health, or biodiversity.

**Recommendation 26. The next NAF should strengthen the criteria and processes for urgency scoring of adaptation options and this should be extended within and across sectoral plans to establish clear national priorities for adaptation action in Ireland.**

## 6. Implementation

### 6.1 Resourcing

As discussed above, resourcing is inherently linked to prioritisation. The 2018 NAF anticipated that sectors would reflect their key priorities within the annual budgetary and estimates processes. However, this approach leads to fragmentation, lack of synergies and complementarities or even conflicts, when coherence in resourcing our adaptation transition is required.

Enabling community financing structures may assist in a more holistic approach to financing and engagement on adaptation, delivering funding and encouraging 'buy-in' to long-term adaptation projects in key sectors and regions.

However, funding alone will not guarantee our resilience. In the 2021 Adaptation Scorecard the Council gave slightly more weight to sectors demonstrating progress in addressing prioritised risks and vulnerabilities, building adaptive capacity and putting in place good governance and coordination structures, noting that adaptation actions may be well resourced but to be effective they must be coherent with other policies and sectors and addressing key, prioritised risks.

**Recommendation 27. There is a need for an assessment of the prioritised investment needs of adaptation, quantifying what is required to make Ireland resilient by 2050 and beyond. Such an assessment should consider the funding that is required to adapt to climate change and how it should be prioritised. This should include setting an initial adaptation budget to 2030. The budget itself should be determined in light of the social cost of climate change over at least the next 30 years. Such budgetary planning must begin now as projects may have to begin in the short or medium term if they take a long time to mature or require significant investment e.g. coastal protection or national long-term water supply projects. In this the role of the Department of Public Expenditure and Reform will be key.**

## 6.2 Mainstreaming

The IPCC WGII Sixth Assessment Report stated clearly that adaptation must come to underpin almost every aspect of national policy. The world is already experiencing the impacts of climate change and those impacts are guaranteed to be felt more keenly into the future. Every aspect of national policy must therefore take the need to adapt to climate change into consideration and evolve accordingly. However, prioritising mainstreaming alone risks a focus on incremental, rather than transformative, adaptation.<sup>43</sup> Adaptation and mitigation must be better integrated, so that they may address both the impacts and the causes of climate change, and they must be delivered at a greater speed and scale.

To ensure that adaptation is adequately integrated into national decision-making, further clarity is required on the interaction and reporting between national, sectoral and local governance structures, including the role of the Climate Action Delivery Board. This oversight should ensure that adaptation is mainstreamed into policy making, planning and implementation. Adaptation should be directly considered when policies and investments are being prepared and evaluated to ensure they promote, and do not act as barriers to, adaptation.

**Recommendation 28. Further detail should be given as to the efforts needed to facilitate mainstreaming of adaptation into policy and practice, with examples of effective mainstreaming provided. The 2018 NAF provides a discussion of the importance of mainstreaming but less detail**

**on how it is to be achieved in practice. Given the experience of the first round of statutory adaptation planning significant detail can be provided here. Overall, overarching governance, roles and responsibilities of adaptation must be clearer.**

### 6.3 Non-Governmental adaptation including households and businesses

Individuals are already experiencing the impacts of climate change and as climate disruption deepens, this exposure to risk will become more heightened.<sup>44</sup> For individual businesses, organisations, or the public, it is extremely challenging to build awareness and take adaptation actions at a scale that is effective and efficient, and that accounts for social costs and benefits, without centralised support and direction where needed.

To be effective adaptation requires action that is multi-scalar and multi-actor. However, given the focus on the role of government and state action in adaptation, there has been less attention given to the potential role of individuals, households and local communities in adapting to climate change risks, thus neglecting the need for a ‘whole-of-society’ approach to adaptation to complement a ‘whole-of-government’ response.<sup>45 46</sup>

