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National Preparedness to Adapt to Climate Change: Analysis of State of Play

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Rialtas na hÉireann
Government of Ireland

ENVIRONMENTAL PROTECTION AGENCY

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- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

EPA RESEARCH PROGRAMME 2014–2020

National Preparedness to Adapt to Climate Change: Analysis of State of Play

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EPA Research Report

Prepared for the Environmental Protection Agency

by

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DISCLAIMER

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

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Executive Summary

The goal of international and national climate adaptation policy is the transition to a low-carbon, climate-resilient society and economy. This ambition is to be achieved through a combination of policy and legislation, science and technologies, governance arrangements, capacity building and behavioural change.

In order to understand preparedness for the transition to climate resilience, the international regime, led by the United Nations Framework Convention on Climate Change (UNFCCC), will undertake a global stocktake of climate actions, including adaptation. In 2014, the European Union undertook a preliminary inventory of Member State preparedness for climate change impacts and adaptation action. Results from Ireland showed that a number of substantial advances have been made but that more effort is required if vulnerability is to be addressed and resilience built.

This new assessment interrogates in detail Ireland's preparedness for adaptation action. With a focus on seven key areas related to the adaptation plan-making process, the findings are as follows:

1. **Policy and legislation** – a comprehensive policy and legislative regime is now in place, which provides the basis for a coherent approach to adaptation decision making and implementation. This must be recognised as a starting point for the implementation of adaptation at the sectoral, local and community levels. In progressing from the National Adaptation Framework to preparation of statutory sector and local authority adaptation plans, Ireland has successfully developed a sense of urgency with regard to adaptation planning, which was lacking under the previous National Climate Change Adaptation Framework. However, it is important that ongoing support systems are in place to assist this new phase of plan making and implementation.
2. **Governance** – this policy area is extremely challenging to govern because of fragmentation and distribution of roles and responsibilities across key sectors such as water, marine and emergency planning, and spatial scales, from individual actors to local authorities and national structures.
3. **Science base** – a large number of critical knowledge gaps have been filled and the science base is more than adequate for adaptation planning; however, in moving to an implementation phase for adaptation, it is not yet known if the information available is fit for adaptation action. Experience from other countries has highlighted the challenge involved in providing the greater level of detail required in the implementation phase.
4. **Adaptation options** – the lack of implementation details in plans completed under the National Climate Change Adaptation Plan is a challenge and remains to be addressed in future iterations of adaptation plans under the National Adaptation Framework. In addition, little if anything is known about the challenges and risks to be faced with implementation at the community and local levels.
5. **Implementation** – some efforts have been made to integrate adaptation into national, sectoral and local-level policies and plans; however, a concerted effort is needed in key areas:
    - there is a lack of coherence between mitigation and adaptation policy objectives where substantial co-benefits exist;
    - major benefits can be derived from framing adaptation actions within the context of the United Nations Sustainable Development Goals, the Sendai Framework (Disaster Risk Reduction) and the New Urban Agenda goals and objectives.

    The lack of dedicated and adequate funding is also a barrier to the implementation of adaptation actions nationally.
6. **Role of the general public** – insufficient effort has been put into engaging with the public in terms of the implementation of adaptation action, raising awareness and building capacity. This remains a big challenge in the context of the

national policy goal of transitioning to a low-carbon and climate-resilient society and economy, which will have to happen at the community, business, local and sectoral levels.

7. **Monitoring**, **reporting and evaluation** – this area remains to be addressed. In light of potential UNFCCC and European Union reporting requirements, there is a pressing need for a national monitoring framework and indicator set for Ireland.

Conclusions

Ireland is at the beginning of a long and challenging process of transitioning to a low-carbon, climate-resilient and environmentally sustainable economy. The role of central government is to drive and support this agenda by creating an enabling environment in support of this transition at all levels and spheres of decision making. The role of society at large is to implement adaptation in businesses, communities and homes. The key to success will be the ability to effectively link and co-ordinate these spheres of activity in a manner that is fair, efficient and timely. This needs to be supported by structures and processes that can drive this agenda.

This study found that the key components of an enabling environment[1] for climate resilience are in place (e.g. policy/legislation, governance arrangements, evolving knowledge base) but that barriers remain that are hampering adaptation action and implementation. The key to overcoming the barriers to adaptation and realising possible opportunities lies with the effective co-ordination of institutions and processes, such as local authority regional climate change offices, the National Adaptation Framework, the National Dialogue on Climate Action and other newly emerging initiatives.

The proposed local authority regional climate change offices should provide a comprehensive governance structure, capture synergies and drive the implementation adaptation actions on the ground. These offices should create the necessary framework for local-level planning and the means of implementing sectoral policies and objectives at the home, community and business levels.

The National Adaptation Framework has, in theory, the potential to provide a clear vision for a climate-resilient Ireland and to articulate a set of objectives and aims that could drive adaptation at the sectoral, local, business and community levels; create awareness and build capacity; continue to develop and, when possible, exploit the science base (e.g. climate services); address urgent risks; embed adaptation within all relevant policy and legislation; and put systems in place to monitor progress and the effectiveness of adaptation activity. However, barriers such as economics and institutional and information supports may impede or delay implementation.

The proposed National Dialogue on Climate Action should, if carefully planned, managed and funded, provide the impetus to drive this agenda across all levels of society, the environment and the economy. It should be the conduit for the exchange of information in government and between the government and the general public.

Collectively, these key developments must be co-ordinated through one overarching meta-governance structure that understands the component parts, how each of the parts fit together and how they need to work collectively to shape the climate change adaptation landscape.

It will take imagination, innovation (social and technological), and political and societal will to bring all stakeholders on board to share in driving the agenda for a low-carbon, climate-resilient Ireland. Ireland is not the only country currently grappling with how to implement climate action at the local level and it should be actively seeking to understand what more advanced countries are doing and learn from their experiences.

Recommendations

1. **Policy and legislation** – as Ireland now begins to focus on the implementation of adaptation, it will be important to follow how effectively key international, European Union and national

1 An enabling environment is a set of interrelated conditions, such as legal, organisational, institutional, financial, political and/or cultural, that impact on the capacity to deliver on a particular initiative (Street *et al*., 2017).

objectives are implemented across and down to the sectoral, local, business and community levels. Equally important will be the extent to which coherence is achieved in and between sectoral and local-level plans and between mitigation and adaptation.

2. **Governance** – every effort should be made to ensure the effective governance of this new policy area. At the national level a co-ordinating body could be established to drive the governance of this multi-level/sphere of policy, with the mandate to motivate and support action at all levels of decision making.

   The proposed local authority regional climate change offices may be crucial in multi-level governance of this area, whereas the National Dialogue on Climate Action will be equally important in creating awareness, building capacity and motivating public participation in the transition to low-carbon climate resilience. The ability to interlink and co-ordinate each of these institutional process and citizens will be the key to success.

3. **Science base** – the science base should continue to be supported with targeted research into specific policy areas. Certain activities should move from the research arena to operational service provision. New areas of research should also continue to be explored in line with international programmes and best practice. In particular, there is a lack of action-orientated research with a focus on societal transformations for climate resilience. It would be desirable to establish or designate a lead organisation for data gathering, analysis and dissemination of information and knowledge. Efforts must be made to exploit the potential for climate services with a view to supporting decision making, driving innovation and seizing emerging opportunities.

4. **Adaptation options** – the development of detailed options that span a full range of approaches (grey, green and soft) should be considered in all future plans. Preferred options would be supported by relevant selection criteria and costings. Responsibilities and timelines for implementation should be clearly identified. The use of “pathway” approaches should be encouraged as part of best practice for medium- to long-term decision making in relation to climate resilience.

5. **Implementation** – every effort must be made to achieve coherence between the policy arenas of low carbon, climate resilience and an environmentally sustainable economy. In addition, a root and branch analysis of existing policy should be undertaken to identify synergies and opportunities for the integration of climate change at all levels of governance (national, sectoral and local). Synergies with complementary policy areas such as the United Nations Sustainable Development Goals, Disaster Risk Reduction strategies and the New Urban Agenda should be explored and exploited.

6. **Role of the general public** – the need to effectively engage and motivate the general public is pressing if adaptation is to be successfully implemented. This needs to be carefully managed and placed on a programmatic basis by the government, and should include the educational sector, households, community groups, non-governmental organisations and businesses. Innovative societal approaches to communicating and awareness raising must be developed and utilised at community and local levels. Methods for linking in with national governance arrangements will also be vitally important.

7. **Monitoring, reporting and evaluation** – there is an urgent need to identify a national adaptation indicator set for Ireland. This would allow for consistency in the monitoring and exchange of information. A national indicator set should be able to track adaptation progress, monitor effectiveness and communicate on the transition to climate resilience across all levels and spheres of decision making (horizontal and vertical). This is crucial given the requirements that are emerging under the UNFCCC Paris Agreement and the European Union Adaptation Strategy.

1 Introduction

The Paris Agreement (2015) (UNFCCC, 2015a) is considered to be a major step in advancing international actions aimed at avoiding dangerous and irreversible climate change. Within the Agreement, the inclusion of a global adaptation goal that also refers to the United Nations (UN) Sustainable Development Goals (SDGs) is an important step forward for adaptation internationally. One of the key goals of the Paris Agreement is to foster the transition to climate resilience and low-emission development for all countries. As part of this transition, countries will have to undergo a shift from understanding climate change solely as a threat, to embracing the response to climate change as an opportunity for society, the environment and the economy. Under the Agreement, a global stocktake is to be undertaken to include mitigation, adaptation and finance. The outcome of the stocktake will be used to inform parties in terms of updating and enhancing their actions and support.[2]

In a similar vein, the European Union (EU) Adaptation Strategy (EU, 2013) aims to make Europe climate resilient by taking a coherent approach aimed at complementing the activities of Member States. The Strategy includes an objective to develop an adaptation preparedness scoreboard, based on key indicators, for measuring in a comparable way the "level of readiness" of each Member State to meet the challenges of current and projected impacts of climate change and hence the level of preparation of the EU as a whole. The scoreboard is expected to feed into the European Commission's 2018 review of the EU Adaptation Strategy regarding progress made in achieving the objective of promoting adaptation action by Member States.

Nationally, the transition towards a low-carbon, climate-resilient and environmentally sustainable economy is being driven through policy and legislation. The Climate Action and Low-Carbon Development National Policy Position Ireland (DECLG, 2014) aims to achieve transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050. The Climate Action and Low Carbon Development Act 2015 (Government of Ireland, 2015) progresses this goal by setting out a national transition objective. This is to be achieved through the implementation of National Mitigation Plans and National Adaptation Frameworks. Progress on the implementation of mitigation and adaptation will be reported on annually by way of a national transition statement. The first statement was laid before the Oireachtas on 7 December 2016 and the second on 8 December 2017.

At the international and national levels, there is an appetite for understanding and tracking progress on the implementation of adaptation action. To date, high-level reporting has been conducted through the United Nations Framework Convention on Climate Change (UNFCCC) National Communications process (https://www.uncclearn.org/sites/default/files/inventory/undp24.pdf), the EU Mechanism for Monitoring and Reporting Directive[3] and the European Climate Adaptation Platform (Climate-ADAPT) country pages (http://climate-adapt.eea.europa.eu/countries-regions/countries). The information generated through these processes has been collated into the EU adaptation preparedness scoreboard and made available through national fiches (EC, 2015a). Collectively, 28 country fiches were drafted and scored by the Commission. This was an informal process designed to serve two purposes:

1. to test the scoreboard indicators and generate a baseline for comparison for 2017;

2 The Paris Agreement requires all Parties to put forward their best efforts through nationally determined contributions (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts (https://unfccc.int/process/the-paris-agreement/nationally-determined-contributions/ndc-registry; accessed 8 June 2018).

3 Regulation (EU) No. 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No. 280/2004/EC, OJ L 165, 18.6.2013, p. 13.

2. to evaluate which areas in adaptation policy need enhanced support from the Commission.

These initiatives provide a useful overview of where each Member State stands in relation to progress on implementing adaptation based on submissions to international processes.

Ireland's country fiche (2015) provided a snapshot of national progress based on external analysis. However, little internal analysis has actually been conducted to probe deeper into the information behind the headline indicators and to present more vividly the situation on the ground. An internal analysis is needed to understand what progress has been made on the implementation of adaptation and, more specifically, to allow the development of national policy, identification of research gaps, awareness raising and capacity building. Importantly, a detailed internal analysis would provide a useful baseline for the development of a national adaptation indicator set for Ireland. It will also help to inform the next round of the EU adaptation preparedness scoreboard.

The objective of this research is to conduct a detailed analysis of progress on adaptation in Ireland. The study will interrogate the headlines and present more detailed information on Ireland's preparedness for adaptation implementation. It will assess the effectiveness of current policy and legislation, governance arrangements, the scientific evidence base, implementation, monitoring and evaluation. The outcome will be a detailed evaluation of how prepared Ireland is to meet the policy objective of climate resilience by 2050. Based on this, some recommendations will be made on next steps and how these might be achieved. This research is important in that it provides a detailed and objective view of the situation in Ireland, which has been lacking to date.

1.1 Report

The report begins by defining the notion of climate resilience, key concepts and approaches. In Chapter 2, evidence from previous assessments is considered; in Chapter 3, the key steps in the adaptation process and associated indicators are set out and assessed in detail; in Chapter 4, the indicators are scored; and, in Chapter 5, final conclusions are drawn and some recommendations are made.

1.2 Research Methodology

In order to understand national preparedness for climate change adaptation (CCA), a baseline assessment was conducted to understand the state of play. The approach used here is in agreement with the benchmarks for adaptation policymaking. Such benchmarks are shared at the EU level and were reflected in the "guidelines on developing adaptation strategies" published with the EU Adaptation Strategy (2013) and the "adaptation support tool" available on the Climate-ADAPT website, as well as the nationally developed guidelines for local (Gray, 2016) and sectoral (O'Dwyer, 2018) adaptation decision making. These benchmarks or indicators also correspond to those used for the adaptation preparedness scoreboard.

Under this approach, it is the *process of development* towards a comprehensive adaptation strategy and the related implementation action plan that is assessed. In addition, attention is also given to the effectiveness of adaptation policies and measures. In the literature there are two approaches to effectiveness: effectiveness in theory and effectiveness in practice. Following Kautto and Similä (2005), effectiveness in theory is used here, which means analysing the extent to which the objectives of a policy instrument cover the key problems (Mees *et al*., 2018).

Information was collected for each of the steps of adaptation policymaking: (1) preparing the ground for adaptation (policy and legislation); (2) governance: (3) assessing risks and vulnerabilities with regard to climate change; (4) identifying and assessing adaptation options; (5) implementing adaptation action; and (6) monitoring and evaluation of adaptation activities. Within each of the six steps, key performance areas have been defined and further assessed. Collectively, 15 indicators are reported on for this study.

