Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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Report Series No. 17

National Adaptive Capacity Assessment

SSTI
Strategy for Science, Technology and Innovation

Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

Environmental Protection Agency

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EPA Climate Change Research Programme 2007–2013

National Adaptive Capacity Assessment

CCRP Report

End of Project Report available for download on http://erc.epa.ie/safer/reports

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The EPA Climate Change 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

In order to plan effectively for climate change, reliable information is required on expected impacts and an understanding of our ability to manage or adapt to their consequences. This will allow us to determine how vulnerable society, the economy and ecosystems are to climate change and to plan accordingly to minimise risks and increase resilience.

This report is an assessment of Ireland's capacity to adapt to climate change. In the report, a number of important adaptive capacity functions are assessed and presented. Specifically the report provides:

- Analysis of the context within which adaptation will take place;
- An assessment of adaptive capacity; and
- Recommendations on how to enhance adaptive capacity.

The approach used in this assessment was developed by the World Resources Institute. The National Adaptive Capacity (NAC) assessment allows us to determine how well a country is currently performing its core adaptation functions:

- Analysis of climate change impacts and vulnerability;
- Prioritisation of adaptation needs;
- Co-ordination of key actors and institutions;
- Information management; and
- Climate risk assessment.

The results of the NAC assessment indicate that Ireland is in the early stages of the adaptation process. There are good-quality information and established processes and tools to plan for the positive and negative impacts of climate change. There is a need to strengthen and maintain efforts in data gathering, climate observations and analysis to inform adaptation planning. This requires long-term commitment and resourcing, building on the established solid base. The information and knowledge generated, which are suitable for particular needs, must be made available to decision makers, as well as practical guidance on their use. The proposed development of a climate information platform will play an important role in getting information to those responsible for risk assessment and adaptation planning and improving communication on climate impacts and risk.

To date, activities have focused on understanding climate change impacts and relating these to key sectors. The next steps will involve vulnerability and risk assessment, prioritisation, costing, identifying adaptation options, adaptation planning and the implementation of adaptation actions.

The most effective strategy for adaptation planning is to integrate climate change adaptation into policies, plans, programmes and projects at all levels of government and across all sectors. Nationally, some policy sectors have begun to engage with the issue of climate change by including adaptation thinking in their decision-making processes. In most cases, this is driven by international and European Union obligations. Some sectors have taken voluntary actions; however, a number of others have yet to engage with the issue. This report identifies opportunities for the integration of climate change adaptation for each of the sectors analysed in the study.

A number of existing environmental planning tools, such as Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA), Appropriate Assessment (AA) and Regulatory Impact Assessment (RIA), can play important roles in assessing climate risk and in helping to integrate climate change into policy, planning, programme and project-level decision making. Planning instruments, especially those set out in spatial planning, also offer good potential for climate change adaptation, particularly at the regional and local levels and across a number of sectors, such as water, land use and the built environment.

Approaches such as disaster-risk reduction can also increase adaptive capacity, whereby projected climate change impacts are integrated into risk-management strategies with a view to reducing vulnerability and enhancing resilience. Insurance mechanisms may contribute to adapting to climate change by covering the residual risks and providing incentives for risk reduction.

Co-ordination across sectors and levels of decision making is vital if climate change adaptation is to be successfully addressed. This requires the clarification of roles and responsibilities at national, regional and local levels, and should be addressed in future climate change policy and legislation.

Recommendations

Facilitating factors

Work needs to be done to provide an informed and structured approach to adaptation.

- **Recommendation:** Initiate greater sectoral and public information provision and consideration of adaptation issues.

Science/Policy interface

Many elements of a stepwise approach to adaptation planning are already in place; however, a number of gaps remain to be addressed.

- **Recommendation:** Undertake a national vulnerability assessment, identify key areas or sectors for priority attention.
- **Recommendation:** Develop systems and guidance for climate risk management and assessment.

An early-warning system is an important risk reduction strategy in the context of extreme events such as flooding.

- **Recommendation:** Develop climate-informed flood, storm, drought-risk early-warning systems as part of the national emergency planning and responses.

As government departments and local authorities begin to develop and implement adaptation plans, these will have to be inventoried, costed, opportunities identified and tracked over time.

- **Recommendation:** Undertake a national-level cost-benefit analysis based on an appropriate methodology for climate adaptation analysis. The approach taken should also identify any economic and social benefits of adaptation.
- **Recommendation:** Develop a system to inventory adaptation actions, develop process/ effectiveness indicators for monitoring and review purposes.

Information management, communications and awareness raising

A commitment is needed to sustain resources for data gathering and monitoring systems.

- **Recommendation:** Ongoing development of the knowledge base, which should be formalised through a lead organisation and strong co-ordination. Commitment to sustain resources for data gathering and monitoring systems.
- **Recommendation:** Effective dissemination of information to stakeholders through a suitably resourced national Climate Information Platform.

Multilevel governance

The responsibility for climate change policy and implementation is spread across a number of sectors and levels. Mechanisms and tools are already in place to co-ordinate some of these activities, which may need to be set up on a statutory basis.

- **Recommendation:** Establish or mandate a national high-level body on climate change adaptation and mitigation, drawing on a pool of relevant expertise.
- **Recommendation:** Establish a multilevel stakeholder group to ensure vertical co-ordination.

Policy integration

The most effective strategy for adaptation planning is to integrate climate change adaptation into policies, plans, programmes and projects at all levels of government and across all sectors.

- **Recommendation:** Integrate climate change adaptation into all policies, plans, programmes and projects across all government departments/sectors and all levels of government, local to national and inter-sectoral involving non-governmental actors, business, etc.
- **Recommendation:** Develop guidance and update existing assessment tools (e.g. SEA, EIA, RIA) to enable climate change adaptation to be adequately incorporated into policies, plans and programmes.

1 Introduction and Methodology

1.1 Introduction

Climate change is happening and will present us with a set of environmental conditions to which we must adapt. These conditions will manifest on medium to long-term timescales that will be challenging for established governance and planning systems. A constant climate is an implicit assumption in current decision making. Climate change overturns this assumption, and introduces a new element of uncertainty into decision making and particularly for medium to long-term developments.

Effective adaptation to climate change requires an approach that:

- Builds the knowledge base;
- Disseminates knowledge and information; and
- Integrates climate change adaptation into key policy areas.

Such an approach[1] means that a number of important building blocks need to be put in place to enable an effective adaptation response, including:

- Scientific understanding of climate change impacts on natural, managed and human systems;
- Understanding of the sensitivity or resilience of systems;
- Understanding of the capacity of systems to adapt;
- Assessment of the vulnerability of systems;
- Insights into socio-economic aspects;
- Estimation of costs and benefits of different adaptation options; and
- Information on best practices and approaches.

1. See, for example, Watkiss and Harley (2008) in Harley et al. (2008).

In Ireland, a number of elements of such an approach are being developed, such as observation and monitoring systems, modelling and prediction, and impact assessment. A number of other elements are earmarked for urgent attention, such as a national vulnerability assessment and the piloting of a national information system. The findings of this assessment should further contribute to the development of effective adaptation responses to climate change.

This report is an assessment of Ireland's capacity to adapt to climate change. In the report, a number of important adaptive capacity functions are assessed and presented. Specifically, the report provides:

- Analysis of the policy context within which adaptation will take place;
- An assessment of adaptive capacity; and
- Recommendations on how to enhance adaptive capacity.

The information contained in the report is based on an extensive literature review, workshops, interviews and personal correspondence with a large range of stakeholders. The report findings can be used to inform climate change policy and planning.

1.2 Methodology

The approach used here was developed by the World Resources Institute (WRI). It is based on the inputs and experiences of practitioners and experts in the field of adaptation from around the world (WRI, 2009a). Ireland is one of the first developed countries to pilot the approach. Other pilot countries include Bolivia and Nepal. Lessons learned will be shared with the WRI and other pilot countries to allow the methodology to be further developed.

The methodology involves the following steps:

1. Review of the institutional context within which adaptation is likely to occur;
2. Assessment of adaptive capacity; and

3. Recommendations for future developments.

1.2.1 *Review of the institutional context within which adaptation is likely to occur*

The institutional context is based on a review of the socio-economic landscape and decision-making context in which adaptation takes place. It describes the current international, national and sectoral policy context, planning and legal frameworks, available tools and processes for decision making on climate change adaptation. The potential for integrating climate change adaptation into existing policy areas is a key consideration and possible opportunities are identified. These are highlighted in this document. However, the review does not determine the extent to which integration is actually occurring.

Mickwitz et al. (2009, p. 19) define policy integration as "*the incorporation of the aims of climate change … adaptation into all stages of policy-making in other policy sectors (non-environmental as well as environmental*". At different policy levels (i.e. international, national and sectoral), integration can occur at various points in the decision-making cycle – during policy formation, planning, resource allocation and implementation, including monitoring and evaluation. Adaptation will be undertaken by a wide range of actors, including individuals, communities, civil society, governments and private actors (OECD, 2009). A key consideration is the identification of opportunities or 'entry points' for integrating climate change adaptation into different policy levels. An entry point is defined as "*one or more opportunities for incorporating specific climate-change adaptation considerations into a given plan, programme, or project*" (UNDP, 2010). The entry points identified here include policy review and development, planning and review, implementation (including the development of guidelines and tools), and institutional arrangements. In addition to the identification of existing entry points, possible future entry points are also suggested.

This analysis used publicly available information, followed up, where necessary, using correspondence or interviews with stakeholders. A draft report was commented on by relevant stakeholders working in adaptation to climate change. The analysis and stakeholder dialogue was used to provide recommendations on the next steps to be taken to co-ordinate climate change adaptation aims with those of other policy sectors, with a view to enhancing climate resilience (see Appendix 1 for a list of people consulted).

The resulting policy context review represents the first phase in the National Adaptive Capacity (NAC) assessment. It provides the background information to support and justify the answers provided in the assessment worksheets. This information is set out in Part A of this report. The key findings of this section of the study have been published as a stand-alone summary document (Desmond and Shine, 2011).

1.2.2 *Assessment of adaptive capacity*

Adaptive capacity is assessed under the following key functions:

1. Analysis of climate change impacts and vulnerability;
2. Prioritisation of adaptation needs;
3. Co-ordination of key actors and institutions;
4. Information management; and
5. Assessment of climate risk reduction.

These functions are assessed to show how well a country is performing its core adaptation actions and to identify strengths and gaps in a country's adaptation system. This can inform improvements where needed or show where strengths may enable rapid adaptation progress. This assessment can also be used to determine a baseline from which to begin planning for adaptation, or it can be used to review progress on adaptation after a period of implementation.

Part B of this report outlines the assessment process and is based on a series of Excel worksheets contained in the NAC framework[2]. The five key functions were each assessed for adequacy/ inadequacy, institutional responsibility, strengths and weaknesses, supporting evidence, proposed indicators (Table 1.1) and an overall evaluation or recommendation. The responses to these questions are based on the information gathered and analysed in

2. http://docs.wri.org/nac_answer_worksheet.xls

Table 1.1. Summary of criteria used to assess national adaptive capacity.

Criterion	Key question
Adequacy/Inadequacy	To what extent has the capacity function been executed?
Institutional responsibility	Who is institutionally responsible for implementation of the capacity function?
Strengths and weaknesses	What are the strengths and weaknesses in the approaches being taken to the capacity function?
Supporting evidence	What is the supporting evidence (published materials, committees, policies, strategies, guidance documents, etc.) in relation to the capacity function?
Proposed indicators	Can an indicator be suggested to monitor and review progress on the capacity function?

the context document. The answer sheets were completed by a team of Environmental Protection Agency (EPA)-funded researchers and reviewed by academic peers to ensure objectivity in the responses provided. The findings of this section of the study have been published as a stand-alone summary document (Shine and Desmond, 2011).

In order to complete Function 5 on climate risk reduction, priority areas need to be identified. As this has not been done formally at the national level in Ireland, these had to be inferred from existing diffuse efforts. This was the subject of discussion at a workshop with the academic community (see Section 1.2.3), where a variety of approaches to determining priorities were discussed, drawing on national and international experience. The workshop participants decided to base the prioritisation on previous studies and assessments and identified three priority areas for the purpose of the NAC assessment. It should, however, be noted that these are not national priorities, but inferred priorities for the purposes of this study. The three areas chosen were water, critical infrastructure and planning. This selection was in turn endorsed by members of the EPA-chaired Impacts and Adaptation Steering Group (IASG) at the second NAC workshop.

1.2.3 Key steps in the NAC process

The NAC process was overseen by the IASG, which is convened by the EPA to advise on the Impacts and Adaptation theme of the Climate Change Research Programme (CCRP).

Three workshops were held as inputs to the process. The first, in April 2010, involved academics and researchers working on adaptation to climate change and focused on an initial review of the context document, input to the assessment process (worksheets), and a discussion on possible approaches to prioritisation in the context of the NAC. The second, in May 2010, involved members of the IASG and invited feedback on the draft context document and initial findings of the assessment. The third workshop was held in August 2010 with the multi-stakeholder Climate Change Working Group of Comhar, the National Sustainable Development Council (SDC). Participants at all workshops provided useful inputs and advice, which have been reflected in this report.

PART A – Context Review

2 Policy Landscape

This section sets out the policy landscape, including an overview, where necessary, of the international, European and national law and policy frameworks, all of which are drivers for climate change decision making in Ireland. Emphasis is placed on the current national political context in which adaptation will take place. This description also sets out potential entry points and barriers, such as new plans, a reorganisation of government departments and associated agencies, and major forthcoming legislation. For each area analysed, the policy level, key actors, stages in the policy cycle where integration might occur and entry points for intervention are identified. These include existing entry points and those that could be developed in the future. All are summarised in accompanying tables.

2.1 International Policy Context

The United Nations Conference on Environment and Development concluded in 1992 with the opening for signature of the United Nations Framework Convention on Climate Change (UNFCCC), which Ireland ratified in 1994.

2.1.1 UNFCCC

The objective of the Climate Change Convention, according to Article 2, is to "*achieve, in accordance with the relevant provisions of the Convention, stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system*". Article 2 goes on to state that such a level should be achieved "*within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*". Adaptation is referred to specifically in Article 4(1) e) which provides that all Parties shall "*cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods*".

The two subsidiary bodies of the Convention have a number of work areas related to adaptation to climate change. The Subsidiary Body on Scientific and Technical Advice (SBSTA) hosts the Nairobi Work Programme (NWP) on Impacts, Vulnerability and Adaptation to Climate Change agreed in 2006. Other areas of work focusing on technology transfer and science also contribute to adaptation. The Subsidiary Body on Implementation (SBI) hosts the Buenos Aires Programme of Action on Adaptation agreed in 2005. This was an important step in raising the profile of adaptation in the negotiations and, in Bali in 2007, the Bali Action Plan placed adaptation on an equal footing with mitigation for the first time. Also under the SBI are agenda items dealing with specialised funds that address adaptation (Least Developed Countries Fund and Special Climate Change Fund) and adaptation in least developed countries, including the preparation and implementation of National Adaptation Programmes of Action (NAPAs)[3].

The process resulting from the Bali Action Plan recognises the need for enhanced action on adaptation as part of a future international agreement on climate change. This is reflected in the Copenhagen Accord, agreed at COP15 in 2009, which recognises the urgent need for "*enhanced action and international cooperation on adaptation to ensure the implementation of the Convention*" (UNFCCC, 2009). Further development of international policy on adaptation was progressed at COP16 in Mexico in 2010 and COP17 in South Africa in 2011. These developments have implications for both national policy on adaptation and obligations to help developing countries adapt to the adverse effects of climate change.

3. For more information on adaptation under the Convention see http://www.unfccc.int

2.1.2 Kyoto Protocol

The Kyoto Protocol is an international agreement linked to the UNFCCC. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialised countries and the European community for reducing greenhouse gas (GHG) emissions, which amount to an average of 5% against 1990 levels over the 5-year period 2008–2012.

The major distinction between the Protocol and the Convention is that while the Convention encouraged industrialised countries to stabilise GHG emissions, the Protocol commits them to do so. Recognising that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of "*common but differentiated responsibilities*".

The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. The detailed rules for the implementation of the Protocol were adopted at COP7 in Marrakesh in 2001, and are called the Marrakesh Accords.

The Protocol further reaffirms the Parties' commitments on adaptation stated by the Convention. It also establishes an Adaptation Fund to assist developing countries, funded by a 2% levy on the Clean Development Mechanism (CDM). The CDM is one of the flexible mechanisms of the Kyoto Protocol, allowing countries to meet their obligations through market mechanisms[4].

2.1.3 Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988. It is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP). Its role is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced. The overall objective of the IPCC is to understand the risks of human-induced climate change, its observed and projected impacts and options for adaptation and mitigation and to present this information in a policy-relevant but policy-neutral way to decision makers.

The IPCC has started the preparation of its Fifth Assessment Report (AR5). This follows the overall mandate of the IPCC, the main activity of which is to prepare comprehensive assessment reports about climate change at regular intervals, typically of about 5–7 years.

The IPCC's First Assessment Report (FAR), in 1990, played a decisive role in leading to the UNFCCC, which was opened for signature at the Rio de Janeiro Summit in 1992. The Second Assessment Report (SAR) of 1995 provided key input for the negotiations of the Kyoto Protocol in 1997. The Third Assessment Report (TAR) of 2001 provided further information relevant to the development of the UNFCCC and the Kyoto Protocol. The Fourth Assessment Report (AR4) paid greater attention to the integration of climate change, with sustainable development policies and the relationships between mitigation and adaptation, and led to a wider awareness of climate change issues in the general public and among decision makers, inspiring world leaders to agree on the Bali Action Plan.

The AR5, which will be finalised in 2014, will be made up of four reports: the three IPCC Working Groups' contributions dealing, respectively, with (i) The Physical Science Basis, (ii) Impacts, Adaptation and Vulnerability, and (iii) Mitigation of Climate Change, and the Synthesis Report (SYR). Each report will contain its own Summary for Policymakers (SPM), which is approved in detail by all member countries of the IPCC and represents a formally agreed statement on key findings and uncertainties.

The IPCC Working Group 2 on Impacts, Adaptation and Vulnerability assesses the latest literature on impacts, vulnerability and adaptation. It is also expected to include global and sectoral aspects, regional aspects and increased focus on risk management framing, multiple stresses framing and expanded treatment of adaptation (IPCC, 2011a). The findings of this section are summarised in Table 2.1,

4. For more information, see http://unfccc.int/kyoto_protocol/items/2830.php.

Table 2.1. Entry points for integrating adaptation into international climate change decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
IPCC	DECLG	All stages	Official engagement with IPCC ✓✓
	Research strategy – EPA	Enabling climate change research	Development of and funding for climate change research ✓✓
	Research community	Provision of policy-relevant analysis	Scientists and researchers engage with IPCC – publishing research, report writing and review process ✓✓
UNFCCC	DECLG	All stages	Official engagement with UNFCCC ✓✓ Co-ordination of National Communication under UNFCCC ✓✓
	NGOs and others	Lobby and review of policy	Contribute as observers or invited expert contributors ✓✓

IPCC, Intergovernmental Panel on Climate Change; UNFCCC, United Nations Framework Convention on Climate Change; EPA, Environmental Protection Agency; DECLG, Department of the Environment, Community and Local Government; NGO, non-governmental organisation.

which sets out the policy level, key actors, stage in the policy cycle, and entry points for intervention.

2.2 European Union Policy Context

2.2.1 Climate change policy

Tackling climate change is a key priority of the Sixth Community Environmental Action Programme (EAP) (COM/2001/31/). The 2005 communication *Winning the Battle against Global Climate Change* recommends that a number of elements should be included in the EU's future climate change strategy, including adaptation, extension of strategies, innovation, public awareness, use of market-based instruments, stronger co-operation, research and mitigation (COM/2005/35). In its 2007 communication *Limiting Global Climate Change to 2°C*, the European Commission (EC) argued that strong scientific evidence shows that urgent action to tackle climate change is imperative (COM/2007/02/). The European Union (EU) and its Member States have confirmed their target to limit the global average temperature increase to 2°C compared with pre-industrial levels (COM/2007/02/). The 2008 EU Climate and Energy Package contained proposals on effort sharing, revision of the EU Emissions Trading Scheme (ETS) and geological storage of carbon dioxide and pledged that the EU would reduce GHG emissions by at least 20% of 1990 levels by 2020 and reduce energy consumption by 20% by 2020 by improving energy efficiency (EC, 2008).

Since 2010, the EU Directorate-General (DG) for Climate Action (CLIMA) co-ordinates all EU activities related to climate change. One of the four sub-directorates addresses Mainstreaming Adaptation and Low Carbon Technology and is responsible for both domestic actions on adaptation to climate change and inputs to the international process. The Expert Group on Adaptation (EGAD) prepares for and informs the international negotiations.

2.2.2 Adaptation to climate change in the EU

The EC White Paper on adaptation was published in April 2009 (EC, 2009a). The core objective of the White Paper is to improve the EU's resilience to the impacts of climate change. Enhancing resilience also means the chance to invest in a low-carbon economy, for example, by promoting energy efficiency and the uptake of green products. A phased approach is proposed by the White Paper: the first phase runs from 2009 to 2012 and will lay the foundation for a comprehensive EU adaptation strategy in 2013. This comprises four pillars of action:

1. Building the knowledge base on the impacts and consequences of climate change;
2. Integrating adaptation into EU key policy areas;
3. Employing a combination of policy instruments to ensure effective delivery of adaptation; and
4. Stepping up international co-operation on adaptation.

The White Paper aims to increase the resilience of a number of sectors, including health and social policies; agriculture and forests; biodiversity, ecosystems and water; coastal and marine; and production systems and physical infrastructure.