Some impacts will be experienced ‘in-place’, at the scale of everyday life and home, leading to household and individual exposure to health, security and wellbeing impacts, property damage, and disruption to essential infrastructure and the services they provide.<sup>47</sup> In line with above recommendations on including the voice of those affected in adaptation planning, to avoid maladaptation, decisions must be sensitive to how place is valued. **Error! Bookmark not defined. Error! Bookmark not defined.** Other impacts will result from wider national and global challenges, for example, as climate change disrupts national and global supply chains, food production and energy security, with potential cost of living implications.<sup>48</sup> There has been progress in addressing flood related risks to property at a scheme scale and in local government, but less progress in implementing the health and infrastructural adaptation plans and overall the Council is not satisfied that national and local policy has sufficiently considered these risks or enabled, prepared and supported households, individuals and communities to take action to address such vulnerabilities. Taken in the absence of strong Government policy, direction and support, adaptation actions by individuals and households have the potential for reinforcing pre-existing socio-spatial inequalities or risking maladaptation or the displacement of risks onto others.<sup>49</sup>

Many coastal communities are witnessing a need for coastal adaptation and having to handle the situation on their own. They are finding that education, signage, fencing off areas and a variety of

Nature-based approaches can achieve real results. However, the burden of taking such actions should not fall exclusively upon the shoulders of these communities. The role of local communities in decision making and managing the coastline has potential. This requires deeper integration of funding and other socio-economic planning supports between government and coastal communities in Ireland, for the development of sustainable coastal economies and infrastructures under the impacts of future climate changes.

The 'Climate Change Adaptation: Risks and Opportunities for Irish Businesses' EPA-funded study, published in February 2022, found that most Irish businesses have limited awareness of the need for or the roles they could play in climate adaptation, despite the risks climate change poses to certain production processes, the reliability of supply chains and the interdependencies between businesses, customers and enabling sectors. Large businesses, particularly in chemical and pharmaceutical manufacturing, and financial services and energy sectors, were found to be the most advanced at incorporating climate-related risks into their long-term business strategies, while food and beverage manufacturing and the hospitality and tourism sectors were found to be the least advanced, despite being the most vulnerable to risks related to extreme weather events.<sup>50</sup>

**Recommendation 29. Enabling household and community level adaptation must be addressed in the next NAF, however this cannot just involve the individualisation of risk away from the state towards the individual or community as this may lead to uneven outcomes, displaced risk and maladaptation or retrenching pre-existing socioeconomic outcomes. Adaptation actions led at this level must be legitimate, effective, robust and lead to just outcomes which support clear, effective and just national adaptation objectives. It is imperative that the social contract (i.e. the expectations of the state from its citizens) around adaptation and climate risks is negotiated in a clear, transparent, inclusive and just way.<sup>51</sup>**

**Recommendation 30. Adaptation must be integrated further into existing and future climate action communications and campaigns (which currently mainly target mitigation), while making use of new insights about place attachment, memorable extremes, and storylines to personalise climate risks and adaptation opportunities for diverse audiences.**

**Recommendation 31. Reinvigorated focus will be required to draw the private sectors' attention to the risks of not adapting to the changing climate, and the opportunities provided by forward-thinking and factoring climate-related risks and effective actions all along businesses' supply chains into their long-term strategies. The next NAF should also set a clear strategy for coordinating and**

**incentivising private sector adaptation as well as the community financing of adaptation investment.**

## 7. Monitoring and evaluating adaptation and resilience

### 7.1 How to integrate with the National Transition Objective, including links with mitigation and biodiversity considerations

Mitigation and adaptation must be more closely integrated in policy and practice. It is clear that, as stated in the 277 EPA report on Irish Climate Futures, ‘too often mitigation and adaptation are treated as independent strategies; in reality, even if we could somehow stop all greenhouse gas emissions right now, some degree of impact on Ireland’s society, economy and environment will still result from historical emissions. Additionally, as the IPCC WGI and WGII reports make clear, even at 1.5°C and 2°C warming, potentially severe impacts will still be felt. Therefore, it is critical that society adapts to future impacts of climate change’.<sup>52</sup>

In May 2019 the Dáil declared a climate and biodiversity emergency. Although public awareness of biodiversity loss and change has increased and cross-sectoral engagement in biodiversity action has improved in recent years, the status of biodiversity in protected areas, seas and the wider countryside is in poor condition and continues to decline. This is primarily due to causes such as land-use change, intensive agriculture, overharvesting and pollution, and threatens the provision of critical services such as flood mitigation, clean drinking water, as well as pollination, which underpin current and future economic activity in agriculture, forestry and tourism, and ensure basic quality of life.<sup>53</sup> The concept of resilience and its value to Ireland and its people should be further articulated in the next NAF and a clear conceptualisation must be at the centre of local and sectoral plans and meeting the national climate objective. Greater emphasis must also be placed on nature-based approaches to adaptation, which integrate mitigation and adaptation considerations, while also benefitting biodiversity, within the next NAF, but also within the National Development Plan, the Climate Action Plan and the National Biodiversity Action Plan, all of which need to be more aligned.<sup>54</sup>