This assessment drew on nationally available indices, literature, reports and expert opinion to determine the current state of play regarding the indicator set. It further drew on previous assessments in this area, including Desmond and Shine (2012), the EU adaptation preparedness scoreboard – Ireland's fiche (EC, 2015), the Annual Transition Statement (DCCAE, 2016) and Shine (2016). Based on this, conclusions are drawn and recommendations have been made

regarding a number of key interventions that are required to further drive the adaptation agenda, including enhancing governance structures, filling research gaps, decision making based on a wide range of options, mainstreaming and monitoring and evaluation.

Particular attention has been placed on the central role of national policy and legislation in driving the adaptation agenda. Here, a policy *effectiveness* approach is taken, which is based on the following criteria: relevance, effectiveness, efficiency, coherence and capacity to deliver (EEA, 2016, modified). These criteria and examples of related evaluation questions are outlined below:

- Relevance: to what extent do the policy objectives correspond to needs and issues?
- Effectiveness: to what extent do the observed actions correspond to the objectives?
- Efficiency: were the costs involved justified, given the changes and effects achieved?
- Coherence: to what extent is the intervention coherent with other policy interventions?
- Capacity to deliver: to what extent does capacity exist to deliver on policy objectives?

These are highly relevant questions to ask of the first National Climate Change Adaptation Framework (NCCAF) (DECLG, 2012). In addressing the questions above, it is possible to begin to see more clearly if previous policy and its orientation were fit for purpose and what lessons have been taken into the new National Adaptation Framework (NAF) (DCCAE, 2018).

2 Climate Resilience: Concepts and Approaches

We can define climate resilience as the capacity of a socio ecological system to absorb stresses and maintain function in the face of external stresses imposed by climate change and adapt, reorganise and evolve into configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts (Folke, 2006; Nelson *et al*., 2007).

The idea of climate resilience has become a framework for designing solutions that are needed to address the impacts of climate change. In essence, actions that bolster climate resilience are ones that enhance the adaptive capacity of social, industrial and environmental infrastructures and mitigate the effects of climate change (Adger *et al*., 2005). The strongest indicator of successful efforts towards climate resilience at all levels is a well-developed, pre-existing network of social, political, economic and financial institutions that is already positioned to effectively take on the work of identifying and addressing the risks posed by climate change (Satterthwaite, 2013).

The NAF (DCCAE, 2018, p. 40) describes itself as a framework for delivering climate resilience. It goes on to define climate resilience as:

> the capacity of a system, whether physical, social or ecological, to absorb and respond to climate change and by implementing effective adaptation planning and sustainable development (including governance and institutional design) to reduce the negative climate impacts while also taking advantage of any positive outcomes. This will allow the system to either return to its previous state or to adapt to a new state as quickly as possible.

There are any number of approaches or "pathways" (Figure 2.1) to climate resilience, which include actions, strategies and choices that reduce climate change impacts while ensuring that risk management and adaptation can be implemented and sustained. In this approach, ultimate goals are identified, but the route to adaptation is flexible with regard to the emerging evidence on climate change, with relevant pre-planned intermediate adaptation options being triggered as new climate thresholds are realised or as a result of opportunities to adjust (e.g. maintenance and replacement schedules, other changes being made).

According to the UN Climate Resilience Initiative – Anticipate, Absorb, Reshape (A2R) (http://www.a2rinitiative.org/) – there are three key capacities for climate resilience: (1) the capacity to anticipate and act on climate hazards and stresses through early warning and early action; (2) the capacity to absorb shocks by increasing access to climate risk insurance and social protection systems; and (3) the capacity to reshape development pathways by transforming economies to reduce risks and root causes of vulnerabilities and support the sound management of physical infrastructure and ecosystems.

Any notion of climate-resilient pathways cannot be separated from levels of climate change (temperature change in particular):

- there is a level of climate change that is low enough that climate resilience for most systems could be achieved without enormous efforts and widespread transformational adaptation;
- there is a level of climate change that is high enough that climate resilience cannot be expected to cope with severe impacts on most systems; and
- between those two levels the challenges to climate resilience grow as the level of climate change rises (IPCC, 2014).

At the high level of climate change, it would be expected that a series of adaptation measures will need to be included, potentially leading to transformational adaptation, that is, transformation inducing fundamental change through the scaling up of adaptation, when the limits of incremental adaptation have been reached; and addressing underlying failures of development, including increasing greenhouse gas emissions, by linking adaptation, mitigation and sustainable development (IPCC, 2014; quoted in Pelling *et al*., 2014).

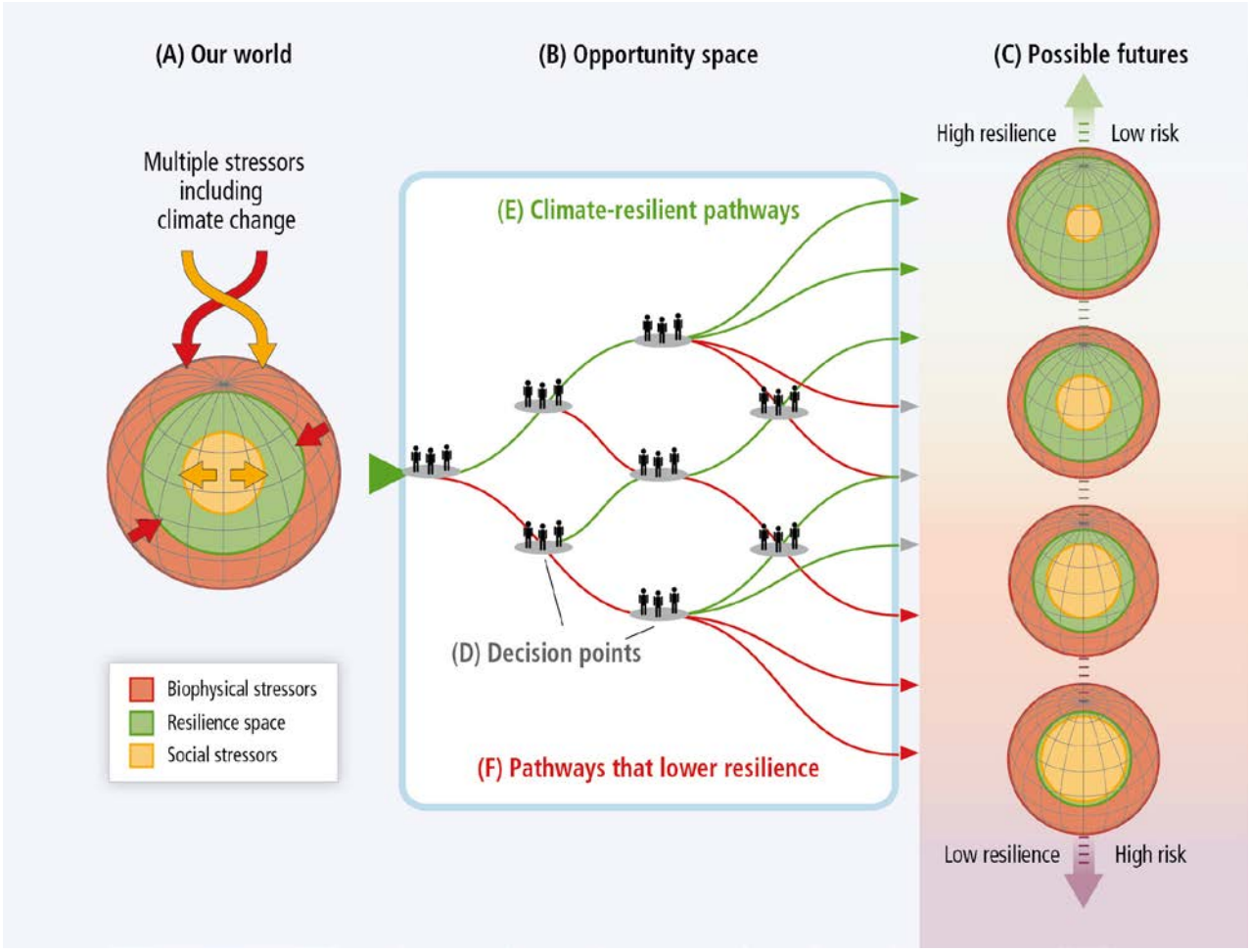

Figure 2.1. Opportunity space and climate-resilient pathways. (a) Our world is threatened by multiple stressors that impinge on resilience from many directions, represented here simply as biophysical and social stressors. Stressors include climate change, climate variability, land use change, degradation of ecosystems, poverty and inequality, and cultural factors. (b) Opportunity space refers to decision points and pathways that lead to a range of (c) possible futures with differing levels of resilience and risk. (d) Decision points result in actions or failures-to-act throughout the opportunity space, and together they constitute the process of managing or failing to manage risks related to climate change. (e) Climate-resilient pathways (in green) within the opportunity space lead to a more resilient world through adaptive learning, increasing scientific knowledge, effective adaptation and mitigation measures, and other choices that reduce risks. (f) Pathways that lower resilience (in red) can involve insufficient mitigation, maladaptation, failure to learn and use knowledge, and other actions that lower resilience; and they can be irreversible in terms of possible futures. Reproduced from IPCC, 2014, Fifth Assessment Report, Working Group II, Chapter 1, p. 182, Figure 1.5. © Intergovernmental Panel on Climate Change, 2014.

Scientists do not agree on what magnitude of climate change (e.g. average global warming) defines each of the levels. Some experts support the view that any level above 2°C would mean impacts that are incompatible with sustainable development (Metz *et al*., 2002). The Summary for Policymakers of the Working Group II Fourth Assessment Report indicated that there is an approximate threshold between 2.5°C and 3°C of warming above which impact concerns are severe but below which concerns are less severe (IPCC, 2007; Smith *et al*., 2009).

It is clear that any notion of a transition towards resilience must be cognisant of levels of climate change and that climate-resilient pathways depend on progress on mitigation. Thus, from a national policy development perspective, two things are noteworthy: (1) the level of climate change must always be central

to any decisions taken and (2) adaptation actions cannot be developed and implemented separately from global mitigation considerations.

The timing of the transformation is critical and is directly linked to the levels of resilience being pursued. Some levels of resilience can be achieved without much change, whereas others will require transformative change. Delayed action will reduce the options for climate-resilient development in the future and the costs of taking this option (delaying specific action) should be included when making this decision. Some strategies and actions can be pursued now that will move towards climate-resilient pathways while at the same time improving livelihoods, social and economic well-being and responsible environmental management. Capturing these win–win options is a real opportunity for climate and sustainable development policy in Ireland (Shine, 2018).

In conclusion, the national objective of transitioning to a low-carbon, climate-resilient and environmentally sustainable economy is a huge challenge that must be enacted over time. It requires that mitigation, adaptation and sustainable economy actions are developed in tandem, taking advantage of synergies and minimising conflicts. This would be a real policy win–win scenario if such an effort could be made to recognise and work on these mutually supportive policy areas. This national objective will have to be delivered at the sectoral and local levels, which will require a clear understanding by all concerned of what a climate-resilient Ireland looks like and, importantly, how it is proposed to get there. For this to be achieved, high level co-ordination and integration will be required over time across and between all areas.

However, before we can plan our future, we must first understand the present and how prepared we are right now to meet the challenges ahead. This requires an understanding of our baseline, which includes the policy and legislative context, governance arrangements, scientific evidence base (impacts, vulnerability and risk), adaptation management options, implementation efforts, role of the general public, and monitoring and reporting.

3 Adaptation Preparedness: Previous Assessments

The National Adaptive Capacity Assessment (Desmond and Shine, 2012) provided the first national overview of Ireland's readiness and ability to adapt to climate impacts. The study found that Ireland was at the early stages of the adaptation process and that sufficient information existed to begin the process of adaptation planning. The study made a number of recommendations to increase adaptive capacity: availability of assessment (vulnerability, risk, economic), prioritisation, co-ordination, information management and climate risk reduction. The study concluded that work was advancing but that a lot more needed to be done.

The findings of the national vulnerability assessment (Coll and Sweeney, 2013) further added to this analysis by demonstrating that there is a need to increase resilience across a broad range of sectors in Ireland because of high levels of sensitivity to impacts and/or low levels of adaptive capacity. The study found that the priority sectors for further investigation are biodiversity and fisheries, water resources and the built coastal environment, and forestry and agriculture (Coll and Sweeney, 2013, p. 29). Table 3.1 illustrates vulnerability by sector based on a stakeholder assessment of sensitivity and adaptive capacity.

More recently, Shine (2018) provided an update on the National Adaptive Capacity Assessment (Desmond and Shine, 2012) (Table 3.2). The update reveals that a number of steps have been taken since 2012 to increase Ireland's adaptive capacity, through institutional strengthening and increased knowledge and awareness. However, building capacity to address climate risks and the implementation of adaptation activities remain key challenges. Although there have been project-based efforts with regard to training and capacity building for local authorities and sectoral departments (e.g. awareness raising and training workshops in 2015 and 2016), such one-off and ad hoc interventions are ineffective at bringing about change in the long term. These activities need to be placed on a programmatic basis for adaptive capacity to be increased.

More recently, an analysis of Ireland's preparedness for CCA was conducted by the European Commission (EC, 2015) with a view to measuring the level of readiness by Member States (Table 3.3). Although this process does not include formal reporting requirements for European countries, countries were consulted in the process of developing the scoreboard and thus have an important role in information generation and collection. In 2017/18 the revised scoreboard (EC, 2017) was used by the European Commission to collect information from Member States primarily for the ongoing evaluation of the EU Adaptation Strategy.

Table 3.1. Assessment of sectoral vulnerability to climate change

Sector	Sensitivity	Adaptive capacity	Vulnerability
Agriculture	Potentially sensitive	High	Not particularly vulnerable
Biodiversity	Highly sensitive	Low	Vulnerable
Built environment	Highly sensitive	Medium	Potentially vulnerable
Coastal	Sensitive	Low–medium	Potentially vulnerable
Energy	Sensitive	High	Not particularly vulnerable
Fisheries	Highly sensitive	Low–medium	Vulnerable
Forestry	Sensitive	Medium	Potentially vulnerable
Transport	Sensitive	Medium–high	Not particularly vulnerable
Water	Highly sensitive	Medium	Potentially vulnerable

Source: Coll and Sweeney (2013).