The Adaptation Steering Group (ASG) is hosted by the EC and is supported by a number of technical working groups on:

- Development of the knowledge base, including the EU Clearing House Mechanism 'Climate Adapt'[5],
- Policy integration; and
- Financial instruments.

Ireland is participating in the ASG and the relevant working groups as appropriate.

2.2.3 EU policy integration for climate change adaptation

A number of existing directives can be used to progress the adaptation agenda (these are outlined in more detail in the respective sections in this document):

- Environmental management – Environmental Impact Assessment (EIA) Directive and Strategic Environmental Assessment (SEA) Directive;
- Sectoral – Birds and Habitats Directives, Water Framework Directive (WFD), Floods Directive, Marine Strategy Framework Directive, and the proposed Soil Framework Directive;
- Common policy areas – transport, energy, agriculture and fisheries.

A number of EU working groups are already discussing adaptation, for example the WFD's Strategic Steering Group on Climate and Water and the Ad-hoc Working Group on Biodiversity and Climate Change. Most of the cross-cutting Directives also have a Common Implementation Strategy (CIS) comprised of various technical working groups, for example under the CIS for the WFD there is a working group on floods which will also support the implementation of the Floods Directive. The EC's Agriculture DG is also considering establishing a technical working group on climate change. An inventory is under way to establish a full list of the relevant working groups, with a view to identifying the groups of particular interest for the implementation of the White Paper's four pillars (EC, 2009a). The findings of this section are summarised in Table 2.2, which sets out the policy level, key actors, stage in the policy cycle, and entry points for intervention.

2.3 National Policy Context

The overarching climate change policy document is the *National Climate Change Strategy* (NCCS) 2007–2012 (DEHLG, 2007). The Department of the Environment, Community and Local Government (DECLG)[6] is currently in the process of developing climate change legislation.

5. Climate Adapt, the European Climate Adaptation Platform, was officially launched on 23 March 2012 (http://climate-adapt.eea.europa.eu/).

6. Formerly the Department of the Environment, Heritage and Local Government (DEHLG).

Table 2.2. Entry points for integrating adaptation into European Union climate change decision making

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible future ✓)
European Union: DG-CLIMA, European Council	DECLG	Formation Planning	Engagement with the EC on climate change adaptation via the IASG ✓✓
	National experts	Formation Planning Implementation	Expert participation in technical support groups to the ASG such as the KB-WG ✓✓
European Parliament	Members of the European Parliament	Formation	Engagement with European Parliament on climate change issues ✓✓

DG-CLIMA, Directorate-General for Climate Action; DECLG, Department of the Environment, Community and Local Government; EC, European Commission; IASG, Impacts and Adaptation Steering Group; KB-WG, Knowledge Base Working Group.

2.3.1 NCCS 2007–2012

The purpose of the strategy is to show how Ireland will meet its 2008–2012 commitment and to demonstrate which strategy measures will position Ireland for the post-2012 period. As part of this policy position, the Irish Government has committed to developing a national adaptation strategy. This will provide a framework for integrating adaptation issues into decision making at both national and local levels. The DECLG will lead on providing a national approach to adaptation. Research under the EPA's CCRP continues to inform this policy position.

2.3.2 National reports on implementation of the Convention to the Conference of the Parties – Fifth National Communication

Developed country Parties to the UNFCCC must submit national reports on implementation of the Convention to the Conference of the Parties (COP) on a periodic basis. The core elements of the national communications are information on emissions and removals of GHGs and details of the activities a Party has undertaken to implement the Convention. National communications usually contain information on national circumstances, vulnerability assessment, financial resources and transfer of technology, and education, training and public awareness and information on policies and measures.[7]

Ireland's Fifth National Communication focuses primarily on activities during the 3-year period 2005–2007, and is based largely on data available up to and including 2009 (DEHLG, 2010a). It includes the final emissions inventory data for 2007 and progress on vulnerability assessment, climate change impacts, research, and adaptation measures. Information is provided in relation to research, policy, sectoral activities and decision and policy support.

The *Report of the In-Depth Review of the Fifth National Communication of Ireland* (UNFCCC, 2010, p. 26) commended Ireland for "*its well-organized and systematic approach to developing a climate change adaptation strategy based on a good understanding of vulnerabilities and encourages Ireland to complete the development of the strategy*". The findings of this section are summarised in Table 2.3, which sets out the policy level, key actors, stage in the policy cycle, and entry points for intervention.

7. http://unfccc.int/national_reports/items/1408.php

Table 2.3. Entry points for integrating adaptation into national climate change decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DECLG	Formation Implementation	Consultation on climate legislation ✓✓
National	DECLG	Formation	Engage with policy formation ✓✓
National	EPA	Support research	Research focused on informing national adaptation policy/planning ✓✓

DECLG, Department of the Environment, Community and Local Government; EPA, Environmental Protection Agency.

3 Governance

3.1 Introduction

This chapter sets out a brief overview of the relevant national organisations and processes that contribute to the climate change adaptation landscape. This includes an examination of the formal and informal structures that shape the way adaptation planning occurs. This will help in understanding the interests that may influence decision making.

3.2 Organisations and Processes

At the Oireachtas level, the Joint Committee on Climate Change and Energy Security has representation from all the main political parties. The Orders of Reference of the Joint Committee are mainly focused on mitigation and energy, with no reference to adaptation (House of the Oireachtas, 2007). A Cabinet Sub-Committee on Climate Change and Energy Security was established in June 2007. The Committee is responsible for the co-ordination of work across government with respect to the climate change agenda; however, to date, the emphasis has also been on mitigation and energy. The Committee is supported by a cross-departmental Senior Officials Group, which is chaired by the Department of the Taoiseach.

Responsibility for co-ordinating development of climate change policy rests with the DECLG. Other departments with a potentially strong role to play in implementing climate change policies are the Department of Finance, the Department of Communications, Energy and Natural Resources (DCENR), the Department of Transport (DOT), the Department of Agriculture, Fisheries and Food (DAFF), and the Department of Foreign Affairs and their attendant agencies and authorities. At lower levels, responsibilities may, in time, be further distributed to regional and local authorities and to civil society.

The relationship between the various key actors in climate change in Ireland will evolve over time as more sectors and levels of governance engage in adaptation decision making.

3.2.1 DECLG

The DECLG is responsible for the formulation of Ireland's policy on climate change and has an overarching role in the delivery of this policy. Leadership on national and international climate change issues is provided by the DECLG, with other departments playing a role as required. This includes the Department of Finance, where tax policy and expenditure decisions increasingly take account of energy and environmental concerns, best illustrated through the introduction of a carbon tax and increased funding for schemes promoting energy efficiency. The DECLG is also the central department responsible for the quality and protection of the natural and built environment, housing, infrastructure, terrestrial spatial planning and some aspects of marine spatial planning.

3.2.2 Other government departments

Various government departments have responsibility for sectoral aspects of adaptation. The Department of the Taoiseach will play a lead role in ensuring and sustaining broad political commitment to the issue of climate change adaptation. The Department is responsible for advising the Taoiseach and for the development and co-ordination of policy in relation to economic and social development, Northern Ireland, the EU and public sector change and Oireachtas reform.

The Department of Finance will play an important role in facilitating adaptation at sectoral and local levels by providing resources for adaptation planning and action. However, to date, very few sectors have costed the impacts or benefits of climate change adaptation actions and those that have done so (e.g. on flooding) have funded adaptation from their existing budgetary allocations (for fuller discussion on this point see Section 3.4.1). Thus, at this point it is not possible to say what resources will be required to adapt to climate change or when they will be required. It is however worth nothing that at the policy level there will be an emphasis on budget-neutral options.

Other departments with responsibilities include the DAFF, the DCENR, the DOT, the Department of Health and Children (DOHC), and the Department of Enterprise, Trade and Innovation (DETI). These and other sectoral departments will be assessed more thoroughly in Chapter 5.

3.2.3 EPA

Currently, the EPA plays an important role in implementing the NCCS (EPA, 2009a). It has responsibility for national emissions inventories and projections, the EU ETS, research and capacity building, air and climate science, observations systems, and monitoring and analysis. The NCCS 2007 and the EPA 2020 Vision strategy have strengthened the Agency's role on climate change.

The Agency's CCRP is steered by a National Co-ordination Committee, with representation from a number of government departments and agencies with an interest in climate change. Research under the CCRP includes work on the theme of climate impacts and adaptation. The objective of the impacts and adaptation thematic area is to provide scientific support for the development of national policy and its implementation. The specific aims are to support climate change observations and monitoring, improve climate model prediction for Ireland, and utilise these predictions to provide information on impacts in support of decision making on adaptation. This also involves identification of vulnerabilities to the adverse impacts of climate change, risk assessment and management, the assessment of institutional adaptive capacity and the costs and benefits of adaptation options.[8] The activities of this thematic area are steered by the Climate Change Impacts and Adaptation Steering Group

The thematic area is also involved in international and EU policy and research networks, such as the EU EGAD (which feeds into the UNFCCC negotiations), the EU Working Group on the Knowledge Base (WG-KB) in support of the implementation of the White Paper on adaptation (EC, 2009a), European Environment Information and Observation Network (Eionet), EPAIG[9] and Climate Impact Research & Response Coordination for a Larger Europe (2nd Generation) (CIRCLE-2) (ERA-Net)).

3.2.4 Other agencies and services

A number of national agencies and services have responsibility around different aspects of climate change such as research, planning and implementation, including:

- **Met Éireann:** Carries out research into regional climate projections;
- **Marine Institute:** The Institute's national Marine Climate Change (MCC) research programme began in December 2007 and ran for 2 years. It maintains an ongoing interest in climate change;
- **Teagasc[10]:** Teagasc's current Environment Research Programme and its Economics and Rural Development Programme are predominantly focused on mitigation;
- **Sustainable Energy Authority of Ireland (SEAI):** The Authority is charged with implementing aspects of government policy on sustainable energy and climate change abatement, including statistics and projections on sustainable energy and achievement of targets;
- **The Office of Public Works (OPW):** The OPW is the lead body with responsibility for implementing flooding policy and strategy in Ireland;
- **Science Foundation Ireland:** Sustainable energy and energy-efficient technologies are a key focus of the current work programme of the Foundation;
- **Geological Survey of Ireland (GSI):** The GSI produces a range of products, including maps, reports and databases, for example INFOMAR, the successor to the Irish Seabed Survey, provides valuable information on Ireland's marine ecosystem and natural resources;

8. Some of this work is ongoing and some has been identified as knowledge gaps to be filled at a future date.
9. The EPA's network of interest groups (relevant group, Impacts and Adaptation).
10. Teagasc, the Irish Agriculture and Food Development Authority.

- **Heritage Council:** The role of the Council is to propose policies and priorities for the identification, protection, preservation and enhancement of Ireland's built, cultural and natural heritage:
- **Fáilte Ireland:** Fáilte Ireland's role is to guide and develop a sustainable tourism sector in Ireland; and
- **The Council for Forest Research and Development (COFORD):** Facilitates forestry research, including the impacts of climate change and the mitigation and energy potential of forests.

3.3 Local Government

National government plays an important role in progressing adaptation policy and legislation; however, adaptation is inherently local, which means that local government will have a key role to play in implementation.

Local authorities are multifunctional organisations that deliver a range of services, including housing and building, roads and transport, water and sewerage, planning and development, environmental protection, recreation and amenity, and other miscellaneous services (DEHLG, 2008a). At the regional level, regional authorities co-ordinate some of the county/city and sub-county activities and they also play a monitoring role in relation to the use of EU structural funds. Proposed amendments to the existing planning and development legislation would see the regional authorities having a much stronger role in future (DEHLG, 2008b).

The Development Plan is the basic policy document of the local authority in terms of planning and it is the instrument through which the planning objectives of the local authority are set out, along with planned regulation and control measures (Mullaly et al., 2008). This implies that Local Development Plans could also be appropriate vehicles for addressing climate change adaptation (see Section 5.4.1).

Local Authority Service Indicators were introduced in 2004 to measure the performance of Ireland's local authorities across a range of services that they provide. A climate change mitigation indicator was introduced in 2008, which measures and reports on energy use in local authorities (Local Government Management Services Board, 2009). The development of an appropriate climate change adaptation service indicator should be considered, which could measure and report on the adaptation planning and implementation at the local level.

The role of local authorities in assessing vulnerability and planning adaptation actions will be important. This will require resources in terms of expertise, capacity building, co-ordination and finances. Local government responses to climate change are hindered by lack of horizontal integration of climate change adaptation issues. To address this, a number of local authorities have established climate change teams comprised of members from each service area; this has resulted in more proactive measures being taken and enhanced knowledge transfer among departments. A review of County and City Development Plans from a climate change perspective was conducted by Comhar in 2008. It found that the policy focus tended to be on mitigation, especially energy issues, with little attention given to adaptation (Flood and Ní Chiardubhain, 2008). Dublin City Council has led the way in terms of climate change policy and developed a strategy for the period 2008–2012 that deals with waste, transport, planning, energy and biodiversity. The capacity of local authorities to adapt to the impacts of climate is the topic of an ongoing study by the National University of Ireland Maynooth, funded by the EPA's CCRP.

3.4 Distribution of Resources and Local Governance

3.4.1 Distribution of resources

Resources will be needed for climate change adaptation assessment, policy making, information provision and planning, and for the implementation of adaptation measures and actions. Analysis of the costs and benefits of adaptation at a national level or for prioritised actions is an important step in the development of policy and planning measures, which has yet to be undertaken. However, internationally, there is generally a low level of knowledge in this area (Agrawala and Frankhauser, 2008), leading to the commissioning of several new studies on the economics of adaptation (SBSTA, 2009).

It is desirable that a careful assessment of costs of options is included in any study of adaptation options and that the measurable benefits of these options are reported (SBSTA, 2009). Global assessments of the economics of climate change, such as the Stern Report, have shown that the costs of inaction greatly outweigh the costs of action. Dealing with the impacts of climate change and reducing GHG emissions in the short term will reduce the need for more costly or unaffordable adaptation costs in the future (Stern, 2007).

It is worth noting that at different levels of policy making different costing approaches will be necessary, because at different layers of decision making adaptation options have different characteristics. The characteristics of adaptation options can vary between 'hard' engineering-type responses and 'soft' options such as policy development, policy integration and capacity building. These different options can occur across all levels of decision making and imply different financial obligations. From a national policy-making perspective, it is quite possible that the soft options are most appropriate, with the hard options being limited to lower-level and sectoral decision making. This implies different levels of resource commitment at different governance levels.

In this document, the focus is on resources at the level of policy making, where there are many budget-neutral options, such as capacity building, co-ordination, integration and the use of existing tools. Costing of more concrete adaptation actions will emerge in time as local authorities and sectors identify and prioritise adaptation measures. In the current difficult economic climate, resources (human and financial) are limited across all sectors and levels of government. There are no dedicated resources for adapting to climate change and there is unlikely to be any change to this situation in the near future[11]. Individual departments and agencies[12] will be responsible for meeting the costs of climate risk assessments and adaptation measures in their sector. Thus, the onus will be on each department or agency to prioritise adaptation policy areas, estimate costs and benefits and resource these within their existing expenditure allocation. It should be noted that this sector-by-sector approach to identifying and implementing adaptation actions may run counter to the objective of improving horizontal co-ordination and enhancing synergies. Therefore, in this context, the need for a national prioritisation process in order to focus scarce resources becomes more relevant and pressing.

It is also worth noting that there is a role for privately funded adaptation, such as that required for privately owned critical infrastructure (e.g. energy). Future investments in privately owned critical infrastructure should ideally be screened for climate change risk, which may require the introduction of measures to enhance future resilience; these measures will need to be costed and funded by the owners of such infrastructure.

While specific measures have been set up to collect environment and climate-related revenue, none of this is currently channelled to address adaptation, the only exception being the Environment Fund, which is sourced from levies on plastic shopping bags and the landfill of waste. The Environment Fund is dedicated to environment-related activities, including funding research on climate change. The carbon tax introduced in 2009 feeds directly into the Exchequer, and does not target resources for climate change adaptation. Likewise, auctioning revenue generated from the EU ETS is not ring-fenced for climate-change-related activities, either domestically or internationally.

A report by the Commission on Taxation in 2009 includes a chapter on tax and the environment. The recommendations include the introduction of a carbon tax (acted on in 2009), taxes on other GHGs, such as methane and nitrous oxide, environmental products and amendments to taxes related to energy efficiency and transport. The report reveals that VAT and excise duties are the main 'environment-related' taxes in the country – and that in common with most EU Member States, environmental tax revenues are low, in the order of 2–3% of the Gross Domestic Product (GDP). The report raises the issue of targeting revenue from environmental taxes to environment-related activities to increase public support for the measures. However,

11. Department of Finance response to DEHLG adaptation survey.
12. It is also worth noting that the private sector will be expected to fund its own adaptation activities.

no specific measures are recommended to target environment-related taxes to environment/climate change activities.

Overall, fewer resources in the public service due to the economic downturn will pose a challenge to planning and implementing adaptation actions. However, it should be noted that there are many 'low-cost' or budget-neutral measures that can be taken and which would greatly enhance adaptive capacity, such as:

- Improved co-ordination across sectors;
- Improved policy coherence;
- Strategic forward planning;
- Detailed appraisal of climate risks; and
- Greater use of instruments such as Regulatory Impact Assessment (RIA), SEA, Appropriate Assessment (AA) and EIA.

Local authorities have limited fiscal autonomy, which is likely to be a challenge to local-level planning and action on climate change adaptation. While the resources available are decreasing, those available can be spent in a climate-sensitive manner to minimise climate risk, avoid maladaptation and maximise synergies between short-term needs and longer-term adaptation objectives.

3.4.2 Local-level governance

The vertical integration of governance at the local level with national-level strategy, processes and action is worthy of note in the context of climate change adaptation, as adaptation actions are primarily local. In a study of sustainable development in the context of local development, it was found that while there is a trend towards a multi-stakeholder, multi-sector, multilevel approach, governance alone is not a sufficient condition to steer a path to sustainable development (Mullally et al., 2008). It also requires central government to provide stimulus, support and direction to the process. Since many of the decisions and policies that impact at the local level are either made or channelled through the national level, the strategic integration of sustainable development needs to be steered at national level. Integration must be driven from the top down in such a way that it enables local action and the feeding up of local and regional priorities and experience. Integration should be supported by high level interdepartmental groups or committees and agencies such as the EPA, and the SEAI also has a critical role to play in a co-ordinated approach.

In the context of climate change there is no reason to believe that the findings from the sustainable development study (Mullally et al., 2008) are any less valid. The main point of relevance is that integration at local level requires corresponding integration at national level. In addition, vertical integration of governance, i.e. linking local and national government, needs to be strengthened. At present, power resides predominantly at the national level in Ireland. Government departments use a mixture of traditional command and control instruments (legislation, regulation, directives, etc.), influencing instruments (control of finance) and co-operative instruments (consultation and joint working groups) in their relationships with local authorities (DEHLG, 2008b). There is a need to enhance co-operation between local and national levels and formalised structures, such as the County and City Managers' Association (CCMA), which meet with senior management in the DECLG have a key role to play. In particular, the CCMA Environment Committee will have an important guiding role to play in climate change adaptation implementation at the local level.

3.4.3 Summary

It is clear from this initial description of the departments and agencies responsible for climate change policy and implementation that a large number of institutions are already involved in this process. Responsibilities and capacities are spread out across a broad landscape, with varying interests and commitments relating to climate change. Some mechanisms and tools are already in place to co-ordinate some of these activities but more are needed.

In relation to the implementation of adaptation activities at the local level, resources, appropriate guidance and capacity building will be key issues to be addressed. An analysis of the costs and benefits of adaptation is an important next step. Adaptation

indicators for monitoring and for future review purposes should also be developed. It is also clear that there are actions which can be done that require little additional resources to implement, but need, nevertheless, to be steered from the national level and have to be well co-ordinated. In this respect, vertical integration will be a key consideration for the successful implementation of adaptation strategies. The findings of this section are summarised in Table 3.1, which sets out the policy level, key actors, stage in the policy cycle, and entry points for intervention.

Table 3.1. Entry points for integrating adaptation into governance activities.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National level	DECLG	Formation Planning Implementation	Policy/Legislation to improve national co-ordination by proposing structures and procedures to enable horizontal and vertical co-ordination ✓
National level	DECLG	Formation Planning Implementation	Requirements for analysis of the costs and benefits of adaptation actions, highlighting win–wins/co-benefits options ✓
National level	DECLG	Implementation	Raise the profile of climate change adaptation in the Cabinet Sub-Committee on Climate Change and Energy and in the Joint Oireachtas Committee ✓
National level	DECLG/ Local authorities	Implementation	A local authority service indicator for climate change adaptation could be considered ✓

DECLG, Department of the Environment, Community and Local Government.

4 National Strategic Planning

4.1 Introduction

This chapter sets out the key national policy either already in place or ongoing/forthcoming. This includes the major relevant documents, when they were created, the key institutions responsible for funding and implementing them, and potential entry points for integrating climate change adaptation.

4.2 Key National Strategic Planning Documents

The Capital Expenditure Review sets out infrastructure investment priorities for the years 2010–2016 and fulfils the requirement to publish a revised set of investment priorities as pledged in the Renewed Programme for Government (DOF, 2010). The Review seeks to identify the optimum level of infrastructure investment and the sectors in which this investment will take place in order to:

- Contribute to economic recovery;
- Support employment;
- Deliver important social infrastructure; and
- Develop a low-carbon, Smart Economy.