As emphasised in both the IPCC’s WGII Sixth Assessment Report and the EU’s Adaptation Strategy, Nature-based Adaptation provides an opportunity to adapt to climate change, mitigate against climate change, and protect biodiversity simultaneously.<sup>55,56</sup> Options such as peatland restoration, afforestation in strategic locations, and green urban planning can act as adaptation measures to help with flood mitigation, soil erosion and the urban heat island effect, as mitigation measures by removing carbon from the atmosphere, and as biodiversity protections by providing new habitats.<sup>57</sup>

**Recommendation 32. An integrated, multidisciplinary, long-term systemic approach, within public policy making, towards integrating adaptation and mitigation as a means of combating climate change and building resilience is essential. This also includes just resilience and just transition and wellbeing. Resilience indicators will be essential to demonstrating progress and identifying gaps and priorities towards meeting the new National Climate Objective.**

**Recommendation 33. The next NAF must explain how the NAF, sectoral adaptation plans and local climate plans work together to deliver the National Climate Objective. Inherent to this, the next NAF should adopt a more outcome-based approach, where the NAF itself and sectoral and other plans under it are outcomes focused.**

## 7.2 Evaluation of adaptation actions

It is rare that adaptation interventions have singular impacts that can be easily evaluated using one metric (risk reduction may be coupled with changes in aesthetic value or access to green space), and with an increasing focus on transformative adaptation it is likely that there will be multifaceted direct and indirect consequences of different adaptation interventions. Whilst traditionally success of adaptation projects have been judged on reduction of risk (e.g. reduced likelihood of flooding) and cost effectiveness of interventions, increasingly it is recognised that the impacts of adaptation strategies are much further reaching.<sup>58</sup> Adaptation decision making has implications for how people see themselves,<sup>59</sup> for health outcomes<sup>60</sup> and can result in reinforcement or redistribution of a range of vulnerabilities.<sup>61</sup>

Taking a broader approach to monitoring and evaluating success can allow a more holistic understanding of how adaptations impact populations and how they can be harnessed to pursue sustainable and transformative adaptation strategies. This reframing of success will require a broader set of indicators for evaluation processes. Metrics that can capture the fairness of process and distribution of outcomes of adaptation will help to clarify exactly who benefits, and who may suffer as the result of climate adaptation interventions. A project on Healthy Adaptations at Maynooth University and funded by the Wellcome Trust is working with policy makers and communities in Ireland, Ghana and the UK to identify health and wellbeing metrics for adaptation planning ([www.healthyadaptations.org](http://www.healthyadaptations.org)), and the metrics emerging from the project reflect issues such as community identity, place attachment and wellbeing.

### 7.3 Indicators

The 2018 NAF indicated that a ‘priority for Ireland will be to take forward a project to develop a range of adaptation indicators which will enable Ireland to monitor progress in preparing for the long-term effects of climate change’. The Council has regularly indicated the urgent need for adaptation indicators and regrets that they are still not in place, despite progress on an indicators pilot under the Climate Action Plan 2021.

The Council also notes recommendations within the literature that indicators of ‘restorative’ action be included (i.e. action that includes heritage protection and restoration), alongside indicators of progress towards furthering community participation.<sup>62</sup>

**Recommendation 34. Adaptation indicators must be set out in the next NAF. Indicators should be provided on socio-economic vulnerabilities, such as the location, condition, and performance of critical infrastructure, or for health and social care delivery and linking with wellbeing and social justice that are critical to the achievement of the SDGs. Sector specific indicators that do not consider cross cutting risks, synergies and co-dependencies will be a missed opportunity, e.g. progress in one sector could be increasing vulnerability in another. Above all, there is scope for more indicators describing resilience and effectiveness of adaptation actions for and across key sectors such as agriculture, biodiversity, health, the built environment, and infrastructure.**