Table 3.2. Current status of recommendations made in the 2012 National Adaptive Capacity Assessment

Adaptation function	Key recommendations	Current status
Assessment	Undertake national vulnerability assessment	Full assessment still required
	Develop national approach to climate risk assessment	Ongoing
	Cost priority adaptation options	No full-scale economic assessment
	Inventory adaptation actions	Small-scale study completed
Prioritisation	Undertake national prioritisation	Part of national climate change risk assessment (ongoing)
Co-ordination	Establish a national high-level body on CCA	Climate Change Advisory Council established by the Climate Act 2015. Council has an adaptation subcommittee.[a] National climate change adaptation committee exists (will be normalised under the NAF)
	Strengthen institutional capacity	Institutional capacity in government departments and local authorities being strengthened
Information management	Further develop knowledge base	Approach to systematic climate observation vulnerable unless placed on a programmatic basis
	Assign a lead organisation to oversee data gathering, analysis and dissemination	Not yet
	Develop a national climate information system	Climate Ireland is now online but not fully operationalised
Climate risk reduction	Develop climate risk guidelines	Guidelines for local authorities published 2016.[b] Guidelines for government departments/ sectors in preparation (all research outputs, not official government guides). A guidance note on integrating climate change into SEA was published[c] by the EPA
	Update assessment tools (e.g. EIA, SEA, AA)	Partially
	Develop adaptation indicators	Framework under development/incomplete

AA, appropriate assessment; EIA, environmental impact assessment; SEA, strategic environmental assessment.
[a]http://www.climatecouncil.ie/
[b]http://www.epa.ie/pubs/reports/research/climate/researchreport164.html (accessed 14 October 2014).
[c]http://www.epa.ie/pubs/advice/ea/Climate-Change-SEA-Ireland-Guide-Note.pdf
Source: adapted from Shine (2018).

The 2015 report assessed preparedness across a number of indicators, which correspond to the steps in adaptation decision making and are also comparable with the indicators used in the Desmond and Shine (2012) assessment. These include:

- preparing the ground;
- assessing risks and vulnerability to climate change;
- identification of adaptation options;
- implementation of adaptation actions; and
- monitoring and evaluation of adaptation activities.

The evaluation was based on information gathered from a number of sources, including country pages on the Climate-ADAPT website, the UNFCCC 5th National Communication (DECLG, 2010) and national-level reporting under the Monitoring Mechanism Regulation (MMR) Directive during 2014/15 (EU, 2013). The performance under each indicator was scored according to the matrix set out in Appendix 1.

Overall, the assessment highlighted that good advances have been made in terms of policy and legislative development, knowledge base, governance, and risk and vulnerability assessment. However, more effort is required in terms of the implementation of adaptation, development of adaptation options, and monitoring and evaluation.

Table 3.3. Ireland's adaptation preparedness

Adaptation Scoreboard for Ireland		
Step	**Definition**	**Level of progress**
1. Preparing the ground for adaptation	1.1 A central administration body is in charge of adaptation policymaking and putting vertical and horizontal co-ordination in place with other governmental bodies	Good progress: • central administration body officially in charge of adaptation policymaking exists • horizontal (i.e. sectoral) co-ordination mechanisms exist • vertical (across levels of administration) co-ordination mechanisms exist
	1.2 Stakeholders (e.g. interest groups, scientists and the general public) are involved in the preparation of adaptation policies	Insufficient progress: • no dedicated process to facilitate stakeholders' involvement in the preparation of adaptation policies • no transboundary co-operation is planned to address common challenges with relevant countries
2. Assessing risks and vulnerabilities to climate change	2.1 Systems are in place to monitor and assess current and projected climate change, impacts and vulnerability	Good progress: • observation systems are in place • scenarios and projections are used to assess the impacts of climate change • climate risks/vulnerability assessments for priority vulnerable sectors are undertaken • risk/vulnerability assessments do not take transboundary risks into account
	2.2 Knowledge gaps on climate change and adaptation are tackled	Very good progress: • key stakeholders (e.g. from science, administration and the private sector) are involved in setting research priorities • identified knowledge gaps are used to prioritise public funding for research on impacts of vulnerabilities and adaptation
	2.3 Knowledge transfer processes are in place to build adaptive capacity across sectors	Some progress: • adaptation-relevant data and information are not available to all stakeholders (e.g. through a dedicated website or other comparable means) • science–policy interfaces, such as workshops, are in place to facilitate dialogue between researchers and decision makers and policymakers • capacity-building activities do not take place on a systematic or programmatic basis; education and training materials on CCA concepts and practices are available and disseminated through Climate Ireland (however, this is not guaranteed)
3. Identifying adaptation options	3.1 For priority sectors, a range of adaptation options is considered	Insufficient progress: • adaptation options considered are not consistent with the results of sectoral risk assessments • selection of priority adaptation options are not based on robust methods • mechanisms not in place to co-ordinate disaster risk management and adaptation
	3.2 Dedicated and adequate funding resources have been identified and made available to implement adaptation action	Insufficient progress: • dedicated budget is not available for financing cross-cutting/ co-ordinated adaptation action (e.g. national scenarios and climate services, capacity building, website) • funding is not available to increase climate resilience in vulnerable sectors

Table 3.3. Continued.

Adaptation Scoreboard for Ireland		
Step	**Definition**	**Level of progress**
4. Implementing adaptation action	4.1 Climate change adaptation is mainstreamed into priority and key national planning and sectoral policymaking	Some progress: • climate change has not been included in the national frameworks for EIAs • strategies (e.g. early warning systems) are not in place under national disaster risk management plans to comprehend current and projected climate extremes • key land use and resource management planning policies take into account the impacts of climate change • national policy instruments do not promote adaptation at the sectoral level, in line with national priorities and in areas where adaptation is mainstreamed in EU policies • adaptation is not mainstreamed in insurance or alternative policy instruments, when relevant, to provide incentives for investments in risk prevention
	4.2 Climate change adaptation policies and measures are implemented	Some progress: • co-operation mechanisms foster and support adaptation at relevant scales • procedures or guidelines are not available to assess the potential impact of climate change on major projects or programmes, and facilitate the choice of alternative options • there are no processes for stakeholders' involvement in the implementation of adaptation policies and measures
5. Monitoring and evaluation	5.1 Systems are in place to monitor and report on climate change adaptation, including adaptation-related expenditures, through relevant indicators	Insufficient progress: • the integration of CCA in sectoral policies is not monitored • information on adaptation actions is not collected and disseminated, including, for example, related expenditures • co-operation with regional or local administrations does not allow for the collection of information on adaptation action
	5.2 Evaluation framework is in place for assessment and periodic review of the strategy is planned	Good progress: • a periodic review of the national adaptation strategy and action plans is planned • stakeholders are not involved in the assessment, evaluation and review of national adaptation policy

EIA, environmental impact assessment.

Source: adapted from EC (2015).

It is important to note that the scoreboard has been developed in order to evaluate the EU Adaptation Strategy of 2013. As such, it has been developed with specific objectives in mind, which may differ somewhat from the objectives of monitoring and evaluation of adaptation at the national level. Countries are likely to benefit from assessing the applicability and usefulness of its indicators for their national-level monitoring and evaluation needs (EEA, 2018). Accordingly, a revised set of indicators has been devised for this study, which will provide more information on relevant dimensions of the adaptation policy process in Ireland.

4 Adaptation Preparedness Assessment: What the Indicators are Really Telling Us

In this chapter, each of the steps set out in Table 3.3 will be considered in detail and re-analysis provided. In addition, two extra key indicators on governance and the general public are also included, given the perceived national challenges in these areas. The revised indicator set now contains seven areas and 17 indicators, as set out in Table 4.1.

The findings will then be summarised in a revised preparedness scoreboard for Ireland.

4.1 Policy Context (Indictor 1)

A substantial body of international and EU climate change policy exists to guide the development of national policy. These policies frame the objective of transitioning to climate resilience and realising inherent opportunities. It is worth noting that the international policy interventions set out below are mutually reinforcing when it comes to the objective of addressing climate change. In particular, a trilogy of agreements (Paris Agreement, Agenda 2030 (SDGs) and the Sendai Framework) pursue common goals of low-carbon, climate-resilient development. These policies mutually reinforce climate action. For effective use of resources, the three frameworks should ideally be implemented in an integrated manner, ensuring that action taken under any of the frameworks complements the objectives of the others (UNISDR, 2015).

The EU Member States individually implement the required data collection and reporting for each of these three global agreements. In addition, the European Commission contributes to the implementation of these global commitments at the EU level and thus helps to ensure connectivity and coherence between these frameworks within the EU.

4.1.1 International policy

The 1992 UNFCCC provides the platform for advancing international policy on climate change. Its key objective is “to avoid dangerous human interference with the global climate system”.

Paris Agreement

The Paris Agreement (2015) is considered to be a major step in advancing international actions to avoid dangerous and irreversible climate change. With the Paris Agreement, adaptation and mitigation are

Table 4.1. Indicator set for national preparedness for CCA

Key indicator	Sub-indicator	Sub-indicator	Sub-indicator
1. Policy context	1.1 National policy/legislation	1.2 Sectoral and local plans	1.3 Scope by territory/ population
2. Governance	2.1 Central administrative body (vertical and horizontal co-ordination)	2.2 Stakeholder involvement in plan development	
3. Risk and vulnerability	3.1 Climate change monitoring and climate projections	3.2 Addressing knowledge gaps	3.3 Knowledge transfer
4. Adaptation options	4.1 Priority sectors, priority options	4.2 Dedicated funding	
5. Implementation	5.1 Mainstreaming	5.2 Plans and measures implemented	5.3 Stakeholder involvement in adaptation action
6. Role of the general public	6.1 Process to allow two-way exchange of information	6.2 Progress on climate action	
7. Monitoring, reporting and evaluation	7.1 Systems to monitor and report	7.2 Evaluation framework	

now considered equally important pillars in climate policy. The global adaptation goal was established in the Paris Agreement with the aim of "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the global temperature goal" (UNFCCC, 2015, Art. 7), thus, linking adaptation and sustainable development.

Progress will be determined by a regular global stocktake, which will assess how collection actions are aligned with the ambitions of the Agreement. As a signatory to the Paris Agreement, Ireland has a number of reporting obligations that will have to be met over the coming years. Among them is a national stocktake, which will contribute to a global inventory of mitigation, adaptation and finance actions.

The 2030 Agenda for Sustainable Development

The 2030 Agenda for Sustainable Development (UN, 2016) sets out 17 goals and 169 targets across a range of topics (http://www.un.org/sustainabledevelopment/sustainable-development-goals/). The overall objective is to end poverty, protect the planet and ensure prosperity for all. Goal 13 is aimed at taking urgent action to combat climate change and its impacts. In total, 12 of the SDGs involve action on climate change.

Sendai Framework for Disaster Risk Reduction 2015–2030

The Sendai Framework for Disaster Risk Reduction (2015–2030) was adopted by the UN in 2015 (UN, 2015a). It is a voluntary agreement that includes four priority actions: understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction (DRR) for resilience and enhancing disaster preparedness. The Framework acknowledges climate change as one of the drivers of disaster risk. An important element is alignment with other post-2015 international agendas on climate change (UNFCCC, 2015) and sustainable development (UN, 2015b), which has implications for national (including Ireland) policy programmes.

4.1.2 Climate change adaptation and disaster risk reduction

Climate change adaptation and DRR are both relevant to the main goals of the UN 2030 Agenda for Sustainable Development. For its part, the Sendai Framework identifies climate change and variability as a driver of disaster risk, along with uncontrolled urbanisation and poor land management, and acknowledges that tackling these issues is expected to lead to a sizeable reduction in disaster risk. Of equal importance, the Paris Agreement also requires major action to adapt to the adverse impacts of climate change and to enhance climate resilience, thus contributing to sustainable development.

Recent reports and policy briefs from the European Environment Agency (EEA, 2017) and the PLACARD (Platform for Climate Adaptation and Risk Reduction) project (http://www.placard-network.eu/about-us/) have noted that efforts to reduce disaster risk and at the same time adapt to a changing climate have become a global and European priority. CCA and DRR provide a range of complementary approaches for managing climate risks in order to build resilient societies.

The EEA report (2017) further notes how both CCA and DDR are cross-cutting and complex development issues but with variations, i.e. CCA addresses weather and climate-related hazards and focuses on the future by addressing uncertainty and new risks, whereas DRR focuses on the present by addressing existing risks from all hazards. Both approaches face similar challenges, such as incomplete and uncertain knowledge bases, the interplay of multiple actors and limited resources.

Notwithstanding many innovative practices in Europe, the report highlighted a need to foster coherence between DRR and CCA policies, practices and knowledge. Such coherence, the report argues, can be achieved by ensuring effective co-ordination and collaboration between the national, provincial and municipal administrations (i.e. multi-level governance).

The convergence of these policy positions can be seen as an opportunity for the implementation of national environmental policy. It is noteworthy that international reporting requirements exist for each of the approaches. Progress in implementing DRR will be monitored through an agreed set of indicators, whereas the UNFCCC is considering how best to track

adaptation efforts at the national level. The SDGs will also require countries to report on progress. There are opportunities to improve connectivity and coherence between these indicator requirements at the EU level, to improve the efficiency of data collection at the national level and to build up a more complete picture of CCA and DRR progress and priorities at the national level. The indicators reported on for these initiatives could provide a good basis for the development of a national adaptation indicator set.

4.1.3 EU Adaptation Strategy

The EU strategy on adaptation to climate change (EU, 2013) aims to make Europe more climate resilient by taking a coherent approach aimed at complementing the activities of Member States. It supports action by promoting:

- action by Member States: the European Commission has encouraged all EU Member States to adopt comprehensive adaptation strategies. It has also promoted adaptation in urban areas through the Covenant of Mayors (Mayors Adapt).
- better informed decision making: the European Commission has been looking at addressing knowledge gaps in adaptation and has developed a European climate adaptation platform, Climate-ADAPT.
- climate proofing common EU action: the European Commission has mainstreamed adaptation into a number of its key policies including the Common Agricultural Policy, Common Fisheries Policy and cohesion policy.

The EU Adaptation Strategy is currently under review (due to be completed at the end of 2018, at which time the Commission will make a decision on revising the Strategy). The review process will assess the progress made by Member States on adaptation through a new adaptation preparedness scoreboard exercise, progress in mainstreaming at the EU level and new knowledge and policy demands.

4.1.4 National Policy Position

The Climate Action and Low Carbon Development National Policy Position for Ireland (DECLG, 2014) outlines the context and basis for national action on climate change. It recognises the challenges and opportunities of the broad transition agenda for society and aims, as a fundamental national objective, to achieve the transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050. The Climate Action and Low Carbon Development Act 2015 provides for the preparation of plans covering climate change mitigation and adaptation with the purpose of pursuing the transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050 in line with the national transition objective. In order to successfully achieve the national transition objective, a system of co-ordinated adaptation planning in Ireland is required so that we are better placed to deal with the future impacts of climate change.

The newly published NAF (2018) is the first statutory policy response to achieving the national climate resilience objective. The NAF provides a strategic context for advancing policy actions at sectoral and local levels through an informed and integrated approach. This includes stakeholders, institutional actors and practitioners, to ensure that effective adaptation measures are identified and implemented, monitored and assessed. It will also need to be incorporated into ongoing governance and management systems and, through investments, manage and reduce national, sectoral and local vulnerability to the negative impacts of climate change.