The current overarching government strategy for medium-term economic recovery is the *Building Ireland's Smart Economy: a Framework for Sustainable Economic Renewal*, which was published in December 2008 (Department of the Taoiseach, 2008). This strategy commits to implementing "*a 'new green deal' to move us away from fossil fuel-based energy production through investment in renewable energy and to promote the green enterprise sector and the creation of 'green-collar' jobs*". While the emphasis is on the promotion of renewable energy and resource efficiencies (mitigation options), recent thinking makes an explicit link between resource efficiency and ecosystem resilience and the green economy (EEA, 2012). From a climate change perspective, the promotion of resilient ecosystems is one of the key adaptation responses (in terms of supporting green measures). Accordingly, the promotion of the 'Green Deal' should also lend itself to climate change adaptation.

The National Spatial Strategy (NSS) 2002–2020 is the key national strategic planning framework document, which aims to achieve a better balance between social, economic and physical development, across Ireland, supported by more effective planning (see Section 5.4.1). The NSS and future iterations offer potential entry points for adaptation planning as the focus is on decades and the medium rather than the short term.

Ireland's National Sustainable Development Strategy (NSDS) (1997–2002) and the more recent National Report for Ireland (2002) set out the strategy for achieving sustainable development. Following the adoption by the EU of a revised EU Sustainable Development Strategy (EUSDS) in June 2006, Ireland committed itself to revising and publishing a revised NSDS in 2007. A consultation process carried out in 2007 led to a review of the 2002 NSDS by Comhar. The resulting report included recommendations to inform the future strategy (Comhar, 2007). Climate change is highlighted as a key challenge to sustainable development, with a focus on reducing GHG emissions. The revised NSDS was published in 2012. *Our Sustainable Future* (DECLG, 2012) frames sustainable development within the context of a low carbon economy. The Strategy aims to provide a long-term framework for actions in many policy areas, including climate change. Specific climate change adaptation measures contained within the Strategy include:

- Continued support for climate change impacts and adaptation research;
- Development of a National Adaptation Framework to mobilise adaptation across sectors and different levels of governance; and
- Ensuring that critical infrastructure is climate resilient.

The DEHLG Statement of Strategy 2008–2010 sets out the Department's commitment to climate change (DEHLG, 2008a). Particular emphasis is placed on the promotion of climate change integration into policy making across the full range of government policy and local government functions.

The EPA state of the environment report is published by the Agency every 4 years. The current report highlights climate change as a key challenge, along with mainstreaming environmental considerations into policies and plans. There is an emphasis on understanding and adapting to climate impacts (EPA, 2008).

4.3 Summary

In the changed economic environment, climate change (mitigation or adaptation) is not mentioned in the revised capital expenditure allocations for 2010–2016. Other documents, such as the NSS, the NSDS, the DEHLG Statement of Strategy 2008–2010 and the EPA state of the environment report, highlight the need to integrate climate change into other policies and plan making. Overall, at the national strategic level, the need to integrate climate change into existing policies and strategies is recognised and this must be capitalised on. The findings of this section are summarised in Table 4.1, which sets out the policy level, key actors, stage in the policy cycle, and entry points for intervention.

Table 4.1. Entry points for integrating adaptation into national strategic planning.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National level	Department of Finance	Formation	Revisions of capital expenditure allocation ✓
National level	DECLG	Formation	Revisions of the DECLG Statement of Strategy ✓✓ Revision of documents such as NSS, NSDS ✓✓
National level	EPA	Implementation	EPA state of the environment report ✓✓

DECLG, Department of the Environment, Community and Local Government; NSS, National Spatial Strategy; NSDS, National Sustainable Development Strategy; EPA, Environmental Protection Agency.

5 Sectoral Planning

5.1 Introduction

This chapter sets out the main processes either already in place or forthcoming, relating to sectoral planning. It lists the key legislative drivers at both European and national levels, where relevant, as well as the strategic policy documents, when they were created, and the key institutions responsible for funding and implementing the management regime. Initial entry points have also been identified. No area has been prioritised for particular attention as a national prioritisation process has yet to be completed.

5.2 Water Quality and Quantity

Key impacts
Changes in the quality and quantity (availability) of water resources, affecting many sectors, including human health, agriculture, food production, biodiversity, industry, the location and viability of potable water infrastructure, and the treatment of wastewater (public and private) (Desmond et al., 2009).

5.2.1 Water quality

The WFD consolidates and updates existing water legislation across the EU (Directive 2000/60/EC). The Directive provides for water management on the basis of natural hydrographic units, termed River Basin Districts (RBDs). The implementation of the WFD is taking place in the context of River Basin Management Plans (RBMPs) led by local authorities. The objective of the RBMP is to achieve at least 'good status' for water by 2015. The first set of plans applies to the period 2009–2010 and will be subject to an ongoing 6-year cycle of review, reassessment and revision. The Directive does not explicitly address climate change. However, an assessment of the WFD by the European Environment Agency (EEA) shows that it "*is well suited to handle the long-term implications of climate change with its step-wise and cyclical approach*" (EEA, 2007).

In the context of the WFD Common Implementation Strategy, an activity on Climate Change and Water was initiated in 2007 to produce guidance on how Member States should incorporate consideration of climate variability and change into the implementation of EU water policy. From this initiative, the guidance document *River Basin Management in a Changing Climate* was developed, which illustrates ways in which preparations can be made for climate change within the second and third RBMP cycles (Council Directive 2000/60/EC). As a next step, the Commission will present by 2012 a Blueprint to Safeguard European Waters, which, together with the analysis of all plans for 110 river districts, will perform a review of the Strategy for Water Scarcity and Droughts and on the vulnerability of water and environmental resources to climate change and man-made pressures (Gammeltoft, 2010).

In addition, the EC White Paper on adapting to climate change (EC, 2009a) highlights the need to promote strategies that increase resilience to climate change of health, property and productive functions of land, inter alia, by improving the management of water resources and ecosystems.

The WFD was transposed into Irish law in 2003. The DECLG has the overall co-ordination role in the implementation of the Directive. The EPA has responsibilities in relation to reporting, classification of waters and other technical activities. This work is supported by a number of working groups, including a National Advisory Committee, a National Technical Coordination Group and advisory/technical groups in specialist topics, such as ground and surface water, risk assessment, geographical information systems, public participation and monitoring. These working groups may prove to be a useful access point for climate change integration with subsequent iterations of RBMPs. There may be potential to set up a technical sub-group on climate change and the WFD.

The first iteration of the RBMPs has been subject to a 'climate check'. The Programme of Measures (POM)

has been 'checked' for resilience and flexibility in the context of predicted climate change (ESBI, 2008). The checking study found that the POM can be flexible and adaptable to potential future climate change in terms of temperature, storm surge, floods and drought and may contribute to national adaptation strategies. From a sample of RBMPs examined for this report, a general trend suggests that climate change will be addressed as a local and a future issue, while climate-proofing is planned for subsequent iterations of the plans in line with EU guidance under the Common Implementation Strategy. It should be noted that it may be difficult to analyse and address climate change impacts in timescales foreseen for future iterations of RBMPs, and this may lead to a tendency to rely on reactive rather than planned adaptation measures. At a minimum, analysis and provision for monitoring for climate change signals should be considered as a priority with a view to planning for climate change in the water sector.

5.2.2 Water quantity (infrastructure and services)

The provision of public water and sewerage services is the responsibility of city and county councils. The role of the DECLG is in developing and implementing government policy in this area, making sure that the necessary funding is made available to finance the Water Services Programme and monitoring physical and financial progress on schemes. The water services sector has entered into a new phase with the implementation of the WFD and the Water Services Investment Programme (WSIP) 2010–2012, which has been aligned with the priorities identified for the RBMPs adopted by local authorities (DEHLG, 2010b).

The Water Services Programme is essentially divided into two main elements: the WSIP and the Rural Water Programme (RWP). The WSIP is a 3-year rolling plan for the provision of major water and sewerage schemes – schemes costing over €1 million at present. The RWP provides funding for the provision and management of private group water supplies and small public water and sewage schemes throughout Ireland. Responsibility for the scheme has been devolved to local authorities, with block grant funding provided by the DECLG. The Exchequer meets the full capital costs of providing services to domestic customers. The non-domestic sector must pay for services provided to it.

Local authorities prepare needs assessment reports that feed into the preparation of the rolling 3-year WSIP. The current programme recognises that the planning of future schemes will need to take appropriate account of best practice in relation to energy efficiency and other issues emerging from ongoing work on the development of national policy on

Table 5.1. Entry points for integrating adaptation into water quality decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Environment	DECLG	Formation	WFD Technical Expert Group on water and climate change ✓
National	DECLG/EPA	Planning Implementation	Amendment legislation for wastewater management and monitoring ✓ Revision to codes of practice for wastewater management ✓ Explore possibility of setting up new technical sub-group on climate change and water under the WFD national technical co-ordination group ✓
Local level	Local authorities	Implementation	Local authority needs assessment and Water Services Investment Programme offer opportunities to integrate climate change adaptation ✓
Sectoral research	DECLG/EPA	Implementation	Develop national guidelines for the integration of climate change into subsequent iteration of RBMPs ✓ Develop a monitoring system for climate change signal in the water sector ✓✓

DG, Directorate-General; DECLG, Department of the Environment, Community and Local Government; WFD, Water Framework Directive; EPA, Environmental Protection Agency; RBMP, River Basin Management Plan.

adaptation to the adverse impacts of climate change. The adaptation agenda also points to the need for assessment in some locations of the vulnerability of existing infrastructure to flood damage (DEHLG, 2010b). In this context, both the local authority assessment and the WSIP may be future climate change adaptation entry points.

Policy for wastewater treatment and disposal (including septic tanks) for single houses is set by the Planning and Building Standards sections of the DECLG. The Renewed Programme for Government includes a commitment to introduce a scheme for the licensing and inspection of septic tanks and other on-site wastewater treatment systems. The DECLG is considering how the inspection of septic tanks should be carried out and it is intended to undertake consultations with stakeholders on the matter. This will involve consideration of the impacts of any proposals, including the costs of the standards to be applied, the qualifications and competency levels required of those carrying out inspections and the appointment and regulation of inspectors.[13] From a climate change adaptation perspective, there may be opportunities at this stage to intervene in the context of climate change, particularly with regard to increased precipitation and extreme events such as flooding that may impact on the location and workings of septic tanks. The most important guidelines in the area are the EPA's *Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses* (EPA, 2009b). In light of any changes to legislation, these guidelines may also have to be revised, which may again provide an opportunity for the integration of climate change adaptation.

The recent report by the Irish Academy of Engineers *Ireland at Risk: Critical Infrastructure, Adaptation for Climate Change* suggests that management of water supply infrastructure and implementation of water policy and strategy should be conducted on a regional basis, consistent with RBMPs (IAE, 2009). Other recommendations include those for the sewerage infrastructure, review of low flow options, use of technology to capture data and the implementation of universal water charging (EPA, 2009a).

13. Comments received from the Planning and Building Standards section of the DOEHLG (now DECLG).

A recent report by Forfás, the national policy advisory body for enterprise and science, entitled *Adaptation to Climate Change: Issues for Business* (Forfás, 2010) summarises the key enterprise issues, both opportunities and risks, arising from climate change. This report and previous work on water policy (Forfás, 2008, 2010) have recommended the following areas which may provide future entry points for climate change adaptation:

- The development of a national framework and the introduction of a single national water authority with overall responsibility for system planning, delivery and maintenance;
- Increased investment in water distribution, particularly in key regional centres, such as those facing capacity shortages in the next 5 years (Dublin, Athlone, Galway, Letterkenny, Mallow and Wexford); and
- The proposed introduction of water charging as a key incentive in promoting adaptation behaviour.

5.3 Flooding

Key impacts
Increased risk of flooding, which will impact on critical infrastructure (water supply, flood protection, energy supplies, transport, communications), buildings, land use, business and industry, agriculture, human health and well-being (Desmond et al., 2009).

The Floods Directive establishes a framework for the assessment and management of flood risks aimed at reducing the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in Europe (Directive 2007/60/EC). The Directive requires Member States to assess all watercourses and coastlines at risk from flooding, to map flood hazards, to identify assets and humans at risk in these areas, and to take adequate and co-ordinated measures to reduce the flood risk. In line with the integrated river basin approach taken under the WFD, the Directive also requires Member States to co-ordinate their flood risk management practices in shared rivers basins. The Floods Directive

provides a comprehensive mechanism for assessing and monitoring increased risks of flooding due to climate change and for developing appropriate adaptation measures (EC, 2007).

In March 2010, the EC (Assessment and Management of Flood Risks) Regulations 2010 were enacted by government. These Regulations provide for the transposition into Irish national law of the provisions of EU Directive 2007/60/EC, establishing a framework for community action in the field of assessment and management of flood risks.

The OPW is the lead agency with responsibility for implementing flooding policy and strategy in Ireland. The strategy involves structural works, such as flood relief schemes, particularly where flooding is already a problem and non-structural measures such as raising awareness of flood risk, including through the flood mapping website (http://www.floodmaps.ie), and promoting preparedness and effective emergency response planning as well as better flood forecasting and warning. Catchment Flood Risk Assessment and Management (CFRAM) studies and their product Catchment Flood Risk Management Plans (CFRMPs) are at the core of national policy for flood risk management and the strategy for its implementation. CFRMPs are under various stages of development for three pilot catchments, the Lee, Dodder and Suir (http://www.opw.ie).

The report of the Flood Policy Review Group sets out a comprehensive policy approach to flooding nationally and a definition of the roles and responsibilities of the various stakeholders involved (OPW, 2004). Climate change is identified as one of the key elements that need to be addressed when assessing future flood relief measures in Ireland.

Consideration of the potential impacts of climate change on flooding and flood risk forms an integral part of all of the work programmes that have been established to implement a flood risk management strategy for Ireland:

- **PFRA:** A national Preliminary Flood Risk Assessment (PFRA) is a requirement of the EU Floods Directive;
- **CFRAM:** The CFRAM programme will produce flood maps and CFRMPs;
- **Coastal flood maps:** Under the Irish Coastal Protection Strategy Study (ICPSS), draft flood maps for current/historic conditions for the east and south coasts have been prepared and issued to local authorities for review;
- **Planning and development management:** The *Guidelines on the Planning System and Flood Risk Management* set out a framework for how flood risk should be considered in both the forward planning and development management contexts (DEHLG and OPW, 2009); and

Table 5.2. Entry points for integrating adaptation into flooding decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Environment	DECLG	Formation	Future review of the Floods Directive ✓
National	DECLG	Implementation	Closer co-ordination of the Floods and Water Framework Directives in the preparation of the second iteration of RBMPs should provide opportunities to address climate change adaptation ✓
National	OPW	Implementation	Promotion of flood risk guidelines to enhance adaptive capacity ✓
National	OPW	Implementation	Ongoing review of flood forecasting and flood warning systems should identify opportunities for climate change adaptation ✓✓
Sectoral research	DECLG/OPW	Implementation	Risk assessment of assets in the context of flooding may be needed; development of support tools would be needed ✓

DG, Directorate-General; DECLG, Department of the Environment, Community and Local Government; RBMP, River Basin Management Plan; OPW, Office of Public Works.

- **Flood forecasting and emergency response:** The OPW has also assisted the DEHLG in the development of protocols for emergency response planning for flood events.

5.3.1 Water as critical infrastructure

The report *Ireland at Risk: Critical Infrastructure, Adaptation for Climate Change* (IAE, 2009) argues that, for each element of critical infrastructure, its frequency of exposure to flooding, its resilience and the consequences of its failure should be considered. It is suggested that a formal flood risk assessment should be carried out for each critical infrastructure asset. The report suggests that agreement should be reached on standards, methodologies and actions to ensure that risk assessments are carried out to an appropriate standard and to provide guidelines for implementation. Other points for consideration include delineation of flood plains, management and control of development, identification of significant flood defences, implementation of coastal protection plans, improvement in flood forecasting and warning, and installation of a tidal gauge network.

One of the best examples of early adaptation measures that can be put in place in respect of flooding is to ensure that decisions in respect of future development are taken fully in accordance with the recently published planning guidelines relating to flood risk management (DEHLG and OPW, 2009). The use of these guidelines in association with both the current scenario and future scenario flood hazard and risk mapping being produced under the OPW CFRAM programme and the ICPSS will allow such adaptation measures to be implemented.

5.4 Spatial Planning and the Built Environment

Key impacts
Impacts on transport, communications, energy and water supply, housing and communities are likely to pose a specific threat to densely populated areas (EC, 2009b).

5.4.1 Terrestrial spatial planning

The Minister for the Environment, Community and Local Government has overall responsibility for planning at a national level in Ireland. The NSS 2002–2020 is the key national strategic planning document, which aims to achieve a better balance between social, economic and physical development across Ireland, supported by more effective planning.

The key legal instrument relating to land-use and terrestrial spatial planning is the Planning and Development Act 2000 (as amended), which aims to contribute to sustainable development. This is the first time sustainable development has been included in an Irish legislative instrument and represents a move away from the traditional shorter-term focus of planning towards a longer-term view. The 2000 Act prescribes a structured hierarchy of plans from national level to the more detailed local level. It also gives statutory recognition to regional development guidelines, issued by the eight regional authorities, as well as Local Area Plans.

The Development Plan is central to the planning system and is the main public statement of planning policies for a local community setting out the land-use, amenity and development objectives and policies of the planning authority for a 6-year period.

A Development Plan consists of a written statement of objectives and a map or series of maps. As such, it sets out where, for example, roads, water supplies, sewerage, etc., will be provided and it zones land for particular purposes (e.g. housing, shopping, schools, factories, etc.). Consequently, this affects the type of buildings that can be constructed and the use to which such lands can be put. At a practical local planning authority level, all planning applications are measured against the Development Plan to assess their conformity with the plan's objectives and permitted development must normally be in accordance with the plan. Section 10 of the 2000 Act (Planning and Development Act, 2000) specifies the mandatory objectives that must be contained in a Development Plan. The First Schedule of the Act lists those discretionary objectives that a plan may contain, such as:

- Regulating, restricting or controlling development in areas at risk of flooding (whether inland or coastal), erosion and other natural hazards;
- Regulating, restricting and controlling the development of coastal areas and development in the vicinity of inland waterways; and/or
- Regulating, restricting and controlling development on the foreshore, or any part of the foreshore.

While these discretionary objectives introduce the potential for flexibility on the part of local authorities, given local circumstances and priorities, to date this option has been somewhat underutilised and Development Plans have tended to follow a common format.

The Planning and Development Acts 2000–2010 (DEHLG, 2010c) have the principal aim of supporting economic renewal and promoting sustainable development driven by the overarching ambition to strengthen local democracy and accountability. They also strive to ensure a closer alignment between the NSS, Regional Planning Guidelines, Development Plans and Local Area Plans. Under the new Act and in support of the broader climate change agenda, Development Plans will be required to contain mandatory objectives for the promotion of sustainable settlement and transportation strategies in urban and rural areas, including measures to reduce GHG emissions and address climate change adaptation. Climate change adaptation is defined under the Act as the "*taking of measures to manage the impacts of climate change*" (Part 2, Section 4, C).

5.4.2 Other planning initiatives of relevance to climate change adaptation

- **Adaptation planning:** The DEHLG has published planning guidelines in collaboration with the OPW (DEHLG and OPW, 2009), which set out a framework for how flood risk should be considered in both the forward planning and development management contexts.
- **National Coastal Protection Strategy:** A National Coastal Protection Strategy is under development by the OPW.
- **Spatial Planning Geographical Information Systems:** The iPlanGIS programme has recently been developed by the DECLG to incorporate within a single system, all land-use zonings outlined in Development Plans and Local Area Plans, as well as additional layers of information, some of which could prove useful for adaptation planning:
  - Flooding areas and flood risk area categories (DEHLG and OPW, 2009);
  - Vacant houses and unfinished estates;
  - Designated Natura 2000 and protected areas and biodiversity zones; and
  - Water catchment management plans and RBMPs, etc.

Table 5.3. Entry points for integrating adaptation into spatial planning and the built environment decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DECLG	Formation	Planning and development legislation provisions for climate change adaptation ✓✓
		Planning	Guidelines and tools on how to integrate adaptation and broader climate change considerations into the statutory planning system and the built environment ✓
Local	Local authorities	Implementation	Local level planning ✓✓ Spatial planning GIS system ✓✓
Sectoral research	DECLG/EPA and sectoral actors	Implementation	Include climate change adaptation into materials, design, guidelines for new builds and retrofitting existing building stock ✓

DECLG, Department of the Environment, Community and Local Government; GIS, Geographical Information System; EPA, Environmental Protection Agency.

A National Landscape Strategy has been prepared by the Planning Policy and Legislation Section of the Department of Arts, Heritage and the Gaeltacht (DAHG) and is out for consultation, which may provide a potential entry point. In addition, the Seveso Directive on major accident hazards of certain industries has a land-use planning element that may be relevant to adaptation planning; the Directive is currently under review by the EC.

5.4.3 Built environment

The built environment is an important product of spatial planning. To date, in Ireland, the built environment and the urban fabric have been considered mainly in the context of climate change mitigation (particularly in relation to energy efficiency). However, both existing and new building stock will have to adapt to the impacts of a changed climate. Thus, in many ways the energy efficiencies that may be gained through retrofitting existing stock and the design of new stock could also be seen as adaptation measures.

The need to integrate climate change adaptation into long-term planning, regulations, design standards and materials for new and existing infrastructure and buildings is important from a domestic, community and business perspective. In addition, there may be a potential significant opportunity for the domestic construction sector in this regard.[14]

5.4.4 Marine spatial planning

Key impacts

Coastal and marine infrastructure, stress for the fisheries and aquaculture sectors, effects on coasts and marine ecosystems**,** and existing defences (Desmond et al., 2009).