<sup>1</sup> Phillips, C.; Murphy, C. (2021). Solastalgia, place attachment and disruption: insights from a coastal community on the front line. Available at: <https://link.springer.com/article/10.1007/s10113-021-01778-y>

<sup>2</sup> Clarke, D.; Murphy, C.; Lorenzoni, I. (2018). Place attachment, disruption and transformative adaptation. Available at: <https://www.sciencedirect.com/science/article/pii/S0272494417301834>

<sup>3</sup> IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

<sup>4</sup> Wilby, R. (2022). Well informed adaptation decision making under uncertainty. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2012%20Decision%20making%20under%20uncertainty.pdf>

<sup>5</sup> Climate Change Advisory Council (2019). Progress towards a Climate-Resilient Ireland: Review of Statutory Sectoral Adaptation Plan Making 2018-2019. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Climate%20Change%20Advisory%20Council%20Review%20of%20Sectoral%20Adaptation%20Plan%20Making%202018%202019.pdf>

<sup>6</sup> Devoy, R.J.N. (2022). Sea-Level Rise: Causes, Impacts and Scenarios for Change. Available at: <https://www.sciencedirect.com/science/article/pii/B978012396483000008X>

<sup>7</sup> IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Available at: <https://www.ipcc.ch/report/ar6/wg2/>

<sup>8</sup> Devoy, R.J.N.; Cummins, V.; Brunt, B.; Bartlett, D.; Kandrot, S. (2021). The Coastal Atlas of Ireland. Cork University Press.