A primary objective of the NAF will be to bring a clear and strong focus to both the challenges and the opportunities of transitioning to a climate-resilient future and the importance of a positively focused and cost-effective national transition agenda.

In line with the National Policy Position on Climate Action and Low Carbon Development and the Paris Agreement, the development of the new NAF is being guided by a long-term vision of a climate-resilient Ireland. This will be based on:

- the legislative and policy context for the Framework;
- an overarching vision and definition of climate resilience in Ireland (i.e. a common understanding of a climate-resilient Ireland);
- a guiding set of principles for adaptation, as described in international research literature;
- the importance of a whole-of-government approach to adaptation;

- the importance of mainstreaming of climate adaptation into all national- and local-level policymaking and decision-making processes (i.e. public spending/capital investment and spatial planning processes);
- the requirements for sectoral and local government adaptation planning under this Framework;
- the roles of key stakeholders identified under this Framework;
- the approach to CCA and emergency planning and management;
- future research priorities; and
- the reporting and implementation arrangements to ensure delivery.

4.1.5 Climate legislation

The Climate Action and Low Carbon Development Act 2015 provides for the preparation by the Minister for Communications, Climate Action and Environment and approval by government of plans covering climate change mitigation and adaptation with the purpose of pursuing the transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050.

Section 5 of the Act provides that the Minister shall make and submit to government for approval a "national adaptation framework" not later than 24 months after enactment (i.e. not later than 10 December 2017). The Minister must review the framework not less than once every 5 years thereafter.

The NAF will specify the national strategy for the application of adaptation measures in different sectors and by a local authority in its administrative area for the purpose of reducing the vulnerability of the State to the negative effects of climate change and availing of positive effects of climate change that may occur.

The Act further provides that the Minister must consult with the Climate Change Advisory Council (CCAC) when developing the NAF and, before submitting a framework to the government for approval, must also consult with the public and any interested parties, inviting submissions on a draft NAF.

The Climate Action and Low Carbon Development Act 2015, however, has shortcomings, which have been recognised in the NAF. One of the supporting objectives of the NAF is the examination of potential legislative changes to the Act to enhance implementation, e.g. underpinning the making and adopting of a local or regional adaptation strategy and providing for the making and adoption of a local or regional adaptation strategy as a reserved function. Once plans begin to be rolled out it will be necessary to ensure that any potential barriers contained in the Act are revised and amended.

4.1.6 The National Climate Change Adaptation Framework

The NAF aims to build on the work already carried out under the existing NCCAF (DECLG, 2012) and ensure that climate adaptation in Ireland is brought forward in line with EU and international best practice (DECLG, 2016).

The non-statutory NCCAF was the first step in developing a national policy position to address the anticipated impacts of climate change through a structured programme of action on adaptation. The objective of the NCCAF was to provide a strategic policy focus to ensure that adaptation measures were taken across different sectors and levels of government to reduce Ireland's vulnerability to the negative impacts of climate change. The key aims were:

- development of draft sectoral plans, based on sectoral risk assessments and following consultation with relevant stakeholders, to be published by mid-2014 and adopted as quickly as possible thereafter;
- development of local authority adaptation plans based on a review of their development plans by mid-2014;
- to continue to build the evidence base.

4.1.7 Sectoral plans

In drawing up sectoral plans, three basic steps were to be reflected:

1. a clear understanding of the consequences of a changing climate for each sector;
2. actions to equip decision makers with skills and tools; and
3. the integration of adaptation into policy and administration at the sectoral level in Ireland.

To date, 4 out of 12 proposed sectoral plans (Table 4.2) have been developed, including:

1. Office of Public Works: draft Climate Change Sectoral Adaptation Plan for Flood Risk Management (2015–2019) (http://www.opw.ie/en/media/Draft%20Climate%20Change%20Sectoral%20Adaptation%20Plan.pdf);
2. Department of Agriculture, Food and the Marine: draft Adaptation Plan for the Agriculture and Forest Sector (https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/ApprovedAdaptationPlanning040817.pdf);
3. Department of Transport, Tourism and Sport: adaptation planning – Developing Resilience to Climate Change in the Irish Transport Sector (http://www.dttas.ie/sites/default/files/publications/public-transport/english/adaptation-planning-developing-resilience-climate-change-irish-transport-sector/20161212-final-draft_0.pdf);
4. Department of Communications, Climate Action and Environment (DCCAE): Adaptation Plan for the Electricity and Gas Networks Sector (DCCAE, 2017a).

The development of these plans has benefitted from following the stepwise framework (Gray, 2016; O'Dwyer, 2018) proposed through the National Climate Adaptation Steering Group (see section 4.2). Accordingly, there is a good level of coherence between the plans in terms of structure and use of available data and information.

The plans have also benefitted from the availability of climate information, expert opinion and high-level steering made available through the Centre for Marine and Renewable Energy Ireland (MaREI) CCA research group at University College Cork (UCC) (http://www.marei.ie/research/) and funded by the DCCAE and the EPA. The availability of scientific expertise to work through vulnerability and risk assessment aspects of the plan preparation process was particularly useful.

These plans can be seen as a first step in advancing towards a statutory requirement to undertake plans on the basis of the new NAF (2018) and the corresponding sectors are now well positioned to produce more detailed/actionable plans in their next iteration. Over and above producing plans there are also a number of other identifiable benefits, such as:

- creating awareness;
- building capacity and confidence;
- engaging stakeholders;
- identifying information sources and knowledge gaps.

However, some challenges are identifiable, which are common across all plans. These include an inability to address cross-sectoral issues (e.g. flooding) and the implications of proposed cross-sectoral adaptation options, external impacts, scales and levels of governance (including potential cascading of effects in the management of these) and monitoring and reporting. From a multi-level governance perspective, this is a major challenge for effective policymaking and needs to be addressed as a central objective in

Table 4.2. Lead departments and agencies responsible for sectoral adaptation plans (DECLG, 2014)

Sector level	Lead department or agency
Water	Department of the Environment, Community & Local Government (DECLG)
Emergency planning	DECLG
Marine	Department of Agriculture, Food and the Marine (DAFM)
Agriculture	DAFM
Forestry	DAFM
Biodiversity	Department of Arts, Heritage and the Gaeltacht (DAHG)
Heritage	DAHG
Transport	Department of Transport, Tourism and Sport
Energy	Department of Communications, Energy and Natural Resources (DCENR)
Communications	DCENR
Flood defence	Office of Public Works (OPW)
Health	Department of Health

the new NAF. To this end a new governance subgroup has been formed by the DCCAE to help overcome some of these barriers through better communication, exchange of knowledge and information, and awareness raising.

Perhaps one of the main gaps in some of the sectoral plans developed under the NCCAF has been the lack of detail regarding the implementation of adaptation through clearly articulated actions, assignment of responsibilities and identification of appropriate timelines and costings. This problem may be linked to a number of risks associated with implementation such as lack of funding, inability to drive policy objectives across and down to different levels of governance, lack of support or lack of a sense of urgency and buy-in from potential implementing bodies. For example, the lack of funding available to implement stated activities (see section 4.3) is linked to wider challenges for central government regarding the funding of this policy space. It would be expected that the next iteration of these plans (i.e. the first statutory plans) would see a comprehensive set of actions that have been costed, are clearly linked to previously identified climate vulnerability and future risks and have designated ownership.

For those sectors that have not engaged with the process to date, it would seem that they have a large task ahead of them under the statutory plan-making process. They should, however, be able to benefit from the experiences of other sectors that have been early movers in this area.

4.1.8 Local-level plans

A small number of local authorities have developed adaptation strategies as a result of the NCCAF. A variety of approaches have been taken. These have the following typology:

- Adaptation chapter integrated within development plans: for example, Clare County Council has integrated climate change actions in its current development plan (https://www.clarecoco.ie/planning/publications/clare-county-development-plan-2017-2023-volume-1-written-statement-24125.pdf), with the aim of reducing the carbon output of the county, managing the risks associated with flooding and ensuring that CCA is a priority during the lifetime of the plan. In relation to adaptation, the key focus is to liaise with all relevant stakeholders to prepare a Climate Change Adaptation Strategy for County Clare during the lifetime of the plan (2017–2023). Overall, this plan can be seen to place an emphasis on DRR, CCA, mitigation and sustainable development.
- Combined mitigation and adaptation strategies: general climate change strategies that include elements of both mitigation and adaptation: for example, A Strategy Towards Climate Change Action Plans for the Dublin Local Authorities (http://www.codema.ie/images/uploads/docs/A_Strategy_Towards_Climate_Change_Action_Plans.pdf).

Under best practice approaches to local-level planning, a separate and distinct strategy at the local-authority level is advocated (Gray, 2016). Such plans should be able to account for the local nature of climate change risk, the long-term nature of the climate change challenge and the broad scale of climate adaptation measures. It is anticipated that nested regional plans and stand alone local plans will emerge as a result of the NAF and the proposed Local Authority Regional Climate Change Office structure (see section 4.1.9).

4.1.9 Local authority preparedness

In an earlier study, McGloughlin and Sweeney (2012) highlighted that local authorities are best placed to implement CCA, but that this was challenging because of a lack of legislative push, resource constraints and lack of political support. In particular, the lack of a coherent governance approach was seen as a major barrier, which would require formal structures and legislative support to normalise existing informal processes.

More recently, O'Dwyer *et al*. (2017) identified a number of additional barriers to the implementation of adaptation at the local-authority sector level including:

- lack of a statutory basis for plan making at the sectoral and local level – this has been cited by sectors and local authorities as the main reason for not engaging with the process;
- lack of awareness and capacity – some sectors and local authorities were insufficiently aware of the current and potential risks to their sector from climate change;

- lack of resources and technical expertise – for a number of sectors and local authorities the relevant scientific literacy and technical know-how to develop relevant plans does not exist;
- lack of high-level support – the responsibility and ownership for plan development was not placed at a sufficiently high level to drive action;
- fragmentation of roles and responsibilities – for sectors and local authorities, themes such as emergency planning and response, the marine environment and the urban environment, and the fragmentation of responsibilities and roles across government departments, agencies and bodies are proving to be a major problem for climate change decision making.

Currently, in recognition of the challenges posed by climate change for the local authority sector, the County and City Management Association (CCMA) is progressing with the development of Regional Climate Change Offices. Taking a regional risk-based approach, the aim is to enhance co-ordination, develop synergies and provide consistency in the development and implementation of climate adaptation plans in each local authority and reduce costs (staff, information technology, expertise). The risk-based regional approach being proposed has a number of advantages for progressing climate action, such as:

- providing a logical risk-based regional structure to address adaptation and mitigation;
- providing a coherent system of multi-level governance that is able to account for sectoral climate change plan objectives and other regional and local authority plan objectives;
- the pooling of expertise and resources;
- linking with national initiatives such as the National Dialogue on Climate Action (NDCA) (https://www.dccae.gov.ie/en-ie/climate-action/topics/national-dialogue-on-climate-action/Pages/default.aspx);
- linking into national research institutions to develop capacity and training and build synergies;
- creating awareness and behavioural change at the community and local levels.

4.1.10 Evaluation of the NCCAF

As part of this assessment, the effectiveness of the NCCAF (DECLG, 2012) has been evaluated against the criteria of relevance, effectiveness, efficiency, coherence and capacity to deliver (Table 4.3). A mixed picture emerges from this assessment, with some successes but with a number of challenges also noted. However, the outstanding issues should be addressed within the statutory NAF (2018); these include providing an overarching national vision and associated policy objectives, providing for effective governance arrangements across and between sectors and local authorities, driving the development and implementation of sectoral and local-level plans, putting the mainstreaming of climate change central to all policy and plan making, and developing a national adaptation indictor set for reporting and monitoring.

Relevance: do the policy objectives support needs and issues?

The key aims of the NCCAF were (1) building the evidence base and (2) the development of sectoral and local-level plans by mid-2014. Large strides have been made in further developing the evidence base (see section 4.3); however, the objective of developing sectoral and local plans has not been achieved.

The new NAF should address these challenges for adaptation plan making. Under the “Key Actions (Action 1)” for sectoral plans set out in the NAF, the government is to request that Ministers submit sectoral adaptation plans within a specified period. The request to trigger has been made to government departments and the first statutory sectoral adaptation plans are expected by 30 September 2019. From a monitoring perspective, it will be interesting to watch this process unfold over the coming year.

The objectives set out in the old NCCAF are still highly relevant and are contained in the new NAF.

Effectiveness: are outcomes linked to objectives?

The stated central objective of the NCCAF was to ensure that adaptation measures were taken across different sectors and levels of government to reduce Ireland’s vulnerability to the negative impacts of climate change. Given that only a handful of sectoral and local-level plans were developed, and none of them contained any real sense of how they might be implemented, it is probably fair to say that the outcomes of these plans did not deliver on the objectives of the NCCAF.

Table 4.3. Assessment of the NCCAF for effectiveness

Criteria	Policy link	Outcomes	Recommendations
Relevance	Do policy objectives support national needs and issues?	Yes, but some objectives remain to be addressed. Key objectives still valid, i.e. building the knowledge base and development of plans	New NAF should address outstanding policy objectives from old NCCAF
Effectiveness	Are outcomes linked to objectives?	The NCCAF was partially effective at driving change, such as the development of the knowledge base, strengthening of governance structures and increased awareness. However, few sectoral or local-level plans were delivered	New NAF sets out clear adaptation priorities and policy objectives and how it sees them being implemented at the sectoral and local level. The outcomes of these objectives must be monitored and reported on periodically to track effectiveness
Efficiency	Were costs justified?	As this is an ongoing process, it is very likely that investments in research, capacity building and dissemination will prove to be money well spent. Research outputs are being used to develop national, sectoral and local-level strategies, policies and plans	New NAF must push for the refocusing of research activities on the information needs for implementing adaptation. Use of mechanisms under Ireland's Capital Investment Plan (2018–2027) (Department of Public Expenditure and Reform, 2015) to support adaptation implementation must be monitored and evaluated
Coherence	Is there policy coherence with other sectoral and local-level policies?	There has been a lack of coherence between sectoral and local-level plans developed under the non-statutory NCCAF. There is also a lack of coherence between mitigation and adaptation policies and between the SDGs, DRR policies and climate change adaptation	New NAF recognises the need for coherence between sectoral and local-level plans. It also advocates for coherence between policy areas (e.g. National Planning Framework; DHPLG, 2018). More needs to be made of understanding the commonalities across international policies and building on these. Activities will need to be monitored and reported on to ensure that coherence is occurring
Capacity to deliver	Does capacity exist to deliver on policy objectives?	Some capacity building for adaptation planning was included in the NCCAF and this was delivered to sectors and local authorities. However, the reach of these activities is time specific and they have only reached some decision makers. A high level of capacity building is still required with a new focus on climate action at sectoral, local and community levels	A programme for capacity building across all levels of decision making is included in the new NAF. This also includes provisions for the funding of adaptation options. These developments must be monitored and evaluated in time to assess whether they are delivering on adaptation in a timely fashion

Assessment based on modified EEA criteria (EEA, 2016).