In the EU, the Integrated Maritime Policy (IMP) (COM/2007/575 final) aims to provide a coherent framework that exploits synergies between different policy areas of the sea and resolves potential conflicts. It lays the foundation for the governance framework and cross-sectoral tools necessary for an EU IMP. Maritime Spatial Planning (MSP) and Integrated Coastal Zone Management (ICZM) are recognised as key approaches for sustainable decision making in this area. The EC has published a set of common principles to be applied when implementing both MSP and ICZM.[15] To implement the Environmental Pillar of the IMP, the Marine Strategy Framework Directive (2008/56/EC) has been adopted. This aims to achieve 'good environmental status' of the EU's marine waters by 2021. The Directive establishes European Marine Regions on the basis of geographical and environmental criteria, in a similar way to the RBDs established by the WFD. Each Member State must, in co-operation with other Member States and non-EU countries within a marine region, develop strategies for its marine waters. All of these initiatives represent a new and evolving framework for marine and coastal management in the EU and as such it is difficult to speculate on the impacts they will have for adaptation to climate change.

In Ireland, marine and coastal sectors have been managed largely on a sectoral basis. This strong land–sea divide has resulted primarily from the jurisdictional divide associated with the position of the Mean High Water Mark. Historically anything landward of this line was managed by the Department of the Environment (or equivalent) while anything seaward of the line was managed by the Department of the Marine (or equivalent). In an attempt to address this fragmented management approach, the Planning and Development Act, 2000, included for the first time, the foreshore area within the jurisdictional area of local planning authorities for the purposes of foreshore development planning. While this change represents a move in the right direction, in 2010, management still remains divided between eight central government departments and approximately 17 statutory or semi-state agencies. A draft CZM Plan for Ireland was published in 1997; however, the recommendations from this document have yet to be taken forward.

In 2010, all foreshore functions were transferred to the DEHLG (now DECLG). This includes not only licensing and leasing of foreshore development (including marine renewables) but a broader responsibility for coastal management and maritime spatial planning. Currently, it is not known whether this transfer of

14. Comment from Forfás, July 2010.

15. In relation to MSP, see COM/2008/791 final and, for ICZM, see COM/2002/413 final.

Table 5.4. Entry points for integrating adaptation into coastal and marine decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG MARE	DECLG	Formation Planning	Integrated Maritime Policy, Marine Strategy Framework Directive opportunities for climate change adaptation ✓
National	DECLG	Implementation	Interdepartmental Marine Coordination Group possible role ✓
National	DECLG	Implementation	Development of expert systems and climate change adaptation tools for marine spatial planning ✓
Sectoral research	DECLG/ Marine Institute	Implementation	Maximise use of research such as the Irish Seabed Survey and Ireland's Coastal Atlas ✓

DG MARE, Directorate-General for Maritime Affairs and Fisheries; DECLG, Department of the Environment, Community and Local Government.

responsibilities will result in any new policies, but in light of developments at the EU level these are anticipated to act as a significant policy driver at Member State level. The DECLG will also co-ordinate overall implementation of Marine Strategy Framework Directive in Ireland. Regulations to transpose the Directive are currently being drafted.

Information on the marine environment, which will be critical for adaptation planning, is provided through initiatives such as the Irish Seabed Survey (INFOMAR) and the Marine Irish Digital Atlas (MIDA). The INFOMAR programme is a joint venture between the GSI and the Marine Institute and is the successor to the Irish Seabed Survey. Covering some 125,000 km^2 of Ireland's most productive and commercially valuable inshore waters, INFOMAR will produce integrated mapping products covering the physical, chemical and biological features of the seabed. MIDA is the comprehensive resource for coastal and marine information and spatial data in Ireland.

5.5 Agriculture, Forestry and Fisheries

5.5.1 Agriculture

Key impacts
Crop yields, geographic distribution of crop viability, possible new crops, livestock management, pest survival, greater risks of plant and animal diseases. Potential for enhanced soil erosion in areas of high vulnerability, changes in species suitability for forestry, changes in the growing season (Desmond et al., 2009).

The Common Agricultural Policy (CAP) is the main driver for agricultural policy across the European Member States. In 2005, the CAP was 'health-checked' with a view to its modernisation and simplification. Direct payments to farmers were reduced and the savings transferred to the Rural Development budget to enable Member States to respond to new challenges and opportunities and to reinforce programmes in the fields of climate change, renewable energy, water management, and biodiversity, as well as innovation linked to these four areas and for accompanying measures in the dairy sector. Climate change is currently being considered within the reform of the CAP. Pillar II of the CAP is generally seen as more suitable to climate change adaptation than Pillar I. This is mainly due to the fact that Pillar II gives room for measures tailored to specific Member State conditions. The impact of CAP reform will continue beyond 2012 and will be a factor in Ireland's post-Kyoto strategy for mitigation of GHG emissions within agriculture.

The DAFF is engaged in an expert group on agriculture and climate change in the EC's DG Agriculture and is also engaged in the ongoing review of the CAP.

The international markets, especially the European market, for beef and dairy products are strong drivers for activity in Irish agriculture. With the easing of milk quota restrictions, there may be a significant economic incentive to increase milk production, which will increase GHG emissions. The recently launched *Food Harvest 2020* report indicates a 50% increase in milk output by 2020, along with increases in the output value of beef, sheep, pigs and poultry, to maximise

opportunities from the international market and enhance the contribution of the agri-food sector to economic development in Ireland (DAFF, 2010a). While this has implications for GHG emissions, the report also refers to the need to adapt to both the positive and negative impacts of climate change in the sector.

The DAFF Statement of Strategy 2008–2010 (DAFF, 2008b) recognises climate change as a challenge and acknowledges the role of fisheries and agriculture in helping to meet the objectives of the NCCS. The Department's 2010 annual report (DAFF, 2010b) examines the role of agriculture and fisheries in reducing GHG emissions and discusses opportunities in the area of bioenergy. Overall, the emphasis is on the role of agriculture in mitigation. There has been limited discussion of adaptation to the impacts of climate change on agriculture, fisheries and food production.

The Rural Environmental Protection Scheme (REPS) was a voluntary scheme designed to compensate and reward farmers for delivering environmental benefits. A new environment-focused scheme for the programming period 2007–2013 was approved by the EC in 2007. The new Agri-Environment Options Scheme (AEOS) provides for a more sustainable farming environment, improving the management of organic manures and chemical fertilisers and reducing nitrous oxide emissions. While the REPS was criticised for not enabling quantitative assessment of environmental benefits, the AEOS incorporates specific measures to enhance biodiversity on participating farms. Also, in order to avoid penalties under the Single Farm Payment Scheme, farmers must meet minimum environmental standards; these standards include measures to secure and enhance farmer-level ecosystems and are implemented under Good Agricultural and Environment Conditions (GAEC). These measures also protect the proportion of the agricultural area under grassland, with positive implications for the protection of biodiversity and the resilience of the soil system in changed climate scenarios.

Future environmental protection schemes could include enhanced measures to further reduce the vulnerability of native species to climate change impacts and maintain the resilience of the agricultural system to climate change. Early warning and monitoring systems are important in identifying new threats and where necessary to take actions to reduce spread and minimise impacts.

5.5.1.1 Plant health monitoring

All activities in the area of plant health are guided by the International Plant Protection Convention (IPPC), which is under the auspices of the Food and Agriculture Organization (FAO), of which Ireland is a member. In addition, Ireland is subject to EU legislation, under which exporting Member States are obliged to ensure that their exports are free of a range of pests and importing countries are obliged to monitor imports (Directive 2000/29/EC). An EU-wide rapid notification system (Europhyt) is also in place. This requires notification to other Member States of an interception detected in any Member State. In addition, Ireland carries out annual surveys for a range of pests and diseases that are perceived to be important. Thus, there is a system in place under which new pests and diseases, arising from climate and other changes, which form a threat to plant health or products, are monitored. There is concern that with the increase in trade and climate change impacts, the risk of importing pests is amplified. For this and other reasons, the EU has commissioned a review of the plant health regulatory regime, with a view to updating it in the coming years. This may be a useful entry point for future climate change monitoring.

5.5.1.2 Animal health monitoring

The effects of climate change have the potential to cause significant change in the area of animal disease. It may lead to widening viral disease among farm animals, and to expanding the spread of some microbes that are also a known risk to humans. Health effects occur due to temperature increases, weather effects, air pollution, water/food-borne diseases, and vector-borne diseases. Diseases such as Bluetongue, African Horse Sickness, Rift Valley Fever and West Nile Fever may surface. Vector monitoring carried out in Ireland following the outbreak of Bluetongue in Northern Europe has shown that the competent vectors are present. Contingency planning and monitoring and surveillance systems for such diseases

are necessary and in this regard Ireland is involved in two formal notification systems that provide alerts of disease outbreaks and may provide useful information for climate change planning purposes:

1. Animal Disease Notification System within the EU; and

2. OIE (World Organisation for Animal Health)[16].

In addition to these activities, the DAFF also has a dedicated team of experts dealing with the scientific aspects of various issues linked to climate change: mitigation, review of the impacts of climate change on the sector and review of areas where adaptation may be required – water quality, soils, biodiversity, agricultural engineering, etc.

5.5.1.3 Research

The DAFF funds directly some research related to climate change, water and soils, including one project dedicated to exploring the likely response to climate change among farmers. Teagasc carries out research related to improving agricultural production systems and approaches. Inherent in this activity is the development of systems that are capable of adapting to climate change. For example, breeding programmes select plants and animals that are adapting to the changing circumstances in the environment. In addition, Teagasc's annual National Farm Survey records, inter alia, crop type and yields on a statistically representative sample of farms types, and numbers may be able to provide useful information for the development of agri-phenological indicators of climate change. Ongoing adaptation-related research at Teagasc includes:

- Assessing the impact of climate change on pests and disease prevalence and occurrence in Irish agriculture. This will provide information for monitoring climate change;

- A project to assess the impact of climate change on willow production in Ireland; and

- Teagasc was a partner in the project Climate Change Impacts on Phenology: Implications for Terrestrial Ecosystems, led by Trinity College Dublin and funded by the EPA.

To date, the agriculture sector has focused on the challenges of reducing GHG emissions and exploiting alternative energy sources, with less attention to climate change adaptation. There has been some analysis on the expected impacts of climate change on the sector by the DAFF with inputs from Teagasc agricultural experts, with a view emerging that autonomous adaptation will be important in the sector as natural systems respond to a changing climate. However, little work has been undertaken on possible adaptation responses to protect and increase resilience within the sector, and to ensure that agriculture and agricultural systems continue to fulfil their various functions. The limited level of analysis of the adaptation requirement is problematic as it constrains medium to long-term strategic planning, and the identification of risks and opportunities within the sector.

16. OIE, Office International des Epizooties.

Table 5.5. Entry points for integrating adaptation into agricultural decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Agriculture	DAFF	Formation/Review	Engagement with EC on reform of the CAP and associated measures to engage with climate change adaptation ✓✓
National	DAFF	Implementation	Administration of agricultural programmes could provide opportunities for climate information and monitoring ✓
National	DAFF	Programme implementation and resource allocation	Roll out of Agri-Environment Options Scheme ✓ Single Farm Payment Scheme ✓
Sectoral research	DAFF/Teagasc	Formation Implementation	Agricultural research programmes to engage with climate change adaptation ✓

DG, Directorate-General; DAFF, Department of Agriculture, Fisheries and Food; EC, European Commission; CAP, Common Agricultural Policy.

5.5.2 *Forestry*

Key impacts
Changes in forest health, productivity, quality and changes to the geographic range of certain tree species. Increases in pathogens, pests and windfall (Desmond et al., 2009).

The Forestry Strategy (FS) for the EU sets out common principles of EU forestry and lists international processes and activities to be followed. The EU Forest Action Plan (FAP) builds on the FS and serves as a co-ordination tool for forest-related activities and policies in the EU. Competence for forest policy lies primarily with the Member States, the role of the EU is limited and designed principally to add value to national forest policies and programmes.

The Irish government has committed to expanding 'Kyoto forests', which will contribute towards Ireland's emissions reduction targets outlined in the NCCS. It has also been recognised that to ensure forests continue to play a role in GHG emissions reductions, a programme of forest expansion of 7,500–10,000 ha/year will be required over the next 20–30 years (Malone, 2008). To achieve this target, a range of stakeholders, including environmental and conservation agencies, the public, business and of course landowners must be persuaded that forest expansion is essential. However, in addition to effective incentives to encourage expansion, the policy standards of sustainable forest management (SFM) must be implemented. Guidance on species choice in Ireland has been published and recommendations for the selection and silviculture of broadleaved trees is also available (Joyce et al., 1998; Horgan et al., 2004).

The impacts of climate change on forest growth and species distribution remain a key knowledge gap in the Irish forestry context. Despite this, it is clear that climate change risk assessments and adaptive forest management strategies need to be considered and implemented. Irish forests, in contrast to most European forests, are comprised of intensively managed plantation forestry, with a strong emphasis on correct species selection for a specific site type. Decision support tools are required to guide strategic decision making, for example to guide woodland grant incentives to maintain a robust and sustainable forest policy response to climate change (Black and Ray, 2009).

5.5.2.1 *Research*

COFORD supports research on the development of sustainable forestry in Ireland under 13 broad themes, including forests and climate change. Most of the climate change research relates to mitigation and adaptation. The CLIMADAPT programme will launch a web-based tool in late 2012 to assist managers in selecting and forecasting species suitability to specific site types under future climate change scenarios. This tool will be published together with climate change risk assessment guidelines for policy makers.

5.5.2.2 *The Forest Service*

There is at present no formal forestry adaptation policy. However, the Forest Service has published an Indicative Forestry Statement (IFS) to provide high-level, national guidance in relation to the suitability of land for afforestation (DAFF, 2008a).

Table 5.6. Entry points for integrating adaptation into forestry decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DAFF	Formation Implementation	Future review of National Forestry Plan ✓
Sectoral research	DAFF/COFORD	Formation Implementation	Ongoing and future research into the impacts and consequences of climate change on the sector and the development of tools and guidelines to increase resilience ✓

DAFF, Department of Agriculture, Fisheries and Food; COFORD, The Council for Forest Research and Development.

5.5.3 *Fisheries*

Key impacts
Biodiversity loss and distributional changes affecting individual species and ecosystems and their related services on which society depends (fisheries). Potential increase in invasive species and increased vulnerability of native species, changes in migration patterns and survival of salmonids (Desmond et al., 2009). Potential negative impact on the rate of recovery of over-fished species and pre-stressed or low resilient ecosystems (Nolan et al., 2009).

Fisheries policy in Ireland is guided by the EU Common Fisheries Policy (2002) to the extent that there is no national policy. Reform of the Common Fisheries Policy is ongoing and the new Policy is expected to enter into force in 2013. A Green Paper on Reform of the Common Fisheries Policy was published in April 2009 and makes specific reference to climate change (COM/2009/163).

It is not yet clear how this recognition of the need to address the impacts of climate change will be translated into a White Paper. However, responses to the issues raised in the Green Paper indicate that climate change is an issue that should be addressed through research and appropriate adaptation measures (EC, 2010a).

Research into the impacts of climate change on fisheries has been conducted at EU level and in Ireland. Several research projects managed by the Marine Institute have focused on salmonids as an indicator of climate change (SALSEA – assessing survival of salmon at sea in the North Atlantic and its links to oceanographic issues; Fish Growth and Survival; Climate and Catchment Environment). In relation to other fisheries, there are no specific research programmes but the Marine Institute is interested in "*identifying whether or not there are any detectable signals within fisheries data (such as long-term changes in species abundance and/or spatial distribution, or fluctuations in reproduction and/or condition) that can be attributable to climate change*". These and other studies are presented in the Marine Institute's *Irish Ocean Climate and Ecosystem Status Report* (Nolan et al., 2009).

At EU level, RECLAIM is a framework project on fisheries and climate change. It is working to improve understanding and forecasting of fisheries in a changing climate (RECLAIM, 2007).

5.6 Biodiversity

Key impacts
Biodiversity loss – affecting individual species and ecosystems and their related services on which society depends. Potential increase in invasive species (Desmond et al., 2009).

The EU Birds and Habitats Directives, collectively known as Natura 2000, form the cornerstone of Europe's nature conservation policy, which is built around two pillars:

1. A network of protected sites; and
2. A system for the protection of species across their natural range.

The Birds and Habitats Directives set out various obligations in relation to nature conservation management in Member States. To consider the possible nature conservation implications of any plan

Table 5.7. Entry points for integrating adaptation into fisheries decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG MARE	DAFF	Formation	Reform of the Common Fisheries Policy offers opportunities to engage with climate change adaptation ✓✓
Sectoral research	Marine Institute	Implementation	Ongoing and future research into the effects of climate change on the industry and ecosystems ✓✓

DG MARE, Directorate-General for Maritime Affairs and Fisheries; DAFF, Department of Agriculture, Fisheries and Food.

or project on the Natura 2000 site network, AA is now required.

The Birds and Habitats Directives are complemented and supported by the EU Biodiversity Action Plan, which aims to integrate biodiversity into all sectors, including adaptation to climate change. The specific actions required by Member States include:

- Ensuring that all adaptation and mitigation actions are assessed to prevent negative impacts and maximise positive impacts on biodiversity;
- Assessing habitats at risk (by 2007);
- Identifying and implementing appropriate adaptation actions (by 2010); and
- Developing a comprehensive programme of priority actions to support biodiversity adaptation to climate change in the EU.

Ireland has to translate these actions into national policies, plans and actions[17]. The EC White Paper on adaptation highlights the close inter-relationship between climate change and biodiversity and the need for an integrated approach to policy development. In particular an ecosystem-based approach is suggested.

Responsibility for biodiversity conservation in Ireland lies primarily with the National Parks and Wildlife Service (NPWS) of the DAHG. Biodiversity management and conservation is described in the first National Biodiversity Plan, 2002 (Department of Arts, Heritage, Gaeltacht and the Islands, 2002). The second National Biodiversity Plan, 2011–2016 (DAHG, 2011) recognises the impacts of climate change on the sector and makes recommendations on enhancing resilience.

The Biodiversity Forum[18] identified the effects of climate change as a priority area for further investigation and highlighted the need to prepare and implement responses to protect Ireland's biodiversity in its submission to the second National Biodiversity Plan (Comhar, 2009a). This also included recognition of the role that biodiversity has to play in mitigating the effects of climate change. The Biodiversity Forum is urging the Government not only to help biodiversity adjust and adapt to the impacts of climate change but to integrate biodiversity and climate change policy and to incorporate ecosystem services into climate change adaptation and mitigation measures for the benefit of the economy and society[19]. The Biodiversity Forum also believes that a proactive approach is needed to develop green infrastructure (including ecological

17. For further information, see O'Hagan (2010).

18. The National Biodiversity Forum was established in 2006 under the auspices of Comhar.

19. Ecosystem services are the services nature provides to us for free and they bring many benefits to society and the economy. There are four main categories: (i) provisioning, such as the production of food and water; (ii) regulating, such as the control of climate and disease; (ii) supporting, such as nutrient cycles and crop pollination; and (iv) cultural, such as spiritual and recreational benefits. These were first defined in the Millennium Ecosystem Assessment Report (WRI, 2005).

Table 5.8. Entry points for integrating adaptation into biodiversity decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Environment	DECLG	Formation	Review of EU Biodiversity Action Plan ✓✓
National	DECLG/NPWS	Planning Implementation	National Biodiversity Action Plan ✓✓ Climate change adaptation integration into the guidelines for AA of Natura 2000 sites ✓ Integrate climate change adaptation into conservation objectives and site management plans for SPAs and SACs ✓
Sectoral research	DECLG/EPA	Implementation Monitoring Evaluation	Ongoing and future research into the impacts and consequences of climate change on the sector and the development of tools and guidelines to increase resilience✓

DG, Directorate-General; DECLG, Department of the Environment, Community and Local Government; EU, European Union, NPWS, National Parks and Wildlife Service; AA, Appropriate Assessment; EPA, Environmental Protection Agency; SPA, Special Protection Area; SAC, Special Area of Conservation.

connectivity to address fragmentation), which will have the dual function of enhancing biodiversity and improving resilience and adaptation to climate change.

The EPA developed a Biodiversity Action Plan as part of its strategy *2020 Vision – Protecting and Improving Ireland's Environment* (EPA, 2000). The strategy also resulted in the setting up of a cross-cutting Biodiversity Team in October 2007. The Plan was further updated in 2010 and includes a section on climate change and biodiversity-related research (EPA, 2010). The EPA is also engaged in biodiversity monitoring through its responsibilities under the WFD and supports biodiversity-related research under the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme and the CCRP.

The National Biodiversity Data Centre was created in January 2007 to provide a one-stop shop for biodiversity-related data. It is increasing its focus on climate change and has monitoring programmes in place on butterflies and moths to assess the impacts of climate change. Additional data sets on phenology (plant and animal life-cycle events) and pests and disease vectors will become available in the future.

The National Platform for Biodiversity Research (funded by the EPA and the NPWS) will define national biodiversity research needs, improve the exchange of information between the research community and policy makers, and link with European initiatives through the European Platform for Biodiversity Research Strategy (EPBRS). The EPA has significant new responsibilities under the Environmental Liability Directive in relation to the liabilities of operators causing damage, or risk of damage, to protected species and habitats and the identification of appropriate remediation. The Action Plan contains specific measures related to climate change and impacts on biodiversity.