- 
- <sup>9</sup> Pasimeni, M. R.; Valente, D.; Zurlini, G.; Petrosillo, I. (2019). The interplay between urban mitigation and adaptation strategies to face climate change in two European countries. *Environmental Science & Policy*. pp. 20–27. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S1462901118311274?via%3Dihub>
- <sup>10</sup> Smith, G.; LeTissier, M.; O'Hagan, A.M.; Farrell, E.J. (2022). Policy Coherence for Climate Change Adaptation at the Land-Sea Interface in Ireland. *Planning Practice & Research*. pp. 173-188. Available at: <https://www.tandfonline.com/doi/abs/10.1080/02697459.2021.1991657>
- <sup>11</sup> IPCC (2022). Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
- <sup>12</sup> Haut Conseil pour le Climat (2021). Renforcer l'atténuation, Engager l'Adaptation. Available at: <https://www.hautconseilclimat.fr/publications/rapport-annuel-2021-renforcer-lattenuation-engager-ladaptation/>
- <sup>13</sup> UK Climate Change Committee (2019). Progress in preparing for climate change – 2019 Progress Report to Parliament. Available at: <https://www.theccc.org.uk/publication/progress-in-preparing-for-climate-change-2019-progress-report-to-parliament>
- <sup>14</sup> Climate Change Advisory Council (2021). Building resilience and capacities for Ireland's coastal future. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/documents/Coastal%20Reflection%20and%20Learning%20Workshop%20Report%202021.pdf>
- <sup>15</sup> Bednar-Friedl, B., R. Biesbroek, D.N. Schmidt, P. Alexander, K.Y. Børshiem, J. Carnicer, E. Georgopoulou, M. Haasnoot, G. Le Cozannet, P. Lionello, O. Lipka, C. Möllmann, V. Muccione, T. Mustonen, D. Piepenburg, and L. Whitmarsh (2022) Europe. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
- <sup>16</sup> Adger, W. N., I. Brown and S. Surminski (2018). Advances in risk assessment for climate change adaptation policy. *13 Philosophical Transactions of the Royal Society a-Mathematical Physical and Engineering Sciences*, 376(2121), doi:10.1098/rsta.2018.0106.
- <sup>17</sup> Department of Foreign Affairs (2020). Ireland's Climate and Environmental Finance Report 2019. Available at: [https://www.irishaid.ie/media/irishaid/publications/21-008-Climate-Finance-Report\\_Final--digital.pdf](https://www.irishaid.ie/media/irishaid/publications/21-008-Climate-Finance-Report_Final--digital.pdf)
- <sup>18</sup> Eriksen, S.; Schipper, E.L.F.; Scoville-Simonds, M.; Vincent, K.; Adam, H.N.; Brooks, N.; Harding, B.; Lenaerts, L.; Liverman, D.; Mills-Novoa, M.; Mosberg, M. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? Available at: <https://www.sciencedirect.com/science/article/pii/S0305750X20305118?via%3Dihub>
- <sup>19</sup> Soanes, M.; Shakya, C.; Barrett, S.; Steinbach, D.; Nisi, N.; Smith, B.; Murdoch, J. (2021). Follow the money: tracking Least Developed Countries' adaptation finance to the local level. Available at: <https://pubs.iied.org/20326iied>
- <sup>20</sup> Breil, M.; Zandersen, M.; Pishmisheva, P.; Pedersen, A.B.; Romanovska, L.; Coninx, I.; Rogger, M.; Johnson, K. (2021). 'Leaving No One Behind' in Climate Resilience Policy and Practice in Europe Overview of Knowledge and Practice for Just Resilience. EEA Research. Available at: [https://www.eionet.europa.eu/etcs/etc-cca/products/etc-cca-reports/tp\\_2-2021](https://www.eionet.europa.eu/etcs/etc-cca/products/etc-cca-reports/tp_2-2021)
- <sup>21</sup> Scott, M.; O'Neill, E. (2022). Opportunities for individual, household and community level climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2011%20Household%20adaptation.pdf>
- <sup>22</sup> UK Climate Change Committee (2022). The Just Transition and climate change adaptation. Available at: <https://www.theccc.org.uk/wp-content/uploads/2022/03/CCC-The-just-transition-and-climate-change-adaptation.pdf>
- <sup>23</sup> O'Neill, S.; Gleeson, C.; Torney, D.; Mercier, S.; Daly, C.; Wall, R. (2022). Environmental Justice in Ireland: Key dimensions of environmental and climate injustice experienced by vulnerable and marginalised communities. Irish Research Council. Available at: <https://communitylawandmediation.ie/environmental-justice-in-ireland/>
- <sup>24</sup> Farrell, N.; De Bruin, K. (2019). Just Resilience and Adaptation in Ireland: Sectors and Regions. ESRI. Available at: <https://www.esri.ie/current-research/just-resilience-and-adaptation-in-ireland-sectors-and-regions>
- <sup>25</sup> IPCC (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Available at: <https://www.ipcc.ch/report/ar6/wg2/>
- <sup>26</sup> Best, M.; Hochstrasser, T. (2022). Detecting and avoiding impasse mechanisms for nature-based approaches to climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2010%20Nature-based%20Adaptation%20Impasses%20in%20Ireland.pdf>
- <sup>27</sup> Best, M.; Hochstrasser, T. (2022). Detecting and avoiding impasse mechanisms for nature-based approaches to climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at:

---

<https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2010%20Nature-based%20Adaptation%20impasses%20in%20Ireland.pdf>

<sup>28</sup> Schipper, L. (2020) Maladaptation: When Adaptation to Climate Change Goes Very Wrong, *One Earth*, 3(4), pp. 409-414.

<sup>29</sup> IPCC (2022). Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

<sup>30</sup> Costinot, A.; Donaldson, D.; Smith, C. (2016). Evolving comparative advantage and the impact of climate change in agricultural markets: Evidence from 1.7 million fields around the world. *Journal of Political Economy*. Available at: <https://www.journals.uchicago.edu/doi/abs/10.1086/684719>

<sup>31</sup> Anderson, S.E.; Anderson, T.L.; Hill, A.C.; Kahn, M.E.; Kunreuther, H.; Libecap, G.D.; Mantripragada, H.; Mérel, P.; Plantinga, A.J.; Kerry Smith, V. (2019). The critical role of markets in climate change adaptation. *Climate Change Economics*. Available at: <https://www.worldscientific.com/doi/abs/10.1142/S2010007819500039>

<sup>32</sup> Benzie, M.; Carter, T.R.; Carlsen, H.; Taylor, R. (2019). Cross-border climate change impacts: implications for the European Union. *Regional Environmental Change*. Available at: <https://link.springer.com/article/10.1007/s10113-018-1436-1>