The new NAF sets out clearly its vision, guiding principles and policy objectives for the development of a climate-resilient Ireland. It identifies the stakeholders that are central to the delivery of its core objectives, requiring, in particular, that sectoral plans must have concrete and deliverable objectives rather than aspirations. It states that "Sectoral adaptation plans will need … to include specific and measurable policies rather than just general ones that simply state an intention to minimise negative impacts and maximise opportunities" (NAF, DCCAE, 2018, p. 70). This is a strong statement and merits monitoring over the coming years to assess the effectiveness of the NAF and as a means of assessing the effectiveness of new governance arrangements.

Efficiency: were the costs justified?

There are no national figures available on the overall costs of climate change impacts and the implementation of adaptions actions; it is therefore impossible to say if costs were justified. Although it is beyond the scope of this study to put a costing on national investments made in research,

dissemination, capacity building and outreach, it is clear that such funding is of value. For example, the outputs of CCA research to date have been used to provide the evidence base, influence and shape the development of national policy, sectoral plans and local plans. The outcomes of capacity building and outreach activities have been used to equip sectoral and local authority staff to begin to develop their own strategies and plans. In addition, the dissemination of data, information and analysis through Climate Ireland has meant that there is a coherence in the methods, approaches and information available for plan making at various levels of decision making.

The new NAF will need to put in place an indicator approach to monitor and report on efficiencies at sectoral and local levels, in order to track the benefits and costs involved in adaptation implementation. This should strive to account for all costs, that is, those related to research, capacity building, governance and the implementation of climate change actions.

Coherence: is there policy coherence?

Policy coherence can be usefully categorised according to inputs/process and outputs:

- *Inputs/process*. Each of the four plans that have made it to public consultation have benefitted from following a risk management framework funded by the EPA Research Programme (Gray, 2016; O'Dwyer, 2018), from expert scientific support provided by scientists and researchers at MaREI at UCC and from the information, tools and approaches available on the Climate Ireland website (http://www.climateireland.ie). As a result, the plans developed follow a logical stepwise approach, which provides a structural coherence between them.
- *Outputs*. Coherence in terms of policy objectives across and between plans is a major challenge for all sectoral and local-level plans. The sectoral plans that have been delivered have not been able to take a cross-sectoral approach in their decision making, as each is focused on its own institutional needs. From this perspective, cross-cutting issues such as flooding are not as prominent as expected. This is problematic for efficient plan making as some topics cut across several sectors and need wide recognition and ownership if they are to be effectively addressed.

There is little evidence of coherence between sectoral and local-level plans. This remains a substantial challenge for sectors that have to rely on local authorities for the delivery of some of their policy objectives. For example, the National Planning Framework (NPF) (DHPLG, 2018) represents a key opportunity for ensuring that the climate implications of our spatial choices are fully considered and addressed from the top of the planning hierarchy. It will require strong and effective governance to effect positive outcomes in this and other policy areas.

The coherence between mitigation and adaptation policies was not considered to any extent within policy and subsequent plans. There are a number of areas in which co-benefits exist between mitigation and adaptation, particularly when it comes to implementation options. For example, there are synergies to be found in the built environment (e.g. green infrastructure), in agriculture (e.g. soil conservation) and in the natural environment (e.g. carbon sequestration) that would meet the needs of both the National Mitigation Plan (DCCAE, 2017b) and the NAF. These policy co-benefits need to be explored in any new plans developed under the NAF.

In addition, coherence between the Paris Agreement (2015), the Agenda 2030 SDGs and strategies to reduce DDR, as per the 2015 Sendai Framework, will be critical for effective action. In particular, the integration of CCA with DRR has not been achieved to any extent in Ireland (Shine, 2018), which can partially be explained by the fragmented nature of the emergency response in Ireland. This is an ongoing issue and there are proposals within the NAF to address this challenge. As with other topics, this needs ongoing monitoring and evaluation to determine whether or not progress is being made.

Capacity to deliver

Capacity to deliver is required at two levels: in the development of policy and plan making, and in the implementation of policy objectives across all sectors and local authorities.

The building of capacity and creating of awareness around CCA in general has been ongoing since

the development of the NCCAF. To date, central government has played a strong role in supporting research and organising training and capacity-building sessions for sectors and local authorities engaged in the development of plans. However, this has mostly been done on an ad hoc basis and now needs to be part of a national programme that is ongoing and continuously updated to deliver capacity at all levels of decision making.

Once plans have been developed, the challenge will be to implement them. The capacity to deliver on climate action will most likely be linked to human, technological and financial resources and, importantly, public support. There are risks associated with implementation (Young *et al*., 2016), such as values, uncertainty, risk (understandings and perceptions) and ownership, which are largely unknown and will become apparent only over time. Accordingly, the capacity to deliver on adaptation is not a given and merits closer scrutiny over the coming years.

Summary

A comprehensive policy and legislative regime exists for adaptation plan making in Ireland. Policy provides a clear focus on the national objective of transitioning towards climate resilience by 2050. As Ireland now begins to focus on the implementation of adaptation, it will also be important to follow how key international, EU and national objectives cascade across and down for ultimate implementation at the local, community and business levels. Equally important will be the extent to which coherence is achieved in and between sectoral and local-level plans. This is perhaps going to be a major challenge for the implementation of adaptation and will require careful co-ordination.

The implementation of the NAF will require strong governance and accountability, including oversight by the Oireachtas, independent advice from the CCAC and co-ordination across government and other actors.

4.2 Governance (Indicator 2)

The governance of this new policy space is of vital significance, given the levels, layers and spheres of stakeholder needs to be managed. Effective governance will also aid policy coherence and co-ordination**.** The relevance of this issue was a key objective of the NCCAF (DECLG, 2012), which aimed "to ensure that an effective role is played by all policy and decision makers". A "multi-level" approach was advocated, recognising the myriad of stakeholders involved and to progress a number of topics, such as costing adaptation, collaboration with the insurance industry, integration of adaptation into natural and managed systems, emergency responses, implementation and understanding of the risks and enabling factors (institutional and organisational structures). However, at that time no mechanism was suggested as to how multi-level governance was to be achieved. Subsequently, a number of mechanisms have emerged, which have been extremely useful in providing oversight, enhancing co-ordination and maximising resources in this area.

Sectoral co-ordination has been taking place under the auspices of the National Adaptation Steering Committee, which is chaired by the DCCAE. Set up in 2014, the composition of the Committee includes the majority of sectors originally mandated under the NCCAF (2012) to undertake sectoral adaptation plans, together with expert support, as necessary. The local government sector is represented by the CCMA and the regional assemblies. The aim of the Committee is to provide assistance and guidance to the various sectors (including local authorities) in the development of their sectoral/local-level adaptation plans.

The Committee is a good example of horizontal and vertical co-ordination and has been central in progressing action in this area. The regular meetings have created an enabling environment in which experiences at the sectoral level can be shared and know-how and knowledge exchanged. Extra value has been added by the inclusion of local authority representation on the Committee, which provides a useful forum for communication between the various layers of governance structures involved in supporting adaptation decision making. However, there are some challenges for this forum, which if dealt with would strengthen the governance element greatly:

- One of the key barriers to effective governance is the fragmentation of roles and responsibilities across government departments, agencies, bodies and local authorities. Under the NCCAF

(2012), a list of 12 sectors and their lead body was set out (Table 4.2). These leads were to take responsibility for developing their sectoral plan. However, in reality, the situation was not as clear-cut as set out in Table 4.2 and a number of topics, such as water, coastal and marine, and emergency planning, are spread across a number of agencies, which are not identified in the original listing. This has proven extremely problematic in driving the process across these important sectors. For each of these sectors, no one lead body has been able or willing to co-ordinate and drive this process for their entire sector, which has resulted in no plans being developed under these themes. This remains a serious topic that has to be addressed in the new NAF or perhaps under legislation.

- More recently, the National Climate Adaptation Steering Group has formed a sub-working group on governance issues. This subgroup has an important role to play in attempting to overcome cross-cutting climate topics, adaptation options and policy coherence.
- Wider and deeper stakeholder representation is required as plans come up for development and implementation.

Under the NAF, it is proposed to review and restructure the National Adaptation Steering Committee to ensure a co-ordinated, comprehensive and coherent approach to implementing actions. Membership is expected to be widened to include representatives of those preparing plans under the Framework, the Departments of Finance and Public Expenditure and Reform, representatives of local government and the regional climate offices, spatial planning experts, the EPA and Climate Ireland. The Committee is expected to meet every 2–3 months.

4.2.1 High Level Climate Action Steering Group

Oversight of the National Adaptation Steering Committee activities will be undertaken by the High Level Climate Action Steering Group, which is being established under the National Mitigation Plan and will be chaired by the Minister for Communications, Climate Action and Environment. This high-level group will address the full climate action agenda, including both mitigation and adaptation. In terms of adaptation, the group will:

- monitor progress by sectors and agencies in delivering on CCA actions for which they are responsible;
- ensure that a co-ordinated and coherent approach is adopted and maintained towards achieving a climate-resilient Ireland.

4.2.2 Climate Change Advisory Council

Independent advice will be provided to the National Adaptation Steering Committee by the CCAC, which was established under the Climate Action and Low Carbon Development Act 2015. A key function of the CCAC is to provide independent advice and to make recommendations to the government and ministers in relation to the low-carbon transition process and the adaptation agenda. The Act sets out a clear role for the CCAC in the development of the NAF in terms of advising and making recommendations to relevant ministers and the government. The CCAC published its first report to the government in December 2016 (CCAC, 2016).

The Council, with the support of its Secretariat, will conduct evidence-based analysis on how best to respond to the impact of climate change and provide timely advice on the most effective policies to assist with Ireland's transition to a low-carbon and climate-resilient economy.

As part of this work, the CCAC will provide regular reports on Ireland's progress in achieving its national policy goals and greenhouse gas emission targets agreed by the EU.

4.2.3 Climate Change Advisory Council Adaptation Committee

The CCAC established an Adaptation Committee in 2016 to consider matters relating to CCA. Membership is broad and includes representatives from scientific, sectoral and local authorities. The CCAC is a welcome addition to the governance of CCA in Ireland.
To be fully effective, it must be cognisant of all developments, both internationally and nationally, to drive the adaptation agenda. It would be beneficial to widen the membership of the Adaptation Committee to include the wider policy/governance/economics

community with experience in adaptation decision making. In addition, practitioner and community-level representation would be beneficial.

Summary

The effective governance of CCA is a huge challenge. Practice to date and proposals within the NAF suggest that the government is taking this topic seriously and is strengthening and deepening processes already in place. The multi-level, multi-stakeholder approach being taken is very positive and very necessary when it comes to developing and implementing sectoral and local-level strategies and plans. These processes should provide oversight, independent advice and opportunities for co-ordination and sharing of experiences.

4.2.4 Stakeholders' involvement in the preparation of adaptation policies (including transboundary co-operation)

The process of making Ireland climate resilient must be open, transparent and inclusive. Interested organisations and stakeholders, at sectoral, local, regional and national levels, must be given early and adequate opportunities to input to the process of preparing the NAF, sectoral plans and local strategies. They are crucial to the effective roll-out of adaptation actions on the ground.

Currently, there is no additional/dedicated process to facilitate stakeholders' involvement in the preparation of adaptation policies/plans outside the statutory consultation processes. However, other Member States take an inclusive approach to participation in adaptation decision making, for example "everyone in the Netherlands has been invited to contribute to the process and, more especially, to participate" (Dutch Ministry of Infrastructure and the Environment, 2016). The Baltic Climate toolkit (https://www.toolkit.balticclimate.org/) and its use in Sweden is another positive example of stakeholder engagement.

Cross-border co-operation between Ireland and Northern Ireland covers a range of mutually important issues across a variety of sectors and governance structures, including under the auspices of the North/South Ministerial Council. These include environmental management, energy, co-operation in education, health and transport, enterprise development, joint investment decisions on infrastructure provisions, and accident and emergency planning. There have been some discussions between the two jurisdictions on climate change and to examine common issues such as agriculture, water, the coastal and marine environments, and energy. Some ad hoc arrangements exist between researchers in Northern Ireland and Ireland through ongoing collaboration between Climate Ireland and colleagues in Climate Northern Ireland (http://www.climatenorthernireland.org/).

Summary

Given the national ambitions around transitioning to a climate-resilient Ireland, it would seem that the full participation of the whole of society is needed across all systems. Under the NAF, a serious commitment is being given to the further development and strengthening of institutional governance arrangements, which is most welcome. However, without public buy-in and support of the changes required, the ambition of climate resilience is doomed to failure. Accordingly, every effort should be made to ensure that the NDCA is properly planned, managed and funded (see more in section 4.6.2). In addition, co-operative arrangements with government ministries working on CCA on both sides of the border should be ratcheted up, particularly as the impacts of climate change will be experienced similarly across the entire island of Ireland. Areas of common or shared interest should include the agriculture and forestry sectors, water resources, critical infrastructure (energy, transport and communications), the coastal and marine sector, and research and development. It would seem that there could be synergies to be made in developing joint plans and the exchange of data and information.

4.3 Risk and Vulnerability (Indicator 3)

4.3.1 General policy on funding of research and systematic observations

In Ireland, funding for climate change research, systematic observations and related activities is provided through a number of state agencies

and organisations. The budgetary allocations are provided through relevant government departments. Climate-related systematic observations are funded as a component of the operational activities of a number of state bodies. Observations carried out by research institutions are funded through research programmes.

Funding for environmental research is the responsibility of the DCCAE, which has mandated the EPA to undertake the task of management of this research allocation.

The EPA has identified climate change as a key element of its research programme (2014–2020). The Climate Pillar is framed by the vision of Ireland's transition to a carbon-neutral, low-emission and climate-resilient society and economy by 2050, and as a source of climate change information and solutions (EPA, 2014).

Climate change research is structured around four thematic areas: greenhouse gas emissions, impacts and adaptation, socio-economics and air pollution.

Climate-related research is also funded by a number of other state bodies including Teagasc, Met Éireann and the Sustainable Energy Authority of Ireland (SEAI), e.g. energy research funded by the SEAI; agriculture research and soil carbon analysis funded through the Department of Agriculture, Food and the Marine and Teagasc (http://www.teagasc.ie); forest research and research funded by the Marine Institute (http://www.marine.ie); and socio-economic and enterprise-orientated research being advanced by Forfas (http://www.forfas.ie) and Enterprise Ireland (http://www.enterprise-ireland.com).