It is worth nothing that the Organisation for Economic Co-operation and Development (OECD) 2010 report argues that biodiversity remains the poor relation of Irish environmental policy both nationally and locally, citing the poor conservation status of ecosystem types and species and suggesting that the 2015 targets of the Habitats Directive will be hard to meet. This may hamper successful integration of climate change adaptation and biodiversity policy, and reduce the capacity to manage the impacts of climate change on ecosystem services and vulnerable species.

5.7 Trade and Enterprise

Key impacts

Premises – extreme events can cause damage to business premises and impact upon building design, construction, maintenance and facilities management; logistics – changes in climate can increase the vulnerability of business supply chains, the utilities required to run a business (in particular, energy, waste, waste and telecommunications), as well as transport arrangements, markets, finance, people and processes (Desmond et al., 2009).

Climate change will have an impact on Irish business and enterprise through changing markets, impacts on premises and processes, and increased vulnerability of supply chains, and may have implications for investments, insurance costs and stakeholder reputation. Changes in climate may also bring opportunities for Irish businesses. This is particularly the case as Ireland is expected to be relatively less affected by climate change than a number of key global trading partners/competitor countries. Properly managed, Ireland can have competitive advantages through access to significant water resources, an ongoing temperate climate, etc. Climate change will also incur significant costs. As an indication of what the potential vulnerabilities to climate change might be, the insured property cost of the November 2009 floods totalled €244 million. Beyond property damage, the floods also impacted the economy through inability of workers to access work, water shortages, impacts on water quality and power-outs. Such losses of sectoral output and infrastructure damage on an increased basis can have persistent negative impacts on economic growth (Forfás, 2010).

The DETI is responsible for government policy in this area. The Statement of Strategy 2008–2010 (Department of Enterprise, Trade and Employment, 2009) has a section on sustainability and environmental challenges that addresses eco-

innovation and opportunities presented by a carbon-constrained environment and the impacts of mitigation commitments on enterprise. The Strategy states that the Department will undertake a foresight exercise to examine how EU and national climate change commitments will impact on Irish enterprise – with a focus on challenges and opportunities. Other government policies relevant to this sector include the government strategy for medium-term economic recovery (Department of the Taoiseach, 2008).

In addition to the DETI, other relevant government agencies include Forfás, the Industrial Development Authority (IDA), Enterprise Ireland, County Enterprise Boards, Science Foundation Ireland, Shannon Development and FÁS.

Beyond the areas within the specific remit of the DETI and associated agencies, there are also a number of broader policy areas that stand to impact on the business environment and where there are important policy developments:

- Waste management;
- Spatial policy;
- The public capital investment programme (2010); and
- Planned emission reduction measures from the existing NCCS and White Paper on Energy.

In terms of outreach to the business community on climate change, a number of initiatives are of note. The EPA's Green Business initiative provides advice to businesses on resource efficiency and sustainability, but has yet to address climate change adaptation.[20] Forfás (the policy advisory body for enterprise and science) recently published a report entitled *Adaptation to Climate Change: Issues for Business,* which highlights the impacts of climate change on business and proposes measures to reduce risk and maximise any opportunities arising from climate change (Forfás, 2010). The report indicates that awareness of the need for Irish companies to incorporate climate risks into business planning is mixed. Improved awareness could be achieved through existing and planned climate change research being undertaken in Ireland which could be tailored for businesses through an information campaign aimed at businesses and consulting services. Enterprise development agencies, business representative bodies or existing business information sources (such as http://www.greenbusiness.ie) could play an important role in promoting this information. In addition, some businesses may lack the ability to respond to climate change because of financial or other constraints (knowing where to find information, understanding the information). In this respect, tools and approaches being generated by research (e.g. the EPA COCOADAPT project[21]) and the proposed Climate Information Platform[22] could be useful in assisting businesses to adapt to climate change. Forfás also notes that the Report of the High-Level

20. For more information, see http://www.greenbusiness.ie.
21. Co-ordination, Communication and Adaptation for Climate Change in Ireland: an Integrated Approach (COCOADAPT). EPA CCRP project, lead organisation ICARUS, NUIM.
22. Currently being developed by the Coastal and Marine Research Centre, University College Cork, under the EPA CCRP.

Table 5.9. Entry points for integrating adaptation into principle industry decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Enterprise and Industry	DETI	All	Integration of climate change adaptation into a wide range of policy areas related to enterprise and trade ✓
National	Forfás	Formation	Raise awareness of climate change impacts and adaptation through EPA Green Business website, Forfás website and publications, etc. ✓✓
Local	DETI/Local authorities	Implementation	Raise awareness of the impacts of climate change on business, e.g. via County Enterprise Boards, and integration of climate change risks into business planning ✓

DG, Directorate-General; DETI, Department of Enterprise, Trade and Innovation; EPA, Environmental Protection Agency.

Group on Green Enterprise[23] recommended a number of budgetary measures (such as reduced stamp duties on low-carbon homes and amending the enhanced capital allowances scheme) that could provide adaptation incentives and support to the business sector.

5.8 Education and Skills

Key impacts
Impacts of extreme events on access to schools, impacts of changing climate on design of school infrastructure.

The Department of Education and Science's[24] Statement of Strategy 2008–2010[25] does not make explicit reference to the challenges posed by climate change in its assessment of the changing context in which education is provided in Ireland. However, several initiatives do have climate change considerations, for example an increased emphasis on the sustainability of new school buildings and curriculum development in the area of education for sustainable development (developed jointly with the DEHLG).

There is general recognition that there is a need for an expanded climate change programme in the education sector and that this need would be best met via the production of resources that aid curriculum development. To this end a Climate Change Education Initiative has been developed as part of the national climate change awareness campaign in partnership with St Patrick's Teacher Training College, Dublin. The main aim of this initiative, which is targeted at the Primary School Curriculum, is to develop a long-term resource for teachers on climate change so that they feel equipped to teach the subject and integrate it into their curriculum. Teachers in Ireland have consistently identified lack of appropriate resources as one of the main obstacles to good practice. This project has the capability to address the concerns and needs of teachers and schools in a way that is consistent with best practice in teaching and learning and that has the potential to make a significant contribution to education on climate change. This resource was disseminated to all primary schools and teacher training colleges in Ireland in 2010. In addition, St Patrick's College has committed to developing in-service courses to support this project and to use the resource developed with student teachers and with postgraduate students.

The Green Schools and Green Campus initiatives encourage awareness of environmental issues, including climate change at primary, secondary and third levels. ECO-UNESCO, Ireland's environmental and youth education organisation, raises environmental awareness, understanding and knowledge of the environment among young people and promotes the personal development of young people through practical environmental projects and activities.

The EPA contributed teaching materials to the 2007 and 2008 editions of the education pack *Science and Technology in Action,* both related to the topic of climate change. This material is widely available on the Internet.[26] The EPA Leaving Certificate Geography Pack also refers specifically to the topic of climate change and provides materials for studying elements of the syllabus relating to this environmental issue, using Irish locations and issues. The EPA also acts as chair of the group, which ensures the scientific integrity of the various carbon calculators and carbon management tools that are integral to the ongoing 'Change.ie' campaign (the national climate change public awareness campaign)[27].

5.8.1 Skills

Improved skills and multidisciplinary working in areas, such as the planning, refurbishment of existing buildings and infrastructure, are also necessary. Ensuring that both new and existing professionals have developed the skills necessary to respond to climate change and keep pace with policy and technology advancements will be an important policy response. Within this area, it is also worth mentioning

23. http://www.forfas.ie/media/dete091202_green_economy.pdf
24. Now known as the Department of Education and Skills
25. http://www.education.ie/servlet/blobservlet/des_strategy_statement_2008_2010.pdf?language=EN
26. http://www.epa.ie/downloads/pubs/other/education/secondary/geography/
27. http://www.askaboutireland.ie/reading-room/environment-geography/Change/

Table 5.10. Entry points for integrating adaptation into education and skills decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
International – UNFCCC	DECLG	All stages	UNFCCC documents ✓
National	Department of Education and Skills	Implementation	Assess climate change impacts when deciding on new school infrastructure ✓
National	Department of Education and Skills	Planning	Curriculum development at all educational levels to include climate change adaptation ✓
Sectoral	Schools Professional bodies	Implementation	Include climate change adaptation information and activities in Green Schools Programme ✓✓ Develop training courses for professionals (e.g. planners) on climate change impacts and planning for adaptation ✓

UNFCCC, United Nations Framework Convention of Climate Change; DECLG, Department of the Environment, Community and Local Government.

that professional bodies have responsibilities for educating their members in relation to professional development. In this respect, the activities of the Irish of Academy Engineers (IAE) could be seen as a very good example of raising awareness around climate change adaptation in the engineering professions. Other professions that should have greater awareness of the implications of climate change for their activities include architects, planners, natural resource managers, critical infrastructure managers and financial services. In this respect, a useful entry point for professional training may be bodies such as the College for Continuing Professional Development (CPD) or dedicated university training courses.

5.9 Health

Key impacts
Climate change impacts on well-being, human mortality, disease control and accident and emergency responses (Desmond et al., 2009).

There is currently no mention of climate change in health policy in Ireland. The DOHC's Statement of Strategy 2008–2010 makes reference to the need to co-operate at EU level to address environmental threats in the context of disease surveillance and management but does not make specific reference to the impacts of climate change (DOHC, 2008). Climate change will have an influence on health-care infrastructure, the spread of disease and the health of the most vulnerable in society, but these risks have yet to be assessed in the context of the Irish health-care system. Climate change may also impact on employee health, with implications for business productivity.

The DOHC has appointed an official to the interdepartmental senior officials group that supports the Cabinet Sub-Committee on Climate Change and Energy. This representative is responsible for raising health issues related to climate change. In addition, the Director of Health in the Health Service Executive (HSE) is undertaking work on the management of heat waves. No complete risk assessment of the impacts of climate change on health in Ireland (especially of the most vulnerable groups) has been completed. There is also evidence that the DOHC has started to consider how best to address the impacts of climate change in a response from the Deputy Chief Medical Officer to the DEHLG in relation to the development of the National Adaptation Framework.

5.9.1 Research

A small-scale study is being conducted in collaboration between the Environmental Health Service and University College Cork to investigate the presence of disease-bearing mosquitoes in Ireland which may be linked to a warming climate. Research on Lyme's disease and climate change has recently been published in the *Irish Medical Journal* (Cullen, 2010) and work is ongoing in relation to developing a heatwave plan for Irish cities[28].

5.9.2 Awareness raising

The Institute of Public Health (IPH) held a public

28. Elizabeth Cullen, personal communication, 25 August 2010.

Table 5.11. Entry points for integrating adaptation in human health decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DOHC Department of Social Protection	Formation Resource allocation Implementation	Co-ordinate approach of health sector in assessing and preparing for the climate change impacts (e.g. link to emergency planning, water supply, food safety and social protection) ✓
National	DOHC NGOs	Implementation	Raise awareness of climate change impacts and social vulnerability ✓✓
Sectoral research	DOHC/HRB	Implementation	Research on climate change impacts (e.g. extreme events) on health and well-being ✓

DOHC, Department of Health and Children; NGO, non-governmental organisation; HRB, Health Research Board.

seminar titled 'Climate Change: Whose Health Will be Affected?'. The aims of the seminar were to raise awareness of potential health impacts of climate change and action needed to reduce likelihood of adverse health outcomes and to bring together stakeholders with a role in the climate change agenda. The seminar was the first of its kind for the health sector and was very well attended by health-care professionals and the public (IPH, 2010a). This initiative needs to be built on within the wider health-care community, particularly in the context of emergency situations such as flooding, contamination of water supplies and food safety. The IPH's paper entitled *Climate Change and Health: A Platform for Action* highlights action that needs to be undertaken in the area of climate change and health. This includes reducing energy consumption through smarter travel, food from sustainable sources, better insulation of buildings and increasing the number of open green spaces (IPH, 2010b).

5.10 Heritage

Key impacts
Natural, built and cultural heritage is likely to be impacted by climate change. Ireland's coastal heritage will be affected by increased erosion, more frequent storms and rising sea levels. Archaeological and industrial heritage along inland waterways will be at risk from changes in water flow and supply, flooding and drought (Heritage Council and Fáilte Ireland, 2009).

The DAHG is the primary arm of government responsible for the protection of natural, architectural and archaeological heritage and, through the NPWS, the National Monuments Service and the Architectural Heritage Advisory Unit, formulates and implements national policy and legislation for heritage protection.

The Government Policy on Architecture 2009–2015 places emphasis on sustainable development of the environment and urban design, encourages and supports high-quality modern architecture, and incorporates architectural heritage in a holistic, integrated manner (DEHLG, 2009a). The document recognises that climate change will bring new challenges to the sector in terms of new building design and the adaptation of existing building stock. The policy complements and supports the Government's wider economic strategy (Department of the Taoiseach, 2008) in areas such as research, green enterprise and the development of efficient and sustainable technologies for the built environment.

Research into impacts of climate change on cultural heritage is at the development stage internationally. The Built Heritage and Architectural Policy Section of the DAHG has sponsored the Irish sub-committee of the International Committee on Monuments and Sites (ICOMOS) to undertake a pilot study to monitor the impact of climate change on major monument sites including Brú na Bóinne World Heritage Site and Clonmacnoise (ICOMOS, 2010). The main findings from the report are that climate and impact monitoring are required at sites assessed.

The Heritage Council and Fáilte Ireland collaborated on the *Climate Change, Heritage and Tourism: Implications for Ireland's Coast and Inland Waterways*

Table 5.12. Entry points for integrating adaptation into heritage decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DECLG/NPWS, National Monuments Service, Architectural Heritage Advisory Unit	Formation Implementation	Engage with the Ireland Climate Change Sub-Committee of the ICOMOS to raise awareness of climate change ✓✓
National	Heritage Council	Implementation	Engage with the Heritage Forum to raise awareness of climate change adaptation ✓
National	DECLG/Heritage Council	Implementation	Consider if the Heritage Officer model could be used as a way of addressing climate change at the local level ✓
Local	Local authority	Implementation	Raise awareness of climate change amongst members of the Local Authority Heritage Officers' Network ✓

DECLG, Department of the Environment, Community and Local Government; NPWS, National Parks and Wildlife Service; ICOMOS, International Committee on Monuments and Sites.

report (Heritage Council and Fáilte Ireland, 2009). This is a well-developed assessment of climate impacts on an individual sector carried out by two state agencies. Subsequent to this document, a number of actions have been taken.

5.10.1 Local Authority Heritage Officers' Network

The Local Authority Heritage Officers' Network, set up by the Heritage Council, offers a useful model for successful policy advocacy, integration and implementation. The network might be useful in raising awareness of climate change issues.

5.11 Tourism

Key impacts
The effects of climate change have implications for Ireland's tourism assets and will place additional stresses on infrastructure such as water, sewage, coastal and amenity areas upon which the tourism industry is dependent (Desmond et al., 2009).

Ireland's natural and cultural heritage features strongly among the main reasons why visitors choose Ireland for their holiday. Climate change will have an impact on these attractions and it will be important to assess the risks to the sector and to plan for the future. In this way, Ireland can plan to make the most of any opportunities and to minimise the risks posed by the adverse effects of climate change (Forfás, 2010).

The Statement of Strategy 2008–2010 for the Department of Arts, Sport and Tourism recognises the value of the environment in attracting tourists to Ireland but does not have any specific references to climate change. Fáilte Ireland's Environmental Action Plan 2007–2009 and, the more recent, Environmental Strategy 2010–2012 (unpublished) set out Fáilte Ireland's environmental commitment to advocate a high-quality physical environment for tourism and to promote good environmental practice amongst the industry. The Strategy identifies the key priorities in the coming years. These include:

- Raising awareness of environmental concerns for tourism in key destinations;
- Capitalising on the tourism opportunities presented by the environment in a sustainable manner;
- Gaining insights into the relationship between tourism and the environment; and
- Helping tourism businesses reduce their energy, water and waste costs.

In 2008, Fáilte Ireland published a carbon strategy entitled *Facing the Challenges of Climate Change – Fáilte Ireland's Carbon Strategy,* which outlined the seven actions Fáilte Ireland will undertake in tackling

Table 5.13. Entry points for integrating adaptation into tourism decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	Department of Transport, Tourism and Sport	Formation Planning	Review of Statement of Strategy ✓
National	Fáilte Ireland	Formation Planning Implementation	Raise awareness of the impacts of climate in the tourism industry ✓✓ Build capacity to plan and implement adaptation actions ✓

the issue of climate change and the potential impacts on tourism. As part of this Strategy, Fáilte Ireland published a joint report with the Heritage Council (Heritage Council and Fáilte Ireland, 2009), which outlines the natural and built heritage assets which are most at risk, and the implications this may have for the tourism activities dependent upon these assets. The report also outlines examples of appropriate adaptation measures for various tourism-related activities.

5.12 Energy

Key impacts
Supply and demand. Sustainability of renewables, e.g. biomass, wind energy, wave and tidal, hydro and thermal power, and impacts on infrastructure – structures and the national grid (Desmond et al., 2009).

European energy policy is focused on delivering core energy objectives of sustainability, competitiveness and security of supply. This focus has led to the 20-20-20 initiative, which aims to reduce GHGs by 20%, to increase the share of renewables in energy use to 20% and to improve energy efficiency by 20%, to be achieved by 2020. The main drivers for European energy policy are the Energy End-Use Efficiency and Energy Services Directive (2006/32/EC) and the Renewable Energy Directive (2009/28/EC).

Nationally, the Department of Communications, Marine and Natural Resources set out an energy policy framework in its White Paper *Delivering a Sustainable Energy Future for Ireland (2007–2020)* (DCMNR, 2007). The policy framework is designed to steer Ireland to a new and sustainable energy future. The decision to move towards energy sustainability implies accelerating the growth of renewable energy supply while maximising energy efficiency. These twin goals of renewable energy and energy efficiency contribute to addressing the problem of climate change, increasing security of supply and improving economic competitiveness (DCENR, 2009a).

The SEI *Energy Efficiency in Ireland* report (SEI, 2009) examines energy usage and efficiency. This report examines energy trends, based on the most recent data available and adds to our understanding of how we use energy and what policies and measures are required to improve our efficiency further. Energy efficiency is a key element of Ireland's energy and economic policy and the SEAI's report underlines the important role it plays. The carbon emissions savings made as a result of energy efficiency measures greatly exceed the contribution from renewable energy. The SEAI study of Ireland's *Low Carbon Opportunity* sought to analyse the opportunities to reduce GHG emissions in Ireland over the period to 2030 (SEAI, 2009a). The analysis presents marginal cost curves for GHG abatement that illustrate the extent of each opportunity for abatement and the associated societal saving or cost. The most recent SEAI Strategic Plan (2010–2015) focuses on mitigation with little attention to adaptation (SEAI, 2009b).

5.12.1 Energy infrastructure

Eirgrid manages the electricity transmission network and does medium-term planning for required generation. In its *Grid25* strategy, it outlines its plan to double the capacity of the national transmission grid by 2025, by upgrading the existing network and by constructing new transmission infrastructure (http://www. eirgrid.com).

5.12.2 Research

The Renewable Energy (RE) R&D Programme managed by the SEAI aims to accelerate the deployment rate of renewable-energy technology and thus improve implementation of renewable energy in the Irish market. SEAI research has yet to be undertaken on the impacts of climate change on energy supply and energy infrastructure.

5.12.3 Regulation

The Commission for Energy Regulation (CER) is an independent body responsible for overseeing the liberalisation of Ireland's energy sector. It also has the power to grant licences to generate and supply electricity and to grant authorisations to construct generating stations and provide access to the transmission or distribution system to holders of licences or authorisations. In addition, the CER works to ensure that the supply of natural gas and electricity to customers is safe, secure and reliable and that a quality service is provided by all market participants (http://www.cer.ie). In this context, the CER has a role to play in integrating climate change impacts into decision making around energy generation, supply and demand.

5.12.4 Energy as critical infrastructure

There has been limited consideration of the impacts of climate change on energy infrastructure. The 2009 report entitled *Ireland at Risk: Critical Infrastructure, Adaptation for Climate Change* (IAE, 2009) suggests that a high-quality energy infrastructure must be capable of adapting to the challenges of climate change. The energy sector has critical infrastructure throughout the island that is increasingly vulnerable to flooding or damage from extreme weather. This includes power stations, substations, and gas and oil terminals; many of these plants also have facilities such as cable tunnels and basements, thus increasing the risk from flooding. Rising sea levels will pose problems for coastal installations, and have implications for wind, wave and tidal power generation. According to the *Ocean Energy Strategy* (DCMNR, 2005), the aim is to have 500 MW of installed ocean energy capacity by 2020, yet there are no plans to develop the coastal transmission grid necessary to facilitate this development, which applies to offshore wind energy developments under the Gate 3 process. Theoretically, these issues should be addressed under the National Renewable Energy Action Plans that Member States were required to submit to the EC by

Table 5.14. Entry points for integrating adaptation into energy decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Energy	DCENR	All	Review of energy policy ✓
National	DCENR	Implementation	Engagement with the Commission on Energy Regulation (CER) with a view to integrating climate change adaptation into guidelines and regulations for the energy sector ✓
National	DCENR	Formation	Climate change impacts and adaptation could be integrated into future National Renewable Energy Action Plans ✓
National	DCENR/ Infrastructure owners	Implementation	Review of codes and standards for the design of structures, power plants, electricity and gas network substations, oil storage and dam safety based on climate change projections ✓
National	DCENR/ Infrastructure owners	Implementation	Review of coastal protection measures where energy infrastructure is located, e.g. reserve oil storage, pipelines, power generation, network substation and sub-sea cables ✓
Local level	Infrastructure owners	Implementation	Energy plant output could be reviewed in the context of climate change, e.g. output from wind, wave and hydropower ✓
Sectoral research	DCENR	Implementation	Review of wind and wave atlases could take climate change impacts and projections into account ✓

DG, Directorate-General; DCENR, Department of Communications, Energy and Natural Resources.