<sup>33</sup> Adams, K.; Harris, K.; Klein, R.J.T.; Lager, F.; Benzie, M. (2020). Climate-Resilient Trade and Production: The Transboundary Effects of Climate Change and Their Implications for EU Member States. *Adaptation Without Borders Policy Brief*. SEI, ODI, IDDRI. Available at: <https://www.sei.org/publications/climateresilient-trade-production-transboundary-eu/>

<sup>34</sup> Benzie, M.; Carter, T.R.; Carlsen, H.; Taylor, R. (2019). Cross-border climate change impacts: implications for the European Union. *Regional Environmental Change*. Available at: <https://link.springer.com/article/10.1007/s10113-018-1436-1>

<sup>35</sup> Levermann, A. (2014). Climate economics: make Supply chains climate smart. *Nature*. Available at: <https://www.nature.com/articles/506027a>

<sup>36</sup> Carter, T.R.; Benzie, M.; Campiglio, E.; Carlsen, H.; Fronzek, S.; Hildén, M.; Reyer, C.P.; West, C. (2021). A conceptual framework for cross-border impacts of climate change. *Global Environmental Change*. Available at: <https://www.sciencedirect.com/science/article/pii/S0959378021000868>

<sup>37</sup> Anderson, S.E.; Anderson, T.L.; Hill, A.C.; Kahn, M.E.; Kunreuther, H.; Libecap, G.D.; Mantripragada, H.; Mérel, P.; Plantinga, A.J.; Kerry Smith, V. (2019). The critical role of markets in climate change adaptation. *Climate Change Economics*. Available at: <https://www.worldscientific.com/doi/abs/10.1142/S2010007819500039>

<sup>38</sup> European Environment Agency (2022). Economic losses and fatalities from weather- and climate-related events in Europe. Available at: <https://www.eea.europa.eu/publications/economic-losses-and-fatalities-from>

<sup>39</sup> Niall McNerney (2022). The Macroeconomic Implications of Climate Change for Central Banks. Central Bank of Ireland. Available at: <https://www.centralbank.ie/docs/default-source/publications/quarterly-bulletins/quarterly-bulletin-signed-articles/macroeconomic-implications-of-climate-change-for-central-banks.pdf?sfvrsn=7>

<sup>40</sup> European Environment Agency (2022). Economic losses and fatalities from weather- and climate-related events in Europe. Available at: <https://www.eea.europa.eu/publications/economic-losses-and-fatalities-from>

<sup>41</sup> Wilby, R. (2022). Well informed adaptation decision making under uncertainty. Paper for the Climate Change Advisory Council. Available at:

<https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2012%20Decision%20making%20under%20uncertainty.pdf>

<sup>42</sup> Wilby, R. (2022). Well informed adaptation decision making under uncertainty. Paper for the Climate Change Advisory Council. Available at:

<https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2012%20Decision%20making%20under%20uncertainty.pdf>

<sup>43</sup> Bednar-Friedl, B., R. Biesbroek, D.N. Schmidt, P. Alexander, K.Y. Børshiem, J. Carnicer, E. Georgopoulou, M. Haasnoot, G. Le Cozannet, P. Lionello, O. Lipka, C. Möllmann, V. Muccione, T. Mustonen, D. Piepenburg, and L. Whitmarsh (2022) Europe. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

<sup>44</sup> Scott, M.; O'Neill, E. (2022). Opportunities for individual, household and community level climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at:

<https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2011%20Household%20adaptation.pdf>

<sup>45</sup> CCAC (2020). Annual Review 2020. Available at:

[https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/CCAC\\_AnnualReview2020FINAL.pdf](https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/CCAC_AnnualReview2020FINAL.pdf)