Research by national research institutions is also funded through the EU's Horizon 2020 (H2020) programme (https://ec.europa.eu/programmes/horizon2020/) and international research programmes. There has also been a growing engagement with pan-European research work through the Joint Programming Initiatives (JPIs) and the development of wider international links. For example, the JPI Climate ERA-NET on Climate Services (ERA4CS) is currently supporting six Irish research projects (http://www.jpi-climate.eu/publications). Engagement with such initiatives provides unique collaborative opportunities for Irish researchers and needs to be encouraged and sustained. In addition, it also facilities bringing research outcomes from across all of the ERA4CS projects back to inform Ireland's research programmes.

Climate change impacts and adaptation research: state of play

Climate change research on impacts and adaptation has progressed with a view to providing information in the following sub-thematic research areas:

- observations, monitoring and analysis;
- modelling of future climate change;
- impacts, risk and vulnerability assessment;
- adaptation information and responses;
- economics and costs of climate change.

Observation systems

A number of national bodies are engaged in systematic observations, including contributions to the Global Climate Observation System. Met Éireann has primary responsibility for atmospheric observations, with the National University of Galway, Ireland (NUIG) and other bodies also providing support; responsibility for oceanic and terrestrial observations lies with the Marine Institute, Met Éireann, the EPA, universities and other institutions.

In the *Status of Ireland's Climate* (Dwyer, 2012) it was concluded that many elements of a climate observation, analysis and reporting system are in place. However, there are a number of outstanding issues that need to be addressed to make the system more robust and capable of addressing Ireland's long-term climate change needs and reporting requirements. These include:

- lack of a co-ordinating body between atmospheric, oceanic and terrestrial observations;
- a large number of the Essential Climate Variables (ECVs) are not being observed under a programme and are extremely vulnerable to being discontinued;
- no long-term national observation programme exists for a large number of oceanic variables;
- some ECVs are not being monitored for climate purposes;
- only partial analysis of the majority of the ECVs has been carried out – this is a major knowledge gap;

- there is a dearth of data on sea-level rise; this needs to be addressed as a national priority and placed on a secure footing.

Clearly, it is a truism to say that an observation system is in place; however, it would seem to be incomplete and vulnerable to being discontinued at any time. Evidently, there are still advances to be made in securing the national climate observation system, which is a vital component of the climate change research infrastructure.

4.3.2 Modelling: development of climate projections

Climate modelling is now a core activity in Met Éireann. It was a partner in the EU-funded ENSEMBLES project and has run centennial climate simulations for the European area. Together with University College Dublin and the Irish Centre for High-End Computing, it has contributed to the scientific development of a new global climate model (EC-Earth), performing centennial-scale simulations with the model and contributing to the Coupled Model Intercomparison Project (CMIP5) for assessment by the Intergovernmental Panel on Climate Change in the fifth assessment report (http://ar5-syr.ipcc.ch/). This multi-model ensemble was used by Nolan (2015) to provide an analysis of the impacts of global climate change on the mid-21st-century climate of Ireland. New research is ongoing using CMIP6 data with the EC-Earth model.

Statistical downscaling approaches to analysis of future climate conditions have also been developed in the university sector. The output from this work informs impacts analysis, which aims to quantify regional and sectoral impacts of future climate conditions.

However, it is worth noting that Ireland does not have an official climate change data and projection set. As it currently stands, policymakers and plan developers are free to take information from any source, based on whatever assumptions they are most comfortable with. In order to ensure that plan making is coherent, it is necessary that a national data set is made available that has the approval of national scientific experts. From this perspective, there is an urgent need to designate a lead organisation to produce the authoritative data set for Ireland.

At a general level, Ireland needs a programme of continuously updated regional climate model outputs, to ensure that a state-of-the-art understanding of the climate is maintained. Met Éireann's ongoing engagement with the international climate community is important in this regard but investment is also needed to ensure that advances in science are translated to the Irish situation. On a positive note, Met Éireann is planning to develop its research programme. Specifically, it is proposing to combine observations of the climate system with the latest science to develop authoritative, quality-assured information about the past, current and future states of the climate and weather in Ireland, on regional and local scales. Research capacity will be strengthened and partnerships built with other organisations in Ireland, the EU and the wider international meteorological community (Met Éireann, 2017).

In addition, there is also value to be gained for Ireland from participation in EU programmes such as Copernicus (http://www.copernicus.eu/main/copernicus-brief), which use satellite and *in situ* observations to generate data and a range of services, including the Copernicus Climate Change Service (C3S) (http://copernicus.eu/main/climate-change). Such services will give access to information for monitoring and predicting climate change and will, therefore, help to support adaptation and mitigation at the national level.

With the economic downturn in 2008, Ireland's climate change research budget has been significantly curtailed, with only essential projects continuing to be funded. Although this resulted in a particularly challenging situation, with a focus on key needs, useful policy work continued to be developed on what was essentially a "shoestring" budget. However, there were also some far-reaching repercussions, especially with regard to ensuring continuity of capacity and expertise and provision of state-of-the-art analysis within the research community. For example, during this period a number of university-based research groups disbanded because of a lack of sustained funding, with a huge loss of capacity and expertise to the State.

Summary

It is an ongoing challenge to the State to ensure that nationally appropriate data, analysis and information

continue to be generated. In addition, a review of research strategies around climate change would be encouraged, particularly as we move into the implementation phase of adaptation. The information needs will be different and this has to be recognised by research funding organisations if they are to continue to anticipate and meet policy and implementation needs.

4.3.3 Knowledge gaps

There are still a large number of knowledge gaps that remain to be filled. These fall into two broad groups: those that exist within adaptation assessment and decision making (points 1–9) and those that are part of the wider policy/environmental context (points 10–12). Specifically, these include:

1. **Climate observations** – some basic information is still missing in relation to sea-level rise, oceans and the marine environment, and soil moisture.
2. **Climate projections** – regional climate model projections are presented only for the period 2021–2060. There is a need for short-, medium- and long-term data.
3. **Climate change impacts analysis** – there is limited analysis of impacts temporally, spatially and under different emission scenarios; limited detail on global impacts, for example large-scale singular events, food security and climate migration; and limited analysis of secondary impacts (knock-on effects) and interplay between impacts at the sectoral level.
4. **Climate vulnerability** – assessment is incomplete and there is a need for further research to analyse more fully the vulnerability of each sector and identify critical thresholds.
5. **Risk assessment** – a national risk assessment has not been completed. Ongoing research needs to specify priority risks and sectors and also look at cross-sectoral impacts and external impacts.
6. **Adaptation decision making** – information is needed on decision-making frameworks, such as adaptation pathways and robust decision making, to meet short-, medium- and long-term resilience goals.
7. **Adaptation option and selection** – there is a need for an understanding of the benefits and challenges of grey, green and soft adaptation options. There is a need to understand how these options can also double up as mitigation options and thus function as “win–win” or “low-regrets” policy options.
8. **Costing impacts and adaptation** – a need still exists for a national figure on current climate impact costs (especially for extremes), the costs of inaction and possible future costings, sources of finance and costing frameworks.
9. **Indicators for monitoring, reporting and evaluation (MRE)** – there is a need for a national indicator set that will cover all layers of decision making, within a framework that includes, risk, vulnerability and adaptation actions.
10. **Policy integration** – levels of policy integration and coherence between policy objectives such that there is consistency with the National Policy Position Ireland (2014), i.e. between mitigation, adaptation and the Paris Agreement, UN SDGs and DRR.
11. **Societal transformations** – information is needed on *how* society can be informed and then encouraged to transform in the context of the implications of a low-carbon climate-resilient society and economy.
12. **Development of climate services –** this newly emerging area seeks to better understand the roles of information in informing decision making and how these roles can be enhanced (this includes knowledge for understanding the climate and climate change and its impacts, as well as guidance in the use of climate knowledge; ERA4CS, 2017). It could also provide a boost to jobs and innovation.

Summary

The focus for CCA research internationally is evolving towards an applied science to meet the societal transformation objectives set out in policy. This shift requires a change in the type of research being required *for* adaptation to an understanding of *how* adaptation can and does make a difference by conducting research on adaptation itself (Klein, 2016).

This shift also suggests a new set of research stakeholders from the social sciences and humanities, including economics, behavioural sciences, social geography, political sciences, law and sociology. This new reality has been recognised at the international level by the European Commission and also by JPI Climate in the development of a new action group, "Enabling Societal Transformations in the Face of Climate Change", with a specific focus on transdisciplinary research. These changes must be recognised in Ireland for adaptation research to remain policy and societally relevant.

Under the NAF, a commitment is given to continue to support climate change science while recognising that new emerging areas must also be supported and progressed. It is encouraging that the need for transdisciplinary research is recognised as we move to implement adaptation actions.

4.3.4 Knowledge transfer

In addition to research reports, the development of Ireland's climate information platform, Climate Ireland (http://www.climateireland.ie), is the key knowledge transfer mechanism. Developed as a project with EPA funding, the system provides support to decision makers in Ireland for the development of their adaptation plans and in accordance with national climate policy. Climate Ireland translates existing climate information from a range of data providers to enhance its utility for adaptation planning in Ireland, delivers this information through a user-orientated web-based information system (http://www.climateireland.ie) and provides a programme of outreach and capacity-building activities (O'Dwyer and Gault, 2017).

The system has been developed as a research project and is now moving into an operational phase. To this end, ownership of the system must in time be vested in a body (e.g. EPA, Met Éireann) that can fund and maintain the system, while continuing to develop new tools, products and essential services. It is only through such a process that the system can become truly authoritative and useful to all strands of climate decision making (sectors, local authorities, businesses and communities). This is a vital missing final step in providing support for the implementation of CCA, which should be addressed in advance of the development of sectoral and local-level plans and their implementation.

Capacity building and awareness raising

Efforts to build capacity and create awareness have been ongoing but on an ad hoc basis. To date, EPA research has developed local authority (Gray, 2015) and sectoral-level (O'Dwyer, 2018) adaptation strategy and plan-making guidelines. These guidelines have been developed with a strong stakeholder participation element and in collaboration with advances on the Climate Ireland website. However, as research outputs, they need to be further re-developed as government guidelines to guarantee relevance and authority. This has been recognised in the NAF and is one of the framework objectives for implementation.

More recently, efforts have been made to raise awareness and develop capacity at the local-authority level. During the autumn of 2015 a series of seminars, supported by the DCCAE, were held for local authorities at the regional level, with an aim of introducing decision makers to the basics of CCA. These were then followed up with a series of workshops in 2016, which built on the seminars and went into more detail on plan making and included vulnerability and risk assessment, option selection and implementation (O'Dwyer *et al*., 2017). The workshops were delivered by the Climate Ireland Development Team, who put together a wide range of resources to support the development and delivery of adaptation planning workshops. To help local authorities in their planning, these materials were made available for download and for use in conjunction with the Local Authority Adaptation Support Wizard and Strategy Guidelines (https://www.climateireland.ie/#!/resources/eventMaterials).

Other relevant activities include the All Ireland Adaptation Knowledge Sharing Network (https://www.climateireland.ie/#!/resources/eventMaterials), which aims to support those preparing for or thinking of developing CCA plans. The first meeting of the network was held on 1 March 2016 and aimed to provide an all-Ireland overview of climate legislation, ongoing climate research and adaptation activities.

Although each of these activities represents a step in the right direction in building adaptive capacity and

raising awareness of the challenges of performing CCA at the local level, the bulk of efforts have been funded through EPA research and delivered as part of research projects. To ensure continuity, quality assurance and reach to all participants over time, this type of activity should ideally be driven centrally by the government and placed on a programmatic basis. By taking a long-term and sustainable approach it will allow tools, guidance and other resources to be continuously tested and improved based on the changing needs of users, changes in the data and knowledge available, and changing understanding of vulnerabilities, risks and adaptation.

Such a programme would ideally be delivered through Climate Ireland and would work to include sectoral decision making, business interests and interests of local communities. It should also aim to build strong networks of expertise, knowledge sharing and awareness raising.

Summary

The transfer of knowledge from data providers to end users is being assisted by the Climate Ireland information platform. The platform will provide authoritative information and data for decisions makers engaged in plan development and implementation. Allied to this is the rollout of a programme of capacity building and outreach to decision makers. Climate Ireland and the support that it offers should be placed on a programmatic basis to guarantee its relevance and development to meet changing user needs over time.

4.4 Adaptation Options and Selection (Indicator 4)

According to the EEA (2013), adaptation responses can be grouped under three broad categories:

1. "Grey" actions: technological and engineering solutions. Examples include building or strengthening of coastal and river flood defences/ dykes and beach "nourishment".
2. "Green" actions: ecosystem-based approaches that use the multiple services of nature. Examples include crop diversification; reinforcing natural defences such as dunes or wetlands; maintaining and restoring healthy ecosystems; and enhancing the ability of indigenous plant and animal species to move across landscapes without interruption by man-made obstacles. Green adaptation actions seek to use nature to conserve or enhance carbon stocks and reduce carbon emissions caused by ecosystem degradation and loss. When green adaptation actions are integrated into a spatially organised plan, they are known as "green infrastructure".
3. "Soft" actions: managerial, legal and policy approaches that alter human behaviour and styles of governance. Examples include planning and passing legislation; water supply and demand management to mitigate drought and water scarcity risks; early warning systems for heatwave risks; natural hazards monitoring; land use management and spatial planning; economic diversification and insurance; and awareness raising and public information campaigns about health and heatwave and cold-spell risks.

Although all three options are in theory open to most types of decision making, it is worth noting that "green" and "soft" actions are specifically aimed at decreasing the sensitivity and increasing the adaptive capacity of human and natural systems to build resilience. These actions are often less resource intensive and provide multiple benefits. High-tech and innovative technological solutions typically need more funding and require more research, experience and training to be implemented.

Ideally, what is needed are options that can provide multiple benefits – consistent with adaptation, mitigation and sustainable development requirements. Options such as retrofitting existing housing stocks and reinforcement of natural defences should be utilised as possible solutions that span all climate policy needs and can be understood as "win–win" solutions.

4.4.1 For priority sectors, are a range of adaptation options considered?

Contrary to the misconception that no adaptation action has occurred in Ireland, a large amount of material exists relating to working examples of climate adaptation. This material, however, is scattered across a number of sources and has been developed as part of a number of individual projects rather than as part

of an overarching adaptation plan and some examples are often not regarded as "adaptation".

In a recent study by Power and O'Dwyer (2017), an inventory of adaptation actions undertaken by local authorities in Ireland was compiled. The study identified 51 actions that can be classified as adaptation action. In collating this material, and organising it under structured headings, the case studies developed are not only accessible to those who wish to employ them to develop policies, but can also help to clarify what qualifies as mitigation or adaptation and what can be regarded as both. In cases in which the lines between mitigation and adaptation for a case study are blurred, the term "green resilience" (Udvardy and Winkelman, 2014) was used.