June 2010 according to Article 4 of the Renewable Energy Directive (2009/28/EC).

Adaptation to climate change will need to be incorporated into the long-term planning of the main actors involved in Ireland's energy sector. An important starting point would require owners of energy infrastructure to carry out a climate risk assessment for critical infrastructure assets. In addition, assessments should be undertaken on the impacts of climate change on renewable energy generation. The redesign of wind and wave atlases for future scenarios would be useful in this context.[29] In addition, the existing Wind Energy Development Guidelines (DEHLG, 2008c) may need to be reviewed in the context of adapting infrastructure to the impacts of climate change.

5.13 Transport

Key impacts
Modes of transport and infrastructure such as road, rail, airports and sea (Desmond et al., 2009).

Current EU transport policy is largely set out in the White Paper *European Transport Policy for 2010: Time to Decide* (COM/2001/370). The 2006 review *Keep Europe Moving – Sustainable Mobility for our Continent* stated that international environmental commitments, including those under the Kyoto Protocol, must be integrated into transport policy and transport policy must continue to attain the objectives of European energy policy (COM/2006/314). Two key principles in EU transport policy are intermodality and interoperability. Directive 92/106/EC sets out common rules for the combined transport of goods between Member States, where more than one mode of transport is used for a particular journey.

5.13.1 National policy

The 2007 Programme for Government set out a number of policies over the lifetime of the Government, which aimed to "*cut travelling times, improve safety, deliver real commuting choice, reduce congestion, and protect the environment*". In 2008, the Government published its *2020 Vision – Sustainable Travel and Transport: Public Consultation Document*, which outlined a number of policy options under key headings and invited public submissions (DOT, 2008). In 2009, the *Smarter Travel: A Sustainable Transport Future* document was published (DOT, 2009) and proposed four overarching measures:

1. Actions to reduce the distance travelled by private car, including focusing population and employment growth predominantly in larger urban areas;

2. Actions aimed at ensuring that alternatives to the car are more widely available, mainly through improved public transport and investment in cycling and walking;

3. Actions aimed at improving the fuel efficiency of transport; and

4. Actions aimed at strengthening the institutional arrangements required to deliver the targets.

In addition, the *National Cycle Policy Framework* (NCPF) was also published in 2009 and aims to "*create a strong cycling culture in Ireland* [to the] *extent that 10% of all trips will be by bike by 2020*" (NCPF, 2009).

5.13.2 Fiscal measures to influence travel behaviour

The Government introduced appropriate fiscal policies by ensuring that the Vehicle Registration Tax (VRT) and Motor Tax systems, from July 2008, are entirely based on carbon dioxide emissions, with rates considerably varying between models on the basis of their emissions. The Smarter Travel document (DOT, 2009) also acknowledged, in the context of the then forthcoming report of the Commission on Taxation, the possibility of the application of fiscal measures aimed at reducing car use and achieving a shift to alternative forms of transport.

5.13.3 Technological improvements

There are potential alternative technologies for motor vehicles, which are likely to have a significant impact beyond 2020 as technology is developed. These include plug-in and electric-fuelled vehicles. The Government has set a target of 10% of all vehicles in the transport fleet to be powered by electricity by 2020.

29. Comment Forfás, July 2010.

Table 5.15. Entry points for integrating adaptation into transport decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Mobility and Transport	Department of Transport, Tourism and Sport	All stages	Review of EU Transport Policy ✓✓
National	NRA	Implementation	Design of transport infrastructure (roads, rails, sea (including ports) and air) to take account of the projected impacts of climate change ✓
Sectoral research	Department of Transport, Tourism and Sport	Implementation	Research into the impacts and consequences of climate change on the sector and the development of tools and guidelines to increase resilience ✓

DG, Directorate-General; EU, European Union; NRA, National Roads Authority.

5.13.4 Transport and the NSS

The DOT developed a set of Guiding Principles to guide and inform new transport policies and strategies, which include facilitating a closer integration between land-use planning and transport investment (DOT, 2005). The Guiding Principles recognise that the NSS to 2020 is a key backdrop to all transport plans and policies. The integration of spatial development and transport investment should support more sustainable travel patterns for individuals and business, including facilitating a modal shift to more sustainable forms of transport (e.g. public transport, cycling and walking) and delivering net benefits in terms of reduced environmental and health costs.

5.13.5 Transport as critical infrastructure

The transport sector is one of the main emitters of GHGs in Ireland and its climate change policy focus is firmly on mitigation. However, it may also be exposed and vulnerable to the impacts of climate change and adaptation measures will be required to protect infrastructure and maintain services for road transportation, sea traffic, railways and air traffic. Forfás and the IAE recommend that owners and regulators of critical pieces of transport infrastructure should be required to assess the risks, disturbances and structural impacts caused by climate change in each form of transportation (road transportation, sea traffic, railways and air traffic) (IAE, 2009; Forfás, 2010). They also suggest that the general principle of flood-sensitive areas avoidance should be introduced into planning of road and rail transport networks. Investment should be prioritised in win–win options or in resources with high adaptive value.

5.14 Communications

Key impacts
Impacts on communication infrastructure and the distribution of services in the context of extreme events such as flooding, high winds and storms, landslides and sea level rise.

The DCENR is responsible for setting communications policy and objectives in Ireland. A key role is the development of effective policies for the regulation of the electronic communications sector and management of the radio frequency spectrum. Responsibility for the implementation of policies rests with the Commission for Communications Regulation (ComReg), an independent body under the aegis of the Department.

5.14.1 Communications as critical infrastructure

The substantial fixed assets managed by the telecommunications sector may be vulnerable to climate change. Extreme events present a significant risk (storm damage to overhead cables, subsidence of masts, poles, etc.); steady incremental changes in temperature, precipitation and sea levels will also present an increasing challenge to the operations and distribution of services (e.g. the impact of higher indoor temperatures on the operation of high-tech equipment or increase the risk of subsidence damage to communications masts). All other business and domestic sectors are reliant on the telecommunications services and infrastructure. Any negative impacts in this sector increase the risks in every other industry and could present significant cost

Table 5.16. Entry points for integrating adaptation into communications decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Information Society and Media	DCENR	All stages	Review of EU communications policy ✓✓
National	DCENR	Formation Planning	Consideration of climate change risks when planning the communications infrastructure ✓
National	DCENR	Implementation	Integrating climate change risk into the design of the next generation Broadband Scheme, the Metropolitan Area Networks Scheme and the Spectrum Policy ✓
Sectoral research	DCENR	Implementation	Research into the impacts and consequences of climate change on the sector and the development of tools and guidelines to increase resilience ✓

DG, Directorate-General; DCENR, Department of Communications, Energy and Natural Resources; EU, European Union.

and competitiveness implications (e.g. impacts on supply chains) (Forfás, 2010).

Adaptation will require that impacts of climate change are incorporated into the long-term planning and investment of all actors in the communications sector. New communications infrastructure should be climate-proofed from the early design phase. The maintenance of this infrastructure should be actively managed to test its resilience and flexibility to climatic conditions over its lifetime. Contingency plans should be adjusted in anticipation of more frequent use for more extreme impacts.

5.15 Defence

Key impacts
Potential threats posed by climate change to national security.

The Defence Forces Statement of Strategy 2008–2010 (DOD, 2008) and the White Paper on Defence (DOD, 2000) make no mention of the security implications of climate change. Nevertheless, the Defence Forces are responsible for protecting the national territory and national security, which may be affected directly or indirectly by climate change. The Irish Naval Service has a role to play in defending territorial seas, conducting maritime surveillance, including monitoring and reporting of pollution for the Irish Coast Guard, and protecting maritime assets. It is likely that climate change will have an impact on these functions over time, which will need to be assessed. The Naval Service has identified changing climate as one of the factors affecting operational conditions for its ships, making the argument for investment in larger naval ships (Naval Service, 2010).

The Defence Forces are involved in work at the EU level on security research, which includes the implications of natural disasters, including extreme weather events. There is potential to enhance work on implications of climate change on security in Europe, with the aim of protecting society, citizens, infrastructure and utilities.

Table 5.17. Entry points for integrating adaptation into defence decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	Department of Defence	Formation Implementation	Investigate synergies that may exist between the emergency planning function of the Department of Defence and adaptation planning ✓ Assess the impacts of climate change on national security and prepare appropriate coping strategies ✓ Explore role of Defence Forces in operating in extreme weather and responding to emergencies/extreme weather events ✓

The Minister for Defence chairs the Government Task Force on Emergency Planning and his department houses the Office for Emergency Planning (see Chapter 7). There are opportunities to link the ongoing work on emergency planning with efforts to plan for adaptation to climate change.

5.16 Foreign Affairs

Key impacts
Impacts on international governance and diplomacy, impacts on migration, impacts on poverty reduction efforts in developing countries (Government of Ireland, 2006a).

The Department of Foreign Affairs Statement of Strategy 2008–2010 (DFA, 2008) refers to climate change in the context of Ireland's engagement with the UN, interdepartmental collaboration and EU policy.

The White Paper on Irish Aid (Government of Ireland, 2006a) has a section on climate change and supporting the most vulnerable in their adaptation to climate change. The White Paper considers climate change to be a growing global threat and a key factor contributing to poverty.

The Irish Aid Environment Policy for Sustainable Development addresses the impacts of climate change in developing countries. Two of the four objectives are directly related to climate change:

1. To continue to engage with key multilateral environmental agreements and agencies, and to demonstrate commitment to resolving global environmental problems; and

2. To assist developing countries to prepare for and adapt to changing environmental conditions while taking action to reduce the negative impacts on the most vulnerable members of society.

Irish Aid is engaged with relevant international processes and institutions, informing and being informed by them, in their climate change efforts. Irish Aid supports developing countries to plan and implement adaptation actions via bilateral and multilateral channels and through funding for development non-governmental organisations (NGOs). Cognisant of the growing impact of climate change on developing countries, Irish Aid continues to improve its consideration of, and its response to, the added and growing development challenge that climate change presents to the poorest people in its partner countries.

The Department of Foreign Affairs has responsibility for north–south co-operation on the island of Ireland and this should offer opportunities to develop a cross-border approach to assessing climate impacts and planning adaptation actions. In Northern Ireland, the Department of the Environment takes the lead on climate change and works closely with the Department for Energy and Climate Change (DECC) and the Department for Environment Food and Rural Affairs (DEFRA) in London and with colleagues in the Devolved Administrations of Scotland and Wales. The approach in Northern Ireland is very much on collective responsibility, with all departments playing a role.

The Northern Ireland Climate Change Impacts Partnership (NICCIP) was established in March 2007 (DOENI, 2011). Its aim is to widen the understanding and knowledge of the impacts of climate change within Northern Ireland and the adaptation actions necessary to deal with it. The partnership consists of representatives from central and local government, the business community, the voluntary sector and professional organisations. There is great potential to work closely with this partnership in developing effective adaptation strategies. There is also potential to use existing cross-border work in the development of RBMPs and marine and coastal management to progress adaptation to climate change.

The Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) has a climate change remit and has collaborated with the EPA on climate change activities, for example a workshop to examine the impacts of climate change on the implementation of the WFD[30] was held in Newry in 2009. There may be potential here for additional joint activities, including research.

30. Event co-sponsored by the Northern Ireland Environment Agency and the EPA.

Table 5.18. Entry points for integrating adaptation into foreign affairs decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
International	Department of Foreign Affairs	Formation Implementation Resource allocation	Integrate climate change into the design and review of country strategy papers with Ireland's partner countries ✓✓ Deliver financial and technical climate-related support to Ireland's partner countries and to international climate financing mechanisms ✓✓
European Union (EU)	Department of Foreign Affairs	Formation Implementation	Continue to engage with EU and international fora to ensure coherence between climate change and development policy and to provide support to developing countries to pursue low-carbon/climate-resilient pathways ✓✓
National	Department of Foreign Affairs	Formation Implementation Resource allocation	Support relevant departments (e.g. Finance) in the design and delivery of Ireland's climate change finance commitments ✓✓
National	Department of Foreign Affairs	Formation Implementation	Work more closely with the Department of the Environment (Northern Ireland) and the Northern Ireland Climate Information Platform to enhance synergies and develop common approaches to climate change adaptation ✓

5.17 Finance

Key impacts
Impacts of climate change on productivity and economic growth, potential for climate-related revenue generation, additional costs of adapting to climate change.

The Statement of Strategy 2008–2010 of the Department of Finance (DOF, 2008) states that it will "*formulate and promote sustainable public expenditure policies which support the government's economic, social and environmental objectives*". There is no specific mention of climate change although recent changes to the tax regime have had environmental objectives (revised VRT, introduction of a carbon tax, measures to support energy efficiency and retrofitting of housing). The overriding concern of this Department at present is to manage the significant budget deficit, reduce public sector spending and reprioritise capital investment to focus on infrastructure that will help support employment, economic growth and the SMART/Green economy.

The Stern Review (Stern, 2007) identified financial constraints as one of the main barriers to successful business adaptation. As access to finance continues to be a big issue for business in Ireland, this has an impact on long-term investments such as future-proofing/climate-proofing/adaptation investment. Forfás contends that current business supports and capital allowances could be assessed to understand their potential to support business adaptation. Consideration could also be given to the role that specialised market-based instruments play in business adaptation. The possibility of using revenue generated from auctioning allowances under the EU's ETS for adaptation purposes could also be utilised.[31]

Ireland has commitments to contribute €100 million to fast-start financing to support developing countries in the 3 years from 2010 to 2012. This is part of the EU's collective commitment to provide €2.4 billion as part of the commitment made by Heads of State in the Copenhagen Accord (European Union 9437/10 EU). Ireland and the EU will also be part of an international effort to scale this up to USD 100 billion per year by 2020. A high-level advisory group on climate financing convened by the UN Secretary General is currently looking into ways to mobilise this finance. The Department of Finance has a lead role to play in mobilising international climate finance for both the fast-start period and the longer term.

31. Comment from Forfás, July 2010.

Table 5.19. Entry points for integrating adaptation into financial decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	Department of Finance	Resource allocation	Reform of tax incentives, policies and measures to reduce GHG emissions could raise revenue for adaptation measures ✓
National	Department of Finance	Resource allocation	Consider how auctioning revenue from emissions trading could be used to fund adaptation activities in Ireland and meet international obligations under the UNFCCC ✓
National	Department of Finance	Planning Resource allocation Implementation	Empower sectoral ministries to plan and budget for adaptation to climate change ✓
Local level	DECLG/Local authorities	Implementation	Empower local authorities to plan and budget for adaptation to climate change ✓

GHG, greenhouse gas; DECLG, Department of the Environment, Community and Local Government; UNFCCC, United Nations Framework Convention on Climate Change.

5.18 Insurance

Key impacts
Insurance has a role to play in lessening the net adverse impacts of climatic events on many aspects of business, households, community and infrastructure (Forfás, 2010).

Insurance mechanisms play a key role in adapting to climate change by covering residual risks and providing incentives for risk reduction. Through their underwriting policy, (re)insurance companies can increase risk awareness and provide incentives for risk reduction. Insurance companies have inherent interests in minimising the impacts of climate change in order to maintain residual insurable risks. Through its investment policy and asset management, the financial sector as a whole has considerable influence on companies' investment decisions. It can therefore ensure that any investments made are more climate resilient and channel money into projects related to adaptation and mitigation of climate change (EEA, 2008).

In locations where risk is rising and private insurance is a major risk management option, pricing signals can provide incentives for adaptation; however, protection can also be withdrawn, leaving increased roles for others, including governments (IPCC, 2007a). Insurance can play a dual role with respect to business and society's adaptation to climate change impacts. Access to insurance payouts can lessen the net adverse impact of climatic events on policyholders. At the same time, insurance is also an instrument for incentivising adaptations aimed at reducing climate risks. Thus, as insurance can play a prominent role in any adaptation strategy, the benefits of covering climate risks will need to continue to be promoted to business and homeowners.

As the climate changes and historical weather records become less useful, the insurance sector will have to develop new ways of assessing risk and spreading it away from those least affected, while encouraging those at risk to adapt to the new environment. The big problem for the insurance industry – and for policy makers – lies mainly not in the huge uncertainty of the effects of climate change itself, but in the balance between properly assessing and pricing current risks and ensuring that those in the most exposed areas can afford cover for their property. Government policy, which systematically addresses the risks of climate change and invests in adaptation measures (such as flood defences), can go some way to reducing this uncertainty.

At present, little is known about the insurance-related impacts of climate change for businesses and other property owners in Ireland. Internationally, on the other hand, there has been increasing awareness in recent years of the insurance-related problems stemming from climate change[32] and there are now many working examples of index-based insurance and micro-insurance schemes from which lessons can be learned[33]. To develop a knowledge base of potential

Table 5.20. Entry points for integrating adaptation into insurance decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DECLG	Implementation	Engage with the insurance industry to promote the integration of climate change impact into any revisions of risk assessment approaches and methodologies ✓

DECLG, Department of the Environment, Community and Local Government.

insurance implications of climate change for business and homeowners, Irish insurance companies could develop risk assessment research for insurance in Ireland according to different climate change scenarios (Forfás, 2010). There is scope for insurers (through the Irish Insurance Federation) and the Irish Government to continue to co-operate to ensure that insurable risks are kept to a manageable level and that coverage remains wide (Forfás, 2010).

5.19 Research and Development

Growing research capability is a core component of the EU's drive to become the most competitive and dynamic, knowledge-driven economy. The Framework Programmes for Research and Technological Development are the EU's main instruments for supporting collaborative research, development and innovations in science, engineering and technology. The Seventh EU Framework Programme for Research and Technological Development (FP7) was launched at the end of 2006, with a budget of approximately €50 billion, covering the period 2007–2013. This Programme will be replaced by Horizon 2020 in 2014–2020, with an €80 billion budget.

A dedicated national contact point is assigned to each programme area: the EPA is the national contact point for the environmental (including climate change) thematic area (FP7 Ireland).

Ireland's Strategy for Science, Technology and Innovation (SSTI) 2006–2013 sets out a vision for developing the knowledge economy. While the recently completed Report of the Research Prioritisation Steering Group (Forfás, 2012) sets out the Government's plan to target its €500 million budget spend on scientific research every year on areas with the greatest potential for economic return.

Direct funding for environmental research is the responsibility of a number of government departments. The DECLG has mandated the EPA to undertake its research allocation. The National Development Plan (NDP) 2007–2013 also included additional funding for climate change research and allowed for the development of the more structured CCRP for the period 2007–2008, with improved co-ordination structures and processes. Other climate-change-related research includes energy research funded by the SEAI, agriculture research and soil carbon analysis funded through the DAFF and Teagasc, forest

32. Studies by the Association of British Insurers and the European reinsurers Swiss Re and Munich Re report that climate change has already caused a significant increase in losses for insurers in the past two decades.
33. For example, Insurance Scheme AquaPol in the Netherlands, which offers insurance coverage against damage caused by 'rain storms'.

Table 5.21. Entry points for integrating adaptation into research and development decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Research and Development	EPA	Formation	Reflection of climate change adaptation research needs under the Framework Programme ✓✓
National	Various government agencies	Implementation	Engage with those with responsibility for funding and implementing research to enhance awareness of the need for adaptation-related research ✓✓
Sectoral research	DECLG/EPA	Implementation	Ongoing and future research into the consequences of climate change at local level ✓✓

DG, Directorate-General; EPA, Environmental Protection Agency; DECLG, Department of the Environment, Community and Local Government.

research funded by COFORD, marine research funded by the Marine Institute, and socio-economic and enterprise-orientated research is being advanced by Forfás and Enterprise Ireland. Climate-change-related studies are also indirectly supported by other bodies, e.g. groups that have invested in research infrastructure. These include the Higher Education Authority (HEA), which provides funding for university and other educational institutions. The national meteorological service, Met Éireann, operates a climate analysis section from within its own budget and has primary responsibility for systematic observations of meteorological parameters. Individual NGOs have also been engaged in research initiatives related to climate change.

5.20 Summary

This chapter sets out the main processes either already in place or forthcoming in relation to sectoral planning. Based on this review, it can be noted that a number of sectors are already engaged with climate change adaptation, such as water, biodiversity, forestry, heritage, tourism, planning, research and development, insurance industry, etc. The reasons for the integration of climate change adaptation into sectoral planning are mainly driven by the push from EU directives or the anticipation of climate change impacts. However, it is also evident that other areas have yet to engage with the process, which suggests that awareness raising and communications within these sectors of climate change impacts and adaptation need to be enhanced.

6 Social Protection

This chapter sets out the major policies, plans and programmes, either established or upcoming, relating to social vulnerability. The institutions responsible for funding and implementing social protection measures are also included.

The Office for Social Inclusion has responsibility for developing, co-ordinating and driving Ireland's National Action Plan for Social Inclusion 2007–2016. There is no reference to climate change or the environment as factors affecting social vulnerability and exclusion. The Department of Social Protection has primary responsibility for tackling poverty and vulnerability but the environment and climate change have yet to be acknowledged as drivers of poverty, vulnerability and social exclusion. The Combat Poverty Agency has recently been integrated into the Office for Social Inclusion and resources for this sector are limited as the bulk of available funds are needed for social welfare payments.

Awareness of climate change issues amongst community organisations is very low[34] and this is mirrored by a lack of awareness in government of the need to address the social implications of climate change. As the impacts of climate change are felt locally, a local response is critical and communities have been shown to have a key role to play when empowered and included. Recent extreme events in Ireland, such as the floods in late 2009, demonstrated the invaluable role of community organisations in caring for the most vulnerable and providing basic needs such as food, water and shelter.