- 
- <sup>46</sup> Scott, M.; O'Neill, E. (2022). Opportunities for individual, household and community level climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2011%20Household%20adaptation.pdf>
- <sup>47</sup> Matthews, T.; Mullan, D.; Wilby, R.L.; Broderick, C.; Murphy, C. (2016). Past and future climate change in the context of memorable seasonal extremes. *Climate Risk Management*. Available at: <https://www.sciencedirect.com/science/article/pii/S221209631600005X>
- <sup>48</sup> Scott, M.; O'Neill, E. (2022). Opportunities for individual, household and community level climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2011%20Household%20adaptation.pdf>
- <sup>49</sup> Scott, M.; O'Neill, E. (2022). Opportunities for individual, household and community level climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2011%20Household%20adaptation.pdf>
- <sup>50</sup> Deignan, K.; O'Hara, A.; Delargy, O.; Heuston, L.; Morrow, C. (2022). Climate Change Adaptation: Risks and Opportunities for Irish Businesses. EPA Research. Available at: [https://www.epa.ie/publications/research/epa-research-2030-reports/Research\\_Report\\_402.pdf](https://www.epa.ie/publications/research/epa-research-2030-reports/Research_Report_402.pdf)
- <sup>51</sup> Adger, W.N.; Quinn, T.; Lorenzoni, I.; Murphy, C.; Sweeney, J. (2013). Changing social contracts in climate-change adaptation. *Nature Climate Change*. Available at: <https://www.nature.com/articles/nclimate1751>
- <sup>52</sup> Murphy, C.; Broderick, C.; Matthews, T.; Noone, S.; Ryan, C. (2019). Irish Climate Futures: Data for Decision-making. EPA Report 277. Available at: <https://www.epa.ie/publications/research/climate-change/research-277-irish-climate-futures-data-for-decision-making.php>
- <sup>53</sup> Gorman, C.E.; Torsney, A.; Gaughran, A.; McKeon, C.; Farrell, C.; White, C.; Donohue, I.; Stout, J.; Buckley, Y.M. (2021). Small Scale Study of the Impacts of Climate Change Mitigation Measures on Biodiversity. Paper for the Climate Change Advisory Council. Available at: [https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/documents/cbcbackgroundpapers/Gorman\\_etal\\_CCAC\\_Biodiversity.pdf](https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/documents/cbcbackgroundpapers/Gorman_etal_CCAC_Biodiversity.pdf)
- <sup>54</sup> Best, M.; Hochstrasser, T. (2022). Detecting and avoiding impasse mechanisms for nature-based approaches to climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2010%20Nature-based%20Adaptation%20impasses%20in%20Ireland.pdf>
- <sup>55</sup> IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Available at: <https://www.ipcc.ch/report/ar6/wg2/>
- <sup>56</sup> European Commission (2021). Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN>
- <sup>57</sup> Gorman, C.E.; Torsney, A.; Gaughran, A.; McKeon, C.; Farrell, C.; White, C.; Donohue, I.; Stout, J.; Buckley, Y.M. (2021). Small Scale Study of the Impacts of Climate Change Mitigation Measures on Biodiversity. Paper for the Climate Change Advisory Council. Available at: [https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/documents/cbcbackgroundpapers/Gorman\\_etal\\_CCAC\\_Biodiversity.pdf](https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/documents/cbcbackgroundpapers/Gorman_etal_CCAC_Biodiversity.pdf)
- <sup>58</sup> IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Available at: <https://www.ipcc.ch/report/ar6/wg2/>
- <sup>59</sup> Barnett, J.; Graham, S.; Quinn, T.; Adger, W.N.; Butler, C. (2021). Three ways social identity shapes climate change adaptation. *Environmental Research Letters*. Available at: <https://iopscience.iop.org/article/10.1088/1748-9326/ac36f7/meta>
- <sup>60</sup> Dannenberg, A.L.; Frumkin, H.; Hess, J.J.; Ebi, K.L. (2019). Managed retreat as a strategy for climate change adaptation in small communities: public health implications. *Climatic Change*. Available at: <https://link.springer.com/article/10.1007/s10584-019-02382-0>
- <sup>61</sup> Eriksen, S.; Schipper, E.L.F.; Scoville-Simonds, M.; Vincent, K.; Adam, H.N.; Brooks, N.; Harding, B.; Lenaerts, L.; Liverman, D.; Mills-Novoa, M.; Mosberg, M. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance?. *World Development*. Available at: <https://www.sciencedirect.com/science/article/pii/S0305750X20305118>
- <sup>62</sup> Best, M.; Hochstrasser, T. (2022). Detecting and avoiding impasse mechanisms for nature-based approaches to climate change adaptation in Ireland. Paper for the Climate Change Advisory Council. Available at: <https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/publications/Working%20Paper%20No.%2010%20Nature-based%20Adaptation%20impasses%20in%20Ireland.pdf>