The case studies were further categorised according to grey, green or soft adaptation options. It is noteworthy that, in the majority of case studies identified, grey options accounted for 55% (28/51), soft options accounted for 25.50% (13/51) and green options accounted for 19.50% (10/51) of the total. Clearly, there is a major challenge for future adaptation planning in Ireland to consider and increase the use of green/ecological options to provide a balanced portfolio of responses to climate impacts.

4.4.2 Assessment of adaptation options for implementation

Detailed information will be required on how priority options are identified and chosen using appropriate appraisal methods. Particular needs exist in relation to the use of green options and the costs of different options. The assessment of adaptation options should also include exploring the risks and enablers associated with implementation of the different options being considered. These risks and enablers should also be considered as part of the suite of indicators.

4.4.3 Dedicated and adequate funding resources have been identified and made available to implement adaptation action

One of the more serious challenges for implementing adaptation has been the lack of dedicated funding for the implementation of adaptation action. More recently, Ireland's Capital Investment Plan (2018–2027) (Department of Public Expenditure and Reform, 2015) has recognised the challenges posed by climate change as requiring a whole-of-government approach. It also identified that the national transition objective will need to fundamentally shape investment choices and spatial settlement and that the development and improvement of Ireland's public capital infrastructure is one of the primary levers available to the government to mainstream climate action goals across government departments. The government's Capital Investment Programme is also seen as the cornerstone for the implementation of the Ireland 2040 NPF (DHPLG, 2018). The rate at and extent to which CCA is funded under this plan should be carefully monitored and reported on for future iterations of the NAF.

In addition, the EEA (2016) has also set out possible EU funding sources for municipalities implementing adaptation actions. These include:

- European Regional Development Fund (ERDF);
- Cohesion Fund;
- European Social Fund;
- INTERREG;
- LIFE;
- URBACT;
- EEA grants;
- Horizon 2020;
- Urban Innovation Actions;
- JPI Urban Europe;
- European Investment Bank.

4.5 Implementation Actions (Indicator 5)

4.5.1 Climate change adaptation is mainstreamed into priority and key national planning and sectoral policymaking

The national vulnerability assessment (Coll and Sweeney, 2013) identified the priority sectors as biodiversity and fisheries, water resources and the built coastal environment, and forestry and agriculture. These would still be priority sectors. However, it is beyond the scope of this study to determine the extent to which climate change objectives have been integrated into the policy and planning processes for all of these sectors. It is expected that this will be

further analysed as part of the ongoing national climate change risk assessment (due for completion summer 2019), which will be important for informing the further development of national policy.

Policy integration: spatial planning and land use change

The planning process provides an established means through which CCA objectives can be integrated and implemented at the local level. Planning legislation already requires different levels of the planning process to address climate change. The 2010 Planning and Development (Amendment) Act (Government of Ireland, 2010) requires all new development plans to include objectives that:

- promote measures to reduce energy demand;
- reduce anthropogenic greenhouse gas emissions;
- address the necessity of adaptation to climate change.

These objectives particularly apply to the context of location, layout and design of new development and consideration of climate change as a core issue that must be addressed. However, it is not within the scope of this study to assess to what extent, if any, these objectives are being addressed within planning and development decision making.

These requirements have been further developed through policy measures such as *Planning System and Flood Risk Management* (OPW, 2009), a guidance document for planning authorities. This puts in place a comprehensive framework for assessing and dealing with flood risk, including the requirement for strategic flood risk to be assessed during the preparation of all new development plans.

To support the integration of climate change into local decision making, the *Local Authority Adaptation Strategy Development Guideline* (Gray, 2015) was developed under EPA research. The guideline recommends that a strategy, once approved, should be used by a local authority to assess the adaptation fitness of its spatial plans and the other plans and policies under its remit. The guideline reiterates that the work undertaken to develop a local adaptation strategy should inform development plans and other statutory plans of the local authority. Such considerations should inform future revisions to the development plan and development management guideline for planning authorities, thus ensuring that CCA considerations are mainstreamed into the process. It is expected that this guideline will become the official government guideline as set out in the NAF. The proposed revisions must be based on learning, experience, new data and information and knowledge. It further needs to be integrated more fully with the tools, wizards and general supports available through Climate Ireland.

In relation to wider environmental policy, the spatial planning system utilises environmental impact assessments, strategic environmental assessments and appropriate assessments as structured frameworks for assessing the impact of new developments on the environment, including climate change. Any changes to these environmental management processes must be adjusted to include climate implications. More recently, a guidance note on integrating climate change into strategic environmental assessment was published (EPA, 2015). Something similar should be considered for the environmental impact assessment process.

The new NPF (DHPLG, 2018) represents a key opportunity for ensuring that the climate implications of our spatial choices are fully considered and addressed from the top of the planning hierarchy. The climate projections that are informing such implications must be core considerations within all plans and strategies developed within this hierarchy. The NPF includes an objective to support national targets for emissions reduction and objectives for climate change mitigation and adaptation by ensuring that climate change considerations are further integrated into the planning system and that they continue to be taken into account as a matter of course in planning-related decision-making processes. This is an important planning policy document, which could be a key vehicle for integrating climate change (mitigation and adaptation) into spatial planning. This process should be followed closely by the climate policy community to ensure adequate integration by way of concrete objectives and actions.

Costing and financing adaptation

Perhaps one of the biggest barriers to the implementation of climate actions in Ireland is the lack of national costings for climate change impacts and future adaptation actions. This is an important

policy deficit because, without an estimate of future costs of impacts and adaptation, it is impossible to set realistic and tangible policy objectives. Some research on the costs of climate change impact has been undertaken nationally and this has been summarised by McDermott (2016).

Overall, McDermott (2016) concluded that climate change impacts will cost the Irish economy billions of euros by 2050. The costs for agriculture alone have been estimated at between €1 and €2 billion per year, whereas damages from flooding could add another €1 billion per year, based on European-level projections. Analysis reveals potential substantial additional costs to the Irish economy that will likely arise from more adverse climatic conditions, and which to date have not been sufficiently quantified, for example in the form of disruptions to transport infrastructure and other essential services, lost labour productivity and impacts on business activities.

In particular, focus has been placed on sectoral vulnerabilities with economic significance, for example risks to critical infrastructure, and economic exposure to climate impacts outside Ireland, through effects on international markets and the movement of people and goods. But some opportunities also exist for some sectors of the Irish economy, particularly if Ireland is relatively less adversely affected by climate change than other competing regions. Such effects might be especially important for particular sectors of the economy, such as tourism, agriculture and technology.

Potential also exists for Ireland in the development of innovations around climate services, in particular goods and services that are applicable to developing country situations. Currently, an exercise under ERA4CS is analysing the scope of the European climate services landscape and Ireland is a partner is this work (http://www.jpi-climate.eu/aboutERA4CS).

4.6 Role of the General Public in Adaptation Actions (Indicator 6)

As we now enter a new, second phase of adaptation in Ireland, moving from planning into implementation, this will throw up a new set of challenges and possible barriers to climate action. As it stands, very little research has actually been conducted on how prepared individuals, homes, communities and businesses are to implement climate action. This needs to be informed by levels of awareness, underlying vulnerabilities, values, understanding of risk and its ownership, behaviours and ability to change. However, activities such as the Citizens' Assembly shed some light on this topic.

4.6.1 Citizens' Assembly

The Programme for a Partnership Government (https://www.merrionstreet.ie/MerrionStreet/en/ImageLibrary/Programme_for_Partnership_Government.pdf) committed the government to the establishment of a Citizens' Assembly, with a mandate to look at a limited number of key issues over an extended time period. One of the topics identified for consideration by the Assembly was "How the State can make Ireland a leader in tackling climate change". The Assembly met over two weekends in 2017 to deliberate on the topic (https://www.citizensassembly.ie/en/How-the-State-can-make-Ireland-a-leader-in-tackling-climate-change/).

The recommendations of the Assembly focused on the energy, transport and agriculture sectors, international best practice, and existing national policies and activities. A total of 13 questions appeared on the ballot and the recommendations were reached by majority vote; of these, two related specifically to CCA:

1. The State should take a leadership role in addressing climate change through mitigation measures, including, for example, retrofitting public buildings, having low-carbon public vehicles, renewable generation on public buildings and through adaptation measures including, for example, increasing the resilience of public land and infrastructure.
2. The State should undertake a comprehensive assessment of the vulnerability of all critical infrastructure (including energy, transport, built environment, water and communications) with a view to building resilience to ongoing climate change and extreme weather events. The outcome of this assessment should be implemented. Recognising the significant costs that the State would bear in the event of failure of critical infrastructure . . .

Specifically, these two topics focus on the role of the State in assessing and managing climate risk in relation to public land and critical infrastructure. Unlike the mitigation questions, which placed emphasis on *personal and public* ownership of mitigation responses, the adaptation topic, as it played out under the Citizens' Assembly, focused exclusively on how the *State* could make Ireland resilient to climate change. With a focus on public lands and large-scale infrastructure, which require significant economies of scale or co-ordination, a collective approach seems more efficient and sensible in this context. However, in the literature emphasis is placed on a lower level of abstraction, and participatory approaches, or (adaptive) co-management, are proposed (Huitema *et al*., 2016). Nationally, novel approaches are required to overcome barriers to personal and community engagement to enhance the likely success of the transition to climate resilience.

The proposed NDCA may go some way towards creating awareness and building community and personal capacity around climate change action.

4.6.2 National Dialogue on Climate Action

The aim of the NDCA is to provide an approach on how to transition to a low-carbon, climate-resilient economy and society. In recognition of the long-term nature of climate action, the goals of the Dialogue are to drive policy; engage with people on the challenge of climate change; motivate changes in behaviour; and create structures at local, regional and national levels to support the generation of ideas and their translation into appropriate cost-effective actions. The NDCA will run initially for a period of 2 years, with administrative support to be provided from a secretariat within the EPA (https://www.dccae.gov.ie/ga-ie/energy/topics/Energy-Initiatives/Pages/NDCC.aspx).

To be effective the Dialogue must seek out new and innovative ways to engage and communicate with the public to foster trust, co-operation and effective participation, such as Mini-Publics (Harris *et al*., 2017).

Summary

As we move into the new phase of implementing CCA, it is timely to assess how the public understand the topic, levels of awareness and the sense of ownership around climate risk. Without public support and empowerment to act, it will be very difficult to effectively build resilience at the local and community levels. As it currently stands, very little is known about the public who are expected to implement adaptation, and this could yet prove a major barrier to the effective implementation of climate action.

4.7 Monitoring, Reporting and Evaluation (Indicator 7)

Many monitoring and evaluation systems rely on a combination of indicators that provide information on climate hazards; the impacts of climate change; exposure, or adaptive capacity; and adaptation processes and outcomes. Adaptation processes are most commonly monitored whereas adaptation outcome indicators are among the least used and most difficult to produce, although they play an important role in evaluating adaptation effectiveness over time. From an implementation perspective it is important to understand why a measure is or is not successful.

Assessing whether adaptation measures contribute to reducing a country's exposure and vulnerability to climate change requires aggregating information horizontally across climate-sensitive sectors, as well as vertically across different levels of government (OECD, 2017).

Monitoring and evaluation can potentially play an important part in the adaptation process. Although relatively few countries to date have designed and implemented a national system for adaptation monitoring and evaluation, many more have indicated in their Nationally Determined Contribution that they are working on developing one, or intend to do so (OECD, 2017).

International indicators and reporting: Indicators from the Sendai Framework on DRR as well as from the SDGs process can be linked to and are partly relevant for monitoring CCA. This might offer opportunities through shared indicators, joint implementation, capacity building and mutual support in policy implementation (UNEP, 2017). A recent report by the EEA (2018) presents a selection of 18 indicators with reference to or relevance for CCA included in the SDGs and Sendai Framework on DRR. This demonstrates the potential for clear synergies with adaptation as these available indicators also provide some information relevant to monitoring adaptation.

EU indicators and reporting: Formal requirements for reporting on CCA by Member States to the European Commission, which is supported by the EEA, arise from the MMR (EU, 2013). Article 15 of the MMR describes the requirements for reporting by Member States on national adaptation actions.

The first MMR reporting on adaptation took place in 2015 and reporting is scheduled to be repeated every 4 years, aligned with reporting to the UNFCCC, with the next reporting deadline in March 2019.

The MMR reporting guidance is descriptive and does not include any requirements for indicators as such; rather, it requests Member States to provide information in the following areas:

- policy and legal framework (adaptation strategies and plans);
- information on impacts, vulnerability and adaptation (observations and projections, impact and vulnerability assessments, research and monitoring progress);
- priority sectors and adaptation action;
- engaging stakeholders – participation and capacity building (governance and adaptation capacity, dissemination, education, training).

From 2021 onwards, the reporting by Member States on adaptation requirements is foreseen to be integrated into reporting to the Energy Union Governance Regulation. Article 17 of the proposed regulation (EC, 2016) includes a timeline for the reporting, suggesting that first reporting should be carried out by 15 March 2021, with reporting every 2 years thereafter.

Nationally, a framework and initial set of adaptation preparedness indicators are being prepared under EPA research. When finalised these should provide the impetus for evaluating adaptation effectiveness over time. If used in collaboration with the indicators produced from the ongoing national risk assessment and those set out for reporting on international obligations, a more comprehensive set of indicators could be produced.

5 Reanalysis of Ireland's Preparedness for Climate Change Adaptation

In this final chapter, the new indicator set is scored and set out in a tabular format (Table 5.1). The analysis reveals that across the indicators identified good progress has been made in terms of policy and legislation for adaptation planning, filling knowledge gaps and dissemination of information; some progress has been made in terms of governance; and there has been insufficient progress in relation to stakeholder involvement in plan preparation, identification of adaptation options, implementation and monitoring and evaluation.

In effect, it can be clearly seen that a two-phased development of adaptation has occurred: phase 1 efforts around plan and strategy development are well developed; phase 2 efforts around the implementation of adaptation are in the very early stages of development.

5.1 Conclusions

Ireland is at the beginning of a long and challenging process of transitioning to a low-carbon, climate-resilient and environmentally sustainable economy. The role of central government is to drive and support this agenda by creating an enabling environment in support of this transition at all levels and spheres of decision making. The role of society at large is to embrace these changes and work with government to make this transition as smooth as possible. The key to success will be the ability to effectively link and co-ordinate these spheres of activity in a manner that is fair, efficient and timely.

This study found that Ireland is entering the second phase of adaptation. In phase 1 the emphasis was on putting structures, processes and knowledge in place for adaptation policymaking. In this new second phase the emphasis is on climate action, which will bring with it a new set of challenges.