The Community Workers' Cooperative has recently carried out some research on the implications of climate change on the community sector in Ireland (CWC, 2012). The research acknowledges that the impacts of climate change fall disproportionately on those experiencing poverty, inequality and disadvantage. It identifies ways in which the community and social sectors can engage with planning and decision making related to climate change to safeguard the vulnerable and identify any opportunities to improve social inclusion and combat poverty. The research highlights the social transformation that will result from both the physical impacts of climate change and policies adopted to address climate change. Additional research ongoing from a medical perspective indicates that those most vulnerable to temperature extremes are people over the age of 75 and people who already suffer from respiratory and cardiovascular conditions. The research is also finding that, in the case of flooding, it is those people for whom English is not a first language who may be at most risk due to difficulties understanding warning messages.[35]

34. Comments from Community Workers' Cooperative, June 2010.

35. Elizabeth Cullen, personal communication, 25 August 2010.

Table 6.1. Entry points for integrating adaptation into social protection decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
National	DOHC Department of Social Protection	Formation Resource allocation Implementation	Co-ordinate approach of health sector in assessing and preparing for the climate change impacts ✓
National	DOHC NGOs	Implementation	Raise awareness of climate change impacts and social vulnerability ✓✓
Sectoral research	DOHC/HRB	Implementation	Research on climate change impacts (e.g. extreme events) on health and well-being ✓

DOHC, Department of Health and Children; NGO, non-governmental organisation; HRB, Health Research Board.

6.1 Summary

There is a low level of awareness of the potential impacts of climate change on social vulnerability at either the policy or the community organisation level in Ireland. It is possible that these impacts may fall disproportionately on the most vulnerable sectors of Irish society. Awareness building of the implications of climate change on the most vulnerable sectors of Irish society must be undertaken within the decision-making community, with a view to developing resilience in the human population.

7 Disaster Risk Reduction

7.1 Introduction

In the context of climate change adaptation, one way to increase adaptive capacity is to integrate climate change impacts into disaster risk reduction (DRR) strategies with a view to reducing vulnerability (IPCC, 2007a). Parties to the UNFCCC acknowledged the relevance of DRR to advance adaptation in the December 2007 Bali Action Plan, which calls for enhanced action on risk management and risk reduction strategies, including risk transfer mechanisms such as insurance.

This chapter sets out the major policies, plans and programmes, either established or upcoming, that relate to DRR in Ireland. The authors set out the institutions with funding and implementation responsibilities. The implementation of the Hyogo Framework for Action (HFA) 2005–2015 is also discussed.

7.2 International Context

In 2005, under the auspices of the UN International Strategy for Disaster Reduction, the international community set the context for DRR at a conference in Kobe, Japan. The HFA sets out strategic goals and objectives to increase the resilience of communities to disasters and key actions to be undertaken by all states to prepare for and reduce the risks posed by disasters. The HFA sets out priorities for action common to all countries. It encourages all states to prepare and publish assessments of the status of DRR, designate a national co-ordination mechanism to implement the framework, develop reviewing procedures to assess progress, and promote the integration of the risk associated with climate change into strategies for the reduction of disaster risk and adaptation to climate change.

The HFA stresses multi-sectoral co-ordination and recommends the setting up of national platforms for DRR, with designated responsibilities at national through to local levels. The emphasis is on integrating risk reduction into policies and plans at all levels of government and across sectors. It also stresses the importance of adopting legislation to support DRR, including regulations and mechanisms that encourage compliance and that promote incentives for undertaking risk reduction activities.

7.3 EU Context

The EU has a strong focus on DRR in its Humanitarian Aid Programme and integrates DRR into development co-operation and humanitarian response activities. Domestically, the concept of DRR has not been progressed to the same extent and there are no policy directives implementing the HFA. Activities in this field within the EU have tended to come under the heading of civil protection; however, more recently, efforts have been made to consider DRR in the context of climate change adaptation for Europe.

The EC Communication on disaster risk prevention (COM/2008/130/FINAL) aims to integrate policies and instruments related to disaster (e.g. floods, droughts, wind storms) risk assessment, forecasting, prevention, preparedness and recovery (supported at EU level by the Joint Research Centre, e.g. on forecasts of forest fires, floods and droughts). The Commission's communication calls for improving and better sharing of data on disasters, disaster risk mapping and disaster risk management in the context of the EU civil protection mechanism. Global Monitoring for Environment and Security (GMES) is developing observation data services required for rapid mapping, models and risk mapping. The EEA proposes to provide assessment of the effects of climate change on disasters and the effects of disasters on the environment over a longer time period (decades). The EEA will also support EC work on risk mapping by means of improving synergies with vulnerability mapping (EEA, 2009).

7.4 National Policy

In Ireland, the focus is on emergency management and planning rather than on DRR. While no references are made to DRR or the HFA in emergency planning,

several of the objectives of the HFA are being met. There is multi-sectoral and multilevel co-ordination in the areas of emergency response, and institutions at national, regional and local levels have been strengthened to respond to major emergencies. Risk assessments are carried out by local authorities and other principal response agencies.

Policy in the area of emergency management is set out in the Framework for Major Emergency Management (MEM) (http://www.mem.ie). The development of the framework was led by the DEHLG in collaboration with the DOHC and the Department of Justice and Law Reform. The MEM Framework sets out the principles and approaches to strengthen and scale-up response capacity, to enhance co-ordination and to involve and empower a wide range of key actors and it provides guidance to government agencies and bodies involved in emergency management.

The MEM Framework works at three levels – local authority, regional and national – with planning and co-ordination taking place at all levels. Risk assessments are carried out by local authorities and these are used to inform Major Emergency Management Plans (available on most local authority websites). The emphasis in the MEM Framework is very much on emergency response but it does also include preparedness and recovery (short and long term, including mitigating the impact of future emergencies). The MEM Framework is not statutory and risk assessments are not legislated for. Nevertheless, the Framework is the basis for emergency management and is actively used by local authorities, the Gardaí and the HSE.

An additional document, produced by the Office of Emergency Planning in the Department of Defence, is the *Strategic Emergency Planning Guidance* (DOD, 2004). This document deals with emergency planning, risk assessment, the role of government, communication, etc.; however, it is not clear how it fits with the MEM Framework (approved by Government in 2006).

7.5 National Institutions

The Government Task Force on Emergency Planning (GTF) was established in 2001 to provide policy and direction and to co-ordinate and oversee emergency planning in all government departments and public authorities. The GTF is chaired by the Minister for Defence, with participation from the Defence Forces, the Garda Síochána and representatives of other key public authorities. The GTF has a direct link to and is supported by the Office of Emergency Planning in the Department of Defence and co-ordinates and is informed by the National Steering Committee on Major Emergency Management, under the DECLG.

The GTF's role is to co-ordinate and provide oversight for emergency planning and to refine and develop the emergency planning process. It raises awareness of emergency planning at the highest level in government departments, assigns roles and responsibilities and builds capacity. The Office of Emergency Planning has the power to activate the National Emergency Centre, which is used by lead departments and the major emergency management structures in times of crisis.

An Interdepartmental Working Group shares expertise between government departments and agencies and aims to minimise the potential consequences of any emergency. Responsibility for emergency planning lies with the relevant government department and when an emergency occurs an emergency plan is put into operation led by the relevant department.[36] There are no fixed requirements or guidelines for departments to produce emergency plans although some plans or processes have been established for specific issues on an ad hoc basis.

The distinction between emergency planning and emergency management is unclear – the MEM Framework states that emergency management is a broader term and includes emergency planning, but also preparedness, response and recovery.

Responsibility for emergency management lies with the National Steering Group, which has responsibility to oversee the implementation of the MEM Framework. This group comprises four departments (Environment, Justice, Health and Defence) and the three principal

36. For roles and responsibilities of different Government Departments see http://www.emergencyplanning.ie/media/docs/revised%20annex%20to%20sepg%20-%20roles%20&%20responsibilities%20in%20emergency%20planning.pdf

response agencies (An Garda Síochána, the HSE and local authorities (via the CCMA)). This group sends reports to the GTF on emergency planning but is not under its command.

A National Working Group comprises representatives for the three principal response sectors and is chaired by the DECLG. There is also a Major Emergencies Development Programme Team in the DECLG that supports the National Steering and Working Groups. This team developed the MEM Framework and supporting guidance documents and provides training and capacity support to regional and local levels.

7.6 Regional and Local Institutions

The MEM Framework establishes eight Major Emergency Management Regions, each with a Regional Steering Group comprising representatives of the principal response agencies in the region. These regional institutional structures are linked to the national level via two mechanisms:

1. A representative of the National Working or Steering Group attends meetings of the Regional Steering Group; and
2. Meetings are held between the National Working Group and the chairs of the Regional Working and Steering Groups.

These co-ordination structures are mirrored at the local level, where Major Emergency Management Plans are developed and implemented by the local authority in collaboration with the Garda Síochána and the HSE.

7.7 Summary

The institutional structures for emergency management (including planning) are complex due to the overlapping roles of the Office of Emergency Planning and the National Steering Group on Major Emergencies Management. The MEM Framework has established a robust set of institutions at national, regional and local levels, but co-ordination between the levels remains a challenge. From the perspective of climate change, there are opportunities to improve the provision of information on climate impacts to inform preparedness (e.g. early warning and risk mapping), planning, response and recovery activities.

Table 7.1. Entry points for integrating adaptation into disaster risk reduction approaches.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Humanitarian Aid and Civil Protection	DECLG/Department of Foreign Affairs		Review of the Humanitarian Aid and Civil Protection policy ✓
National	DECLG/Department of Defence	All stages	Include climate change expertise on the Government Task Force on Emergency Planning and on the National Steering Group on Major Emergencies Management ✓ Improve the provision of information on climate change impacts to inform planning, response and recovery activities through the Major Emergencies Management Framework ✓
Sectoral research	DECLG/EPA/ OPW		Further develop early warning systems to inform emergency responses – building on current OPW study on flood risk warning ✓✓ Complete hazard mapping to identify areas at risk from climate change ✓✓

DG, Directorate-General; DECLG, Department of the Environment, Community and Local Government; EPA, Environmental Protection Agency, OPW, Office of Public Works.

8 Environmental Management Tools and Processes

8.1 Introduction

This chapter sets out important environmental planning tools such as SEA, EIA, AA and RIA, and assesses their potential for integrating climate change into policy, planning, programme and project-level decision making.

8.2 SEA

The SEA Directive was transposed into Irish law in 2004. Under the regulations, the types of plans and programmes subject to SEA include agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, tourism and telecommunications (and those that set the framework for future development consent of projects listed in Annexes I and II of the EIA Directive).

Annex I of the Directive lists the information that must be included in the Environmental Report. Paragraph (f) of Annex I requires information on the likely significant effects of plans and programmes on the environment, including on issues such as "*biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors*". These impacts should include secondary and cumulative effects. Adaptation and mitigation considerations fit within the scope of this provision. Annex II contains the criteria for determining the likely significant effects of the plan or programme. Mitigation and adaptation options could also be incorporated into these criteria in future; however, at the moment, consideration of climatic factors in SEAs tends to focus only on mitigation aspects.

The DECLG provides a guidance document for regional and planning authorities in relation to land-use planning (DEHLG, 2004). In addition, the EPA has provided guidance in its document *Development of Strategic Environmental Assessment (SEA) Methodologies for Plans and Programmes in Ireland* (Scott and Marsden, 2003).

The OECD/Development Assistance Committee (DAC) and the UK's Environment Agency have produced guidance for practitioners on how to consider and incorporate climate change within the SEA process (Levett-Therivel Sustainability Consultants, 2007; OECD/DAC, 2008; Environment Agency, 2011). This existing guidance, expected EC guidance or nationally developed guidance could be used to capture the potential of SEA as a tool for climate change adaptation mainstreaming.

8.3 EIA

The EIA Directive (Directive 85/337/EEC as amended by Directive 97/11/EC and Directive 2003/35/EC) requires that certain developments are assessed for the likely environmental effects before planning permission can be granted.

EIA requirements under planning legislation have been consolidated into Part X of the Planning and Development Act 2000 and Part 10 of the Planning and Development Regulations 2001. Legislation was subsequently amended in 2001, 2003, 2004, 2006 and 2009. Guidance on EIA is provided by the DEHLG document: *Environmental Impact Assessment (EIA) Guidance for Consent Authorities Regarding Sub-Threshold Development* (DEHLG, 2003) and the EPA documents (EPA, 2002, 2003).

Incorporation of climate change considerations into the EIA process is something that the EC has also discussed, stating that climate change issues are not adequately assessed in the existing EIA regime and tend to focus on emissions only (COM/2009/378). Likewise, the OECD has recently published some work examining the potential for EIA to better integrate climate change adaptation (Agrawala et al., 2010).

With clear guidance and limited legislative reform, climate change adaptation could be considered in the EIA process. The EU's White Paper on Adaptation has as one of its actions to develop guidelines by 2011 to ensure that climate impacts are taken into account in

both the EIA and SEA Directives (COM/2009/147/FINAL, p. 13).

The EC engaged in a public consultation in relation to the review of the EIA Directive. The consultation covered, among other things, the development of synergies with other EU policies, such as climate change and biodiversity. The findings of the consultation fed into a review in 2011 that is expected to lead to a new EIA Directive encompassing new policy developments, particularly in the sectors of climate change, energy and biodiversity, and taking into account implementation experiences. The review focused on the screening of projects for EIA, the quality of the EIA process, the harmonisation of assessment requirements among Member States, cross-border difficulties when projects affect more than one Member State, the role of environmental authorities, and the development of synergies between the EIA Directive and other EU environmental legislation and policies, such as climate change, resource efficiency and biodiversity, which, according to the EC, are not sufficiently covered by the Directive in its current form (Directive 85/337/EEC). From a national perspective, any changes to the Directive should lead to changes in national guidelines which will provide a useful entry point for adapting projects to climate change.

8.4 AA

AA is a requirement under the EU Habitats Directive. It is an assessment of the potential adverse or negative effects of a plan or project, in combination with other plans or projects, on a European Natura 2000 Site. These sites consist of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) and provide for the protection and long-term survival of Europe's most valuable and threatened species and habitats.

AA is a focused and detailed impact assessment of the implications of the plan or project, alone and in combination with other plans and projects, on the integrity of a Natura 2000 site in view of its conservation objectives. The duty to undertake AA lies with the competent authority, i.e. the national, regional or local authority charged with decision making. *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (DEHLG, 2009b). No reference is made to climate change or adaptation in these guidelines although they shape assessment for vulnerable ecosystems and species.

8.5 RIA

RIA was introduced across all government departments and offices in 2005. It is used to assess the likely effects (including environmental) of a proposed new regulation or regulatory change, hence it applies to legal instruments only (i.e. Acts and Statutory Instruments). The Department of the Taoiseach (2009) produced a revised guidance document for all government departments and offices titled *RIA Guidelines: How to Conduct a Regulatory Impact Analysis*. The revised guidance advises that environmental impacts should be examined under the

Table 8.1. Entry points for integrating adaptation into tools for environmental decision making.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Environment	DECLG	Formation Planning Implementation	Review of SEA Directive ✓ Review of EIA Directive ✓✓
National	DECLG/Various government departments	Formation Planning Implementation	SEA guidance could be reviewed to include climate change adaptation ✓ EIA guidance could be reviewed on foot of revision to the EIA Directive ✓ Revisions of guidelines for Planning Authorities on AA of plans and projects to include climate change adaptation ✓ Climate change adaptation could be highlighted as a key environmental consideration when legislation is subject to RIA ✓

DG, Directorate-General; DECLG, Department of the Environment, Community and Local Government; SEA, Strategic Environmental Assessment; EIA, Environmental Impact Assessment; AA, Appropriate Assessment; RIA, Regulatory Impact Assessment.

headings identified by the EPA for conducting an EIA: both adaptation and mitigation are included in this.

8.6 Summary

A number of important environmental planning tools, such as SEA, EIA, AA and RIA, are already part of the Irish environmental management landscape. However, these are not currently being used in the context of climate change adaptation. Accordingly, their potential for integrating climate change adaptation into decision making at all levels needs to be acknowledged and further developed. In the context of anticipated changes at the level of the EC in relation to some of the parent directives, it can be expected that existing guidelines and procedures in the context of climate change adaptation will need to be addressed in the near future.

9 Equity and Participation

Adaptation is a localised issue and will require the participation of local actors in climate change decision-making processes. At the same time, policy makers' responses can benefit significantly from effective engagement with stakeholders, which gives them an important role in the adaptation process (Swart et al., 2009). In this regard, it is valuable to have insights into the processes that exist in Ireland for participation.

This chapter sets out the major existing policies and laws relating to access to information and participation in planning and decision-making processes that may be of benefit in the context of climate change adaptation.

9.1 Access to Environmental Information

The Aarhus Convention establishes a number of procedural rights for the public (individuals and their associations) with regard to the environment, including access to information, public participation, and access to justice.

The Parties to the Convention are required to make the necessary provisions so that public authorities (at national, regional or local level) will contribute to these rights becoming effective. The Convention is implemented in the EU through two directives and one regulation.[37] The two major pieces of Irish legislation on access to environmental information are the Freedom of Information Act 1997–2003 and the EC (Access to Information on the Environment) Regulations, SI No. 133 of 2007, which transpose EC Directive 2003/4/EC. Ireland has signed the Aarhus Convention but has yet to ratify it; however, a commitment to do so can be found in the revised Programme for Government, 2009.

An assessment of the steps taken by Ireland to improve access to environmental information shows that the Aarhus Convention and EC Directive 2003/4/EC have strengthened the rights of the public in terms of access to information but serious problems with practical implementation remain (Ryall, 2011). The establishment of a new office of the Commissioner for Environmental Information has provided greater assurance that access to environmental information will be provided. However, the absence of a consistent and appropriate schedule of charges, the lack of a list of public authorities, and the €150 fee for appealing decisions all create disincentives for the public to pursue actions with the Commissioner.

An assessment of access to information in Ireland by Ewing et al. (2008) finds that while significant efforts have been made to provide the necessary legislation (with room for improvements), weaknesses in organisation and operation of measures to enable access to information weaken overall effectiveness. Recommendations include amendments to the Irish Regulations transposing the Directive, a review of the guidelines, improvements in public awareness of rights of access to information, improved monitoring of the implementation of the Directive, the need to provide information free of charge, and the need to strengthen structures and capacities to implement the laws in national agencies and local authorities. However, according to the OECD 2010 report, provision of information by environmental authorities in Ireland has shifted from passive to active, with high-quality information routinely made available online by organisations such as the EPA, e.g. the online bathing water quality website (http://www.bathingwater.ie).

9.2 Stakeholder Involvement and Participation

The Aarhus Convention refers to participation, which is an active process, and not just to consultation, which is a passive process. Guidelines for EIA, SEA, planning consent, etc., often require consultation (e.g. posting information on the Internet for comment, inviting submissions) but this does not ensure active participation.

37. Two decisions to further implement the Regulation have been adopted by the Commission but these are not considered relevant to this document.

The need to involve the public at the earliest possible time in Irish terrestrial planning is accepted and legislated for in some decision-making processes, such as road and water planning and SEA, but not in others. For example, in the EIA process, the public are often only included in a review capacity when the report resulting from the EIA is completed (Ewing et al., 2008).

According to Ewing et al. (2008), there is a need to improve the participation mechanisms (procedures and methodologies) used. This involves a good deal of capacity building within public authorities, NGOs and the public. Constructive dialogue requires the development of a new skill set for all participants. The absence of a participatory culture in Ireland until recent times means that there is a lack of expertise in this area. New participatory techniques are regularly being developed and the development of training courses together with an online one-stop-shop toolkit should be a priority (Ryall, 2009).

Information services, such as the Citizens Information Service, also play a valuable role by providing guidance on how members of the public can participate in environmental matters. In particular Comhar SDC has an important role to play as the forum for national consultation and dialogue on all issues relating to sustainable development. Climate change is a significant issue for Comhar SDC and has been addressed in advice and recommendations to Government, drawing on the inputs of its Climate Change Working Group (http://www.comhardc.ie).[38]

In terms of the development of legislation at national level, RIA is used as a mechanism for involving the public in the process. In a recent report published by the European ECO Forum[39], RIA is highlighted as a best practice example in Ireland in terms of public participation.

Opportunities for participation are usually most accessible at local level, hence the emphasis of Local Agenda 21 on local-level action and participation in decision making for sustainable development. A study looking at public participation in local sustainable development planning found that citizen participation is largely passive and that there is real potential to strengthen active participation in decision making at local level (Mullally et al., 2008). Key barriers to improving participation include a poorly perceived sense of capacity to effect change at local level, largely because significant decision making is made at national level. This can cause stakeholders to exit the process, lack commitment or become disillusioned and disruptive to the process. A key step in making local-level participation in decision making more effective is to strengthen the vertical elements of governance, i.e. to link local-level processes such as county and city-level planning to national policy processes (Mullally et al., 2008).

The *Report of the Taskforce on Active Citizenship* (Department of the Taoiseach, 2007) found a perceived absence of meaningful opportunities for civic participation in decision making about local issues. There is a perception that consultation is often an empty exercise rather than a meaningful opportunity to engage. The Green Paper draws on this analysis and suggests that there is significant potential for stronger community influence and input into decision making at local level (DEHLG, 2008d). It proposes measures such as participatory budgeting, petition-related rights, binding plebiscites (direct votes on particular proposals) and regular town/area meetings as possible ways of strengthening engagement.