The key components of an enabling environment for climate resilience are in place. These should aid sectoral and local-level plans to emerge; however, there are barriers, which will hamper adaptation action and implementation. Although the enablers of and barriers to adaptation differ between plan making and adaptation actions, lessons can still be learned and operationalised to enable societal transformation. The key to overcoming the barriers to adaptation and realising possible opportunities lies with institutions, processes and public participation, including the NAF, Local Authority Regional Climate Change Offices and the NDCA, and also ensuring that information and data are suitable for user needs and that processes are put in place to effectively engage with and include the general public in the rollout of climate actions.

The NAF provides a clear vision for a climate-resilient Ireland and articulates a set of objectives and aims that are to drive adaptation at the sectoral, local, business and community levels; create awareness and build capacity; continue to develop and, when possible, exploit the science base (e.g. climate services); address urgent risks; embed adaptation within all relevant policy and legislation; and put systems in place to monitor the progress and effectiveness of adaptation activity. The proposed Local Authority Regional Climate Change Offices should provide a governance structure, capture synergies and implement adaptation actions at the local and community levels. The proposed NDCA, should, if carefully planned, managed and funded, provide the impetus to drive this agenda across all levels of society, environment and the economy.

Collectively, these key developments must be co-ordinated through one overarching meta-governance structure that understands how each of the parts fit together and need to work collectively to shape the CCA landscape. It will take imagination and will to bring all stakeholders on board to share in driving the agenda for a low-carbon, climate-resilient Ireland.

Table 5.1. Scoring of adaptation preparedness across key indicators of action

Step	Definition	Level of progress
1. Policy context	1.1 Is there national policy in place? 1.2 Are there sectoral plans in place? 1.3 Have local-level plans been developed? 1.4 Scope of coverage by the plans (territory/population)	Good progress: • Statutory policy and legislation in place • Statutory sectoral plans due September 2019 • Activity at the local scale commenced • Not yet; should be addressed under the NAF
2. Governance	2.1 Central administration body for policymaking and vertical and horizontal co-ordination arrangements in place with other governmental bodies	Good progress: • Processes and bodies exist to oversee, provide advice, enhance co-ordinating and maximise resources for institutional governance • Sustained and co-ordinated efforts needed to bring sector/local authority leaders and citizens together in support of climate action
	2.2 Stakeholders (e.g. interest groups, scientists and general public) are involved in the preparation of adaptation policies	Insufficient progress: • There is no dedicated process to facilitate additional stakeholder involvement in the preparation of adaptation policies. The public are invited to consult during the plan-making "consultation period". Public not generally aware that plans are being developed because of lack of publicity/awareness by sectors and insufficient time to respond • Great potential for the NDCA to make inroads into this area
3. Assessing risks of and vulnerabilities to climate change	3.1 Systems are in place to monitor and assess current and projected climate change, impacts and vulnerability	Some progress: • Observation system exists; some elements are vulnerable; insufficient use being made of all available data • No permanent national system for development of climate scenarios • No common methodology for assessing risk and vulnerability exists. The ongoing national risk assessment should provide a high-level overview but this will not negate the need for sectoral and local vulnerability and risk assessments
	3.2 Knowledge gaps on climate change and adaptation are tackled	Good progress: • Good progress has been made on developing the knowledge base. However, research funding organisations must be aware of evolving needs, such as more detailed localised, user-driven information for decision making, and the need for action research on how to transition to climate resilience
	3.3 Knowledge transfer processes are in place to build adaptive capacity across sectors	Good progress: • The climate information platform Climate Ireland provides a centralised system through which data, knowledge and information is available to all levels of decision making and the public • Insufficient knowledge transfer by way of education and training materials on CCA concepts and practices – some activities for sectors and local authorities but all on an ad hoc basis. Needs to be put on a programmatic footing, with a dedicated funding stream
4. Identifying adaptation options	4.1 For priority sectors, a range of adaptation options is considered	Insufficient progress: • No priority sectors have been identified for immediate action • As statutory sectoral and local plans are developed under the NAF it would be expected that a full range of options are considered, costed and put on realistic timelines for delivery
	4.2 Dedicated and adequate funding resources have been identified and made available to implement adaptation action	Insufficient progress: • Little progress under the old NCCAF; this is expected to change under the NAF

Table 5.1. Continued

Step	Definition	Level of progress
5. Implementing adaptation action	5.1 Climate change adaptation is mainstreamed into priority and key national planning and sectoral policymaking	Insufficient progress: • Evidence of climate change being mainstreamed into national policy such as the NPF; however, details on adaptation are sparse. This action needs to be systematically driven for all policies, programmes and plans • Understanding is needed of the role of insurance as an alternative policy instrument for residual climate risk. Presently, it is not altogether clear how the insurance industry is responding to climate change risk in its underwriting processes
	5.2 Climate change adaptation policies and measures are implemented	Insufficient progress: • Lack of implementation at all levels; sectoral and local; expected to change under the NAF • Insufficient efforts to allow for transboundary co-ordination with Northern Ireland on issues such as water management, soil, the marine environment, agriculture and forestry
6. Role of the general public	6.1 Process to allow two-way exchange of information	Insufficient progress: • No progress yet, but the NDCA may be the mechanism for the two-way exchange of information. Action required on socially innovative methods to engage with and foster trust in the public
	6.2 Stakeholder involvement in adaptation action	Insufficient progress: • No action in this area yet as no plans have been implemented. Research required on stakeholder awareness, understanding, values, risk, ability and willingness to act
7. Monitoring and evaluation	7.1 Systems are in place to monitor and report on climate change adaptation	Insufficient progress: • No national indicator set or framework for adaptation MRE has been developed yet
	7.2 Evaluation framework is in place to assess and periodically review the strategy	Insufficient progress: • There is no evaluation framework in place to allow for review. This could be addressed under the NAF

5.2 Recommendations

1. **Policy and legislation**. As Ireland now begins to focus on the implementation of adaptation, it will be important to follow how effectively key international, EU and national objectives are implemented across and down to the sectoral, local, business and community levels. Equally important will be the extent to which coherence is achieved in and between sectoral and local-level plans and between mitigation and adaptation.

2. **Governance**. Every effort should be made to ensure the effective governance of this new policy area. At the national level, a co-ordinating body could be established to drive the governance of this multi-level/sphere of policy, with the mandate to motivate and support action at all levels of decision making.

   The proposed Local Authority Regional Climate Change Offices may be crucial in multi-level governance of this area, while the NDCA will be equally important in creating awareness, building capacity and motivating public participation in the transition to low-carbon climate resilience. The ability to interlink and co-ordinate each of these institutional process and citizens will be the key to success.

3. **Science base**. The science base should continue to be supported, allowing targeted research into specific policy areas. Certain activities should move from the research arena to operational service provision. New areas of research should also continue to be explored in line with international programmes and best practice. In particular, there is a lack of action-orientated research with a focus on societal transformations for climate resilience. It would be desirable to establish or designate a lead organisation for data gathering and analysis and dissemination of information and knowledge. Efforts must be

made to exploit the potential for climate services, with a view to supporting decision making, driving innovation and seizing emerging opportunities.

4. **Adaptation options**. The development of detailed options that span a full range of approaches (grey, green and soft) should be considered in all future plans. Preferred options would be supported by relevant selection criteria and costings. Responsibilities and timelines for implementation should be clearly identified. The use of "pathway" approaches should be encouraged as part of best practice for medium- to long-term decision making in relation to climate resilience.
5. **Implementation**. Every effort must be made to achieve coherence between the policy arenas of low carbon, climate resilience and an environmentally sustainable economy. In addition, a root and branch analysis of existing policy should be undertaken to identify synergies and opportunities for the integration of climate change at all levels of governance (national, sectoral and local). Synergies with complementary policy areas such as the UN SDGs and DRR strategies and the New Urban Agenda (UN, 2017) should be explored and exploited.
6. **Role of the general public**. The need to effectively engage and motivate the general public is pressing if adaptation is to be successfully implemented. This needs to be carefully managed and placed on a programmatic basis by government and should include the educational sector, households, community groups, non-governmental organisations and businesses. Innovative societal approaches for communicating and awareness raising must be developed and utilised at community and local levels. Methods for linking in with national governance arrangements will also be vitally important.
7. **Monitoring, reporting and evaluation**. There is an urgent need to identify a national adaptation indicator set for Ireland. This would allow for consistency in the monitoring and exchange of information. A national indicator set should be able track adaptation progress, monitor effectiveness and communicate on the transition to climate resilience across all levels and spheres of decision making (horizontal and vertical). This is crucial given the requirements that are emerging under the UNFCCC Paris Agreement and the EU Adaptation Strategy.

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Abbreviations

CCA	Climate change adaptation
CCAC	Climate Change Advisory Council
CCMA	County and City Management Association
CMIP	Coupled Model Intercomparison Project
DCCAE	Department of Communications, Climate Action and Environment
DRR	Disaster risk reduction
ECV	Essential Climate Variable
EEA	European Environment Agency
ERA4CS	ERA-NET on Climate Services
EU	European Union
JPI	Joint Programming Initiative
MaREI	Centre for Marine and Renewable Energy Ireland
MMR	Monitoring Mechanism Regulation
MRE	Monitoring, reporting and evaluation
NAF	National Adaptation Framework
NCCAF	National Climate Change Adaptation Framework
NDCA	National Dialogue on Climate Action
NPF	National Planning Framework
SDG	Sustainable Development Goal
SEAI	Sustainable Energy Authority of Ireland
UCC	University College Cork
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

Appendix 1 Scoring of Performance by Domain of Activity

Performance area 1	Very good progress if	3 Yes
	Good progress if	2 Yes
	Some progress if	1 Yes
	Insufficient progress if	0 Yes
Performance area 2	Very good progress if	2 Yes
	Good progress if	Yes for 2a
	Some progress if	Yes for 2b
	Insufficient progress if	0 Yes
Performance area 3	Very good progress if	4 Yes
	Good progress if	(3 Yes) or (Yes to 3b and 3c)
	Some progress if	(1 Yes) or (2 Yes other than 3b and 3c simultaneously)
	Insufficient progress if	0 Yes
Performance area 4	Very good progress if	2 Yes
	Good progress if	Yes to 4b
	Some progress if	Yes to 4a
	Insufficient progress if	0 Yes
Performance area 5	Very good progress if	3 Yes
	Good progress if	2 Yes
	Some progress if	1 Yes
	Insufficient progress if	0 Yes
Performance area 6	Very good progress if	3 Yes
	Good progress if	2 Yes
	Some progress if	1 Yes
	Insufficient progress if	0 Yes
Performance area 7	Very good progress if	2 Yes
	Good progress if	Yes to 7a
	Some progress if	Yes to 7b
	Insufficient progress if	2 No
Performance area 8	Very good progress if	5 Yes or Yes to 8a, 8b, 8c and 8d
	Good progress if	3 or 4 Yes (other than 8a, 8b, 8c and 8d together)
	Some progress if	1 or 2 Yes
	Insufficient progress if	0 Yes
Performance area 9	Very good progress if	4 Yes
	Good progress if	3 Yes or 2 Yes including 9a
	Some progress if	2 Yes not including 9a or 1 Yes
	Insufficient progress if	0 Yes
Performance area 10	Very good progress if	3 Yes
	Good progress if	2 Yes
	Some progress if	1 Yes
	Insufficient progress if	0 Yes
Performance area 11	Very good progress if	2 Yes
	Good progress if	Yes to 11a
	Some progress if	Yes to 11b
	Insufficient progress if	0 Yes

Source: European Commission (2014). The Adaptation Preparedness Scoreboard – Final Version. European Commission, Directorate-General for Climate Action, Brussels, Belgium.

Appendix 2 Sectors and Lead Departments

Sectors	Lead departments
Seafood	Department of Agriculture, Food and the Marine
Agriculture	
Forestry	
Biodiversity	Department of Culture, Heritage and the Gaeltacht
Built and archaeological heritage	
Transport infrastructure	Department of Transport, Tourism and Sport
Electricity and gas networks	Department of Communications, Climate Action and Environment
Communications networks	
Flood risk management	Office of Public Works
Water quality	Department of Housing, Planning and Local Government
Water services infrastructure	
Health	Department of Health

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL
Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú
Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha)*;
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil
- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce
- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol
- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil
- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta
- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch
- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas
- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol *(m.sh. Timpeall an Tí, léarscáileanna radóin)*.
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta
- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil
Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:
- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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National Preparedness to Adapt to Climate Change: Analysis of State of Play

Author: Margaret Desmond

Identifying Pressures

The goal of international and national climate adaptation policy is the transition to a low-carbon, climate-resilient society and economy. This ambition is to be achieved through a combination of supports, including policy and legislation, science and technologies, governance arrangements, capacity building and behavioural change.

In order to understand preparedness for the transition to climate resilience, the international regime, led by the United Nations Framework Convention on Climate Change (UNFCCC), will undertake the first global stocktake of climate actions, including adaptation, by 2023. In 2014, the European Union undertook a preliminary inventory of Member State preparedness for climate change impacts and adaptation action. Results from Ireland showed that a number of substantial advances have been made but that more effort is required if vulnerability is to be addressed and resilience built.

This and other initiatives provide a useful overview of where each Member State stands in relation to progress on implementing adaptation based on submissions to international processes. However, little internal analysis has actually been conducted to probe deeper into the information behind the headline indicators and to present more vividly the situation on the ground. This report provides a more detailed assessment of the headline indicators.

Informing Policy

Ireland is at the beginning of a long and challenging process of transitioning to a low-carbon, climate-resilient and environmentally sustainable economy. The role of central government is to drive and support this agenda by creating an enabling environment in support of this transition at all levels and spheres of decision making. The role of society at large is to implement adaptation in businesses, communities and homes. The key to success will be the ability to effectively link and co-ordinate these spheres of activity in a manner that is fair, efficient and timely. This needs to be supported by structures and processes that can drive this agenda.

This study found that the key components of an enabling environment for climate resilience – policy and legislation, governance arrangements and an evolving knowledge base – are in place but that barriers remain that are hampering adaptation action on the ground. The key to overcoming the barriers to adaptation and realising possible opportunities lies with the effective co-ordination of institutions, processes and stakeholders such as Local Authority Regional Climate Change Offices, the National Adaptation Framework, the National Dialogue on Climate Action and other newly emerging initiatives.

It will take imagination, innovation (social and technological) and political and societal will to bring all stakeholders on board to share in driving the agenda for a low-carbon, climate-resilient Ireland. Ireland is not the only country currently grappling with how to implement climate action at the local level and it should be actively seeking to understand what more advanced countries are doing and learn from their experiences.

Developing Solutions

This report provides Irish decision makers with a timely assessment of the enablers of and barriers to effective climate change adaptation. It will assist the development of adaptation strategies and plans at national, sectoral and local levels of decision making. It is part of the solution to the societal challenge of transitioning to a climate-resilient Ireland.

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