9.3 Social Partnership

The Environmental Pillar of Social Partnership comprises 27 environmental organisations working as one entity.[40] The members represent the pillar on national and local policy and planning committees and are internally composed of four policy groups on:

1. Climate change;
2. Environmental economics;
3. Sustainable production and consumption; and

38. In January 2012, the sustainable development role performed by Comhar, the Sustainable Development Council (SDC), was integrated into the work of the National Economic and Social Council (NESC).
39. Report on the Implementation of the Public Participation Pillar of the Aarhus Convention, European ECO Forum, March 2010.
40. For more information, see http://www.environmentalpillar.ie.

4. Natural resources.

The policy priorities developed in the area of climate change offer the potential for the Pillar to integrate climate change adaptation into local and national decision making. Whilst the official channels of social partnership are less active at present, the five pillars[41] are actively engaged with each other and all sectors of local and central government.[42] The Environmental Pillar works closely with the other pillars to advance issues related to sustainable development, equity and participation. In collaboration with the Trade Unions and Community and Voluntary Sector, it is developing alternative narratives for Ireland's development to share with government (http://www.isfeidirlinn.org/).

41. The partnership is made up of five pillars: Farmers, Trade Unions, Community and Voluntary, Employers, and Environment. The Environment pillar is the most recent, added in April 2009.
42. Michael Ewing, personal communication, July 2010.

9.4 Summary

Environmental authorities in Ireland are actively engaged in the provision of high-quality information, which is routinely made available by online mechanisms. A number of mechanisms exist for active participation in environmental decision making in Ireland. Bodies such as the Citizens Information Service play valuable roles in national and local level decision making.

While some blockages exist in the system the potential for vertical integration between layers of governance would be a useful advance. In particular, the Environmental Pillar offers potential for the integration of climate change into local and national-level climate change decision making.

Table 9.1. Entry points for integrating adaptation into equity and participation approaches.

Policy level	Key national actors	Policy cycle stage	Key entry points (existing ✓✓ and possible ✓)
European Union – DG Environment	DECLG	Formation	Review and amendments to Access to Information on the Environment Directive to facilitate information on climate change ✓
National	DECLG	Implementation	Include information on climate change in the work of the Commissioner for Environmental Information ✓
National	Social partners	Implementation	The social partnership process offers opportunities to integrate climate change into emerging policy on economic and social issues ✓✓

DG, Directorate-General; DECLG, Department of the Environment, Community and Local Government.

10 Conclusions of Part A

Current climate change policy focuses predominantly on mitigation, and on adaptation to a lesser extent. The responsibility for climate change policy and implementation is horizontally spread across a number of government departments and agencies. While some mechanisms and tools are already in place to co-ordinate some of these activities, a high-level cross-departmental committee needs to be set up or mandated for on a statutory basis to oversee all activities (mitigation and adaptation), with a view to horizontal integration of activities.

The implementation of adaptation at the local level will require resources, appropriate guidance and capacity building. An analysis of the costs and benefits of adaptation is an important next step. Adaptation indicators for monitoring and for future review purposes will need to be developed. Some activities will require little additional resources to be implemented; they will, however, need to be steered from the national level and will have to be well co-ordinated. In this respect, vertical integration (i.e. the linking of bottom–up and top–down approaches to adaptation) will be a key consideration for the successful implementation of adaptation strategies.

A number of sectors are already engaging with climate change impacts and adaptation. The reasons for the integration of climate change adaptation into sectoral planning can be attributed to two dominant factors – the push from EU directives and the anticipation of climate change impacts. However, it is also evident that other areas have yet to engage with the process, which suggests that awareness raising and communications within these sectors about climate change impacts and adaptation need to be enhanced.

There is a low level of awareness of the potential impacts of climate change on socially vulnerable sectors of society at either the policy or the community organisation level in Ireland. Awareness building of the implications of climate change on the most vulnerable sectors of Irish society must be undertaken within the decision-making community, with a view to developing resilience in the human population.

Disaster risk reduction and management are important climate risk responses in the context of extreme events such as flooding. From the perspective of climate change, there are opportunities to improve the provision of information on climate impacts to inform preparedness, planning, response and recovery activities.

A number of important environmental planning tools such as SEA, EIA, AA and RIA are already part of the Irish environmental management landscape. However, their full potential for integrating climate change adaptation into policies, plans, programmes and projects has yet to be fully realised.

A number of mechanisms exist for active participation in environmental decision making in Ireland. In particular, the Environmental Pillar of Social Partnership offers potential for the integration of climate change into local and national-level climate change decision making.

PART B – Assessment of Adaptive Capacity

11 Introduction

This section examines each of the five NAC functions:

1. Assessment;
2. Prioritisation;
3. Co-ordination;
4. Information management; and
5. Climate risk reduction.

Each of the functions was assessed in terms of the following criteria: adequacy/inadequacy, institutional responsibility, strengths and weaknesses, supporting evidence, proposed indicators and an overall evaluation or recommendation. The following examination is based on the assessment findings generated from the NAC worksheets[43]. In order to summarise the detailed information for each of the functions contained in the worksheets, they are presented under the following headings (which represent a composite of the assessment criteria set out above:

- Institutional arrangements;
- Strengths and weaknesses;
- Action points; and
- Possible indicators.

43. http://docs.wri.org/nac_answer_worksheet.xls

12 Assessment

Assessment is the process of examining available information to guide decision making. Adaptation is likely to require iterative assessments over time, including assessments of vulnerability, climate change impacts, adaptation practices and the climate sensitivity of development activities (WRI, 2009a). Assessment in the context of this evaluation refers to climate change impact and vulnerability.

12.1 Institutional Arrangements

Overall responsibility for assessing exposure to climate impacts lies with the DECLG, which is informed by research carried out by Met Éireann, the EPA, the Marine Institute, the OPW, universities, and by some other state and private sector actors (e.g. Fáilte Ireland, the Heritage Council and the IAE).

Further responsibility has not yet been assigned to ensure that sector, local and community-level assessments of climate impacts and vulnerability are carried out. Likewise, no institution has been made responsible for ensuring transparency in the assessment methodologies used, or for reviewing and inventorying assessments across sectors, levels of government and from non-government actors.

Critically there is no clear institutional responsibility for ensuring the assessment of climate risks in major national planning documents or for resourcing, reviewing and updating these assessments.

12.2 Strengths and Weaknesses

There is an existing body of research assessing exposure to climate impacts in Ireland that can be built on and enhanced in the future. Climate observations, monitoring, modelling and assessments of impacts are ongoing and benefit from EU-level research initiatives and participation in regional and international networks. Much of this has been summarised in Desmond et al. (2009).

There is an increasing level of awareness in the research and policy-making community of climate change impacts, for example work carried out by the IAE (2009) (critical infrastructure), the Heritage Council and Fáilte Ireland (2009) (tourism, heritage and waterways), and the OPW (ongoing) (flooding) and Forfás (2010) (business). Some sectoral vulnerability studies have been undertaken on biodiversity, flooding, and coastal and marine environments such as Devoy's (2008) work on coastal vulnerability in Ireland and the OPW's (2010) work of the Lee Catchment Flood Risk Assessment. While there are no common tools or methods for climate risk assessments, it can be argued that established environmental assessment tools, such as EIA and SEA, provide opportunities to assess climate risks at the policy, programme and project levels, if used to their full potential. These tools are already familiar to environmental decision makers and could be used either in parallel or instead of new climate change risk assessment tools.

There is as yet no systematic assessment of vulnerability (physical, social and economic drivers) at national level and the exposure of most sectors, ecosystems and populations to climate impacts is unknown. Common methodologies that comply with international standards should be agreed and used for assessments. Such an approach would allow for comparisons to be made across sectors and for the prioritisation of key sectors for immediate attention, as well as feeding into international processes. Clarification of responsibilities for conducting and inventorying vulnerability assessments needs to be made and processes put in place to ensure the regular review and updating of assessments. Experience emerging from project-level activities at the local level is providing useful information but this is not captured in any systematic way.

12.3 Action Points

Future policy is expected to clarify roles and responsibilities in relation to the assessment of climate

change impacts across sectors and levels of government. In addition to clarifying responsibility for carrying out assessments, the tools and resources required to do so will have to be made available, building where possible on established processes. An initial national vulnerability assessment is under way since 2011 and the findings are planned for mid-2012.

12.4 Proposed Indicators

- Research activity levels related to climate impact assessment (including funding provided).
- Research outputs (including peer-reviewed papers, IPCC membership).
- Established system to systematically inventory completed assessments.
- Tools and resources to carry out assessments of climate impacts available to users at all levels.
- Sector-level assessments of climate impacts completed and regularly updated.
- National-level vulnerability assessment completed and capacity and resources in place to repeat assessment.
- Mandate and responsibility to carry out and update assessments.

13 Prioritisation

Prioritisation means assigning special importance to particular issues, areas, sectors, or populations. For adaptation, prioritisation at the national level usually takes into account projected geographic distribution of climate change impacts, as well as differential vulnerability to the impacts of climate change among a country's population. Effective processes for prioritisation will engage a wide range of stakeholders, will be made transparent to the public, and will enable review and adjustment of priorities as circumstances change (WRI, 2009a).

13.1 Institutional Arrangements

Primary responsibility for prioritising where, how and to whom adaptation is a priority lies with the DECLG. Prioritisation of key vulnerabilities to climate change will be identified as part of the vulnerability study currently being undertaken.[44] The prioritisation processes will take into account the vulnerability and impact assessments referred to in the previous section. The process should include the input from a broad range of national stakeholders and experts. It should also set out where follow-up priorities might lie for future actions.

13.2 Strengths and Weaknesses

There is a growing awareness of the need to initiate a prioritisation process at the national level, with links to priorities identified by sectors and at the regional and local levels. However, the mandate for the process and a system for identifying and updating national priorities have yet to be established. In light of the current national and local-level budgetary constraints, the need for the prioritisation of adaptation actions is particularly acute.

There are some experiences with prioritisation at the local and project levels but these have yet to be scaled up and reflected at the national level. A key challenge will be the creation of a system that allows for regular updating of priorities as our understanding of climate impacts and our capacity to respond develops over time.

13.3 Action Points

It is expected that roles and responsibilities in relation to prioritisation will be clarified in future policy and legislation. This will have to clarify the responsibilities of actors across sectors and at the local level and put in place a process to use these outputs to inform and update prioritisation at the national level. The current absence of agreed national-level priorities makes it difficult to focus resources and attention where they are most needed. As the negative impacts of climate change are felt more intensely in coming years and decades, the need to focus attention on the most vulnerable sectors, areas, ecosystems and populations will increase.

13.4 Proposed Indicators

- Initial national prioritisation completed and accepted by key stakeholders:
- Transparent process for identifying and updating priorities established (including all sectors, levels of government and a range of stakeholders).
- Adequate and sustained resources made available for the prioritisation process (including scientific research and broad stakeholder engagement).

44. By NUI Maynooth under the EPA CCRP.

14 Co-ordination

Establish or mandate a national high-level group to co-ordinate action on climate change adaptation and strengthen institutional capacity by drawing on a pool of relevant expertise. Adaptation requires action by disparate actors at multiple levels, both within and outside of government. Co-ordination of their activities helps avoid duplication or gaps, and can create economies of scale in responding to challenges. Co-ordination may be **horizontal** (e.g. among ministries), **vertical** (e.g. among national, global, and sub-national actors), or **inter-sectoral** (e.g. between government and business) (WRI, 2009a).

14.1 Institutional Arrangements

Adequate and effective institutional arrangements are central to effective co-ordination. This is an emerging area in Ireland, with clarifications expected in the Climate Change Bill. To date the DECLG has taken the lead in the area of climate change mitigation and adaptation, both domestically and internationally. In addition, the Cabinet Sub-Committee on Climate Change and Energy is responsible for decision making related to climate change. The Senior Officials Group also has an important role to play in addressing the day-to-day institutional arrangements.

Apart from these arrangements, it would seem that there is still a need for a body or institution to be established or mandated with co-ordinating adaptation activities across sectors (horizontal), levels of governance (vertical) and with non-state actors (NGOs, academics, private sector, etc.). To be effective, such a body should ideally be high level and well advised by a team of experts. It should act as a forum for co-ordination and meet and report regularly on its activities to the cabinet and the Dáil.

14.2 Strengths and Weaknesses

There is awareness amongst those currently taking the lead on climate change that co-ordination is critical and that processes need to be put in place to enable this both horizontally and vertically. Existing structures, such as the Cabinet Sub-Committee on Climate Change and Energy and the research-focused cross-sectoral steering group on Impacts and Adaptation chaired by the EPA, provide a good basis on which to establish an effective co-ordination process.

At present, there is no clear mandate to co-ordinate and no common platform to bring together experiences to inform lesson learning.

14.3 Action Points

Upcoming policy or legislation should clarify responsibility for co-ordination. A lead institution should be identified and channels created to enable horizontal, vertical and inter-sectoral co-ordination. There will also need to be provisions for reviewing and updating co-ordination processes and mechanisms over time.

14.4 Proposed Indicators

- Provisions for a co-ordination body and its formation (including roles and responsibilities) outlined in the proposed National Adaptation Framework.
- Co-ordination body established, resourced, meeting and reporting to highest level of government.
- Co-ordination mechanism to enable horizontal, vertical and inter-sectoral co-ordination established and operational.
- Review process established and lessons learned incorporated into subsequent policies and plans.

15 Information Management

Information management consists of collecting, analysing, and disseminating knowledge in support of adaptive activities. Relevant information will vary, but at a minimum typically covers climate variables, the status of natural and human systems, and existing coping strategies. Good information management will ensure that information is useful and accessible to stakeholders. It may also involve general awareness raising or building the capacity of stakeholders to use information for adaptation (WRI, 2009a).

15.1 Institutional Arrangements

Ireland has climate observation and monitoring systems operated by a range of actors, including the EPA, Met Éireann, the OPW, and the Marine Institute. There are also complementary environment monitoring and observation systems operated by the EPA and other agencies, such as the OPW. Data are shared with the public to varying extents, but there are no common protocols. Overall, the institutional arrangements could be enhanced by formalising the mandate for a lead organisation and by putting in place systems for stronger co-ordination.

Analysis of climate information is carried out by a range of actors and, while it is of good quality, there is no single place to access this information (for the public or policy makers and planners) and no arrangements for ensuring that stakeholders receive the information they need.

15.2 Strengths and Weaknesses

Adequate information and analysis are available to enable climate change adaptation planning and implementation to begin in earnest. Improvements could be made to ensure a more sustainable climate observation system and to better communicate data and analysis to the public and decision makers. Those involved in data collection and analysis support the provision of access to environmental and research data, although efforts to make information publicly available have been ad hoc to date.

Stakeholders are creating demand for climate information and pilot projects are providing information to local stakeholders. They are also exploring how best to communicate and use this to inform planning. Importantly, the need for a national climate information platform has been identified. A pilot climate change information system is being developed. The EPA currently funds this development.

Improvements could be made to better co-ordinate the information available by designating a lead organisation and establishing standards and protocols for providing access to data and analysis. Unfortunately, there is no commitment to sustain climate monitoring/observations, or to respond to emerging observation requirements and best available technologies. In addition, the current project-based approach to data collection and observation means that findings are fragmented and on short timescales. This is compounded by the lack of sustained resources for climate analysis and skills and knowledge improvement. There is also the likelihood that capacity will be lost in the current economic climate as researchers move into other fields of research or abroad.

There is a clear need to better understand the information needs of end-users (general public, planners, decision makers, private sector). Initial work on understanding end-user needs is anticipated as part of the research related to the development of the Climate Information Platform. There is an awareness gap at stakeholder level that needs to be addressed in public campaigns, which have to date focused on climate change mitigation.

15.3 Action Points

The efforts of a range of actors in collecting and analysing climate data need to be enhanced, formally recognised, better co-ordinated, and adequately and

sustainably resourced. The proposed Climate Discovery Platform will play an important role in bringing together available climate change information and communicating this to stakeholders. Other important entry points are local-level research projects (e.g. IMCORE, CLAD, CoastAdapt, COCOADAPT[45]), which in various ways engage with end-users needs and expectations. The findings from such research must be co-ordinated and disseminated through appropriate channels such as the proposed Climate Information Platform. The ultimate success of this platform will depend on supplying the right information to the right people in the right format. This will require a team of professionals to work with users to select and apply the right data sources and methods. Capacity building will also be required for proper information management and transfer.

45. IMCORE, CLAD, CoastAdapt, CMRC projects UCC, COCOADAPT NUIM project.

15.4 Proposed Indicators

- Regular authoritative climate reports published (online) that feed into decision making.
- State of climate report produced every 2 years, responding to a mandate for systematic production and communication of analysis.
- Climate Information Platform established, well managed, adequately resourced and accessed by a range of users; further evolution of information system planned and properly resourced.
- Information on climate change is informing the development of policies and plans at national, regional and local levels.
- Climate change is integrated into assessment tools, such as EIA, SEA, RIA, AA and cost–benefit analysis.

16 Climate Risk Reduction

Different development priorities will face different risks from climate change. Addressing these risks depends on the above adaptation functions, but also requires a distinct process of identifying specific risks to a given priority, evaluating the full range of options for addressing the risks, and then selecting and implementing risk reduction measures. Many risk reduction measures will entail changing practices in the areas of infrastructure, natural resources management, or social protection (WRI, 2009a).

The climate risk reduction function was assessed in relation to three inferred priority areas identified during the academic workshop, and endorsed by the EPA-chaired Impacts and Adaptation Working Group (see Section 1.2). It is important to note that these are priorities inferred from existing assessments and analysis for the purposes of the National Adaptive Capacity Assessment only.

The three priority areas examined under this function are:

1. Planning;
2. Water; and
3. Critical infrastructure.

16.1 Planning

Planning refers to terrestrial and marine spatial planning, as well as sectoral planning.

16.1.1 Institutional arrangements

At present, there are no formal obligations on those involved in planning to assess the risks posed by climate change. Institutional responsibility for assessing risk has not yet been determined. Under the Planning and Development Act 2010, development plans are now required to contain mandatory objectives for the promotion of sustainable settlement and transportation strategies in urban and rural areas, including measures to reduce GHG emissions and address climate change adaptation. However, there is little evidence yet to determine to what extent such objectives are being addressed on the ground.

16.1.2 Strengths and weaknesses

Existing tools, guidelines and processes related to planning are starting to address climate risk and could be strengthened to play an important role in climate risk assessment. For example, the EU Floods Directive includes an assessment of climate risk including cost–benefit analysis and an assessment of the short, medium and long-term impacts of flood threats to inform planning. At national level, the flood risk guidelines for planning authorities could be enhanced further to address climate risk, as could the risk management tools employed in the development of local and regional emergency plans.

Existing compulsory environmental and other assessment tools that are regularly used in planning, such as RIA, SEA, EIA and AA, could be enhanced to assess the risks posed by climate change impacts on policies, legislation, plans, projects and ecosystems. These tools have provisions to include climate change (mitigation and adaptation) but this has not yet been reflected in national guidelines. Likewise, existing processes such as county and city development plans and sectoral plans could be used to integrate climate change adaptation into local-level decision making.

Key weaknesses are the lack of a mandate and a systematic process for assessing climate risk in planning. The absence of a common understanding of what climate risk assessment entails and agreed tools and methodologies are additional obstacles. At present, there is no obligation on planners (sectoral, local, private sectors) to assess climate risk, which places much of our current and recent development at risk. Few adaptation options are being implemented in the field of planning. However, some activities that may reduce vulnerability to climate change are being carried out such as flood risk management in the context of planning decisions. Finally, there has been

no consideration of the resource requirements of risk assessment and the implementation of adaptation actions to date.

16.1.3 Action points

The action points for incorporating climate risk assessment into planning are the processes that currently guide planning decisions nationally, regionally and locally. There is a need to integrate climate change into these processes (at all levels of government) and into the tools that are used to inform planning decisions. This will result in the identification of risks, adaptation options and, ultimately, the implementation of adaptation actions. The Planning and Development (Amendment) Act 2010 offers some potential for the greater integration of climate change adaptation into planning decision making.

16.1.4 Proposed indicators

- Guidelines are established to enable the integration of climate change adaptation into county and city development plans and sectoral plans.
- National guidelines for SEA, EIA, AA and RIA include guidance on assessing climate risk and integrating climate change adaptation actions.
- Clear leadership and institutional responsibility for climate change integration stipulated in policy and legislation. Lead agency has legal authority to enforce provisions of legislation.
- Guidelines (above) are used to inform and influence planning decisions at all levels.
- Legally required tools, such as SEA, EIA, AA, RIA, are being actively used to assess climate risk and plan adaptation actions.
- Prioritised adaptation actions related to planning (local, sectoral, national level) adequately resourced, implemented and assessed for effectiveness and value for money.

16.2 Water

This refers to water resources (freshwater and marine), water quality and water availability and supply.

16.2.1 Institutional arrangements

Institutions involved in implementing the WFD, the Floods Directive, the proposed Soils Directive, marine spatial planning and water supply are the primary actors. However, there is no co-ordinated approach to addressing climate change impacts and risk in the water sector or for developing common approaches to integrating adaptation into water resource management and use. There are some project-level adaptation activities under way in relation to water (e.g. CZM and flood risk management). In line with the integrated river basin approach taken under the WFD, the Floods Directive also requires Member States to co-ordinate their flood risk management practices in shared rivers basins. Co-ordination with the implementation of the WFD is required under Article 9 of the Floods Directive from the second iteration of RBMPs onwards. In addition, the water services sector has entered into a new phase with the implementation of the WFD and the WSIP 2010–2012, which has been aligned with the priorities identified for the RBMPs adopted by local authorities (DEHLG, 2010).

16.2.2 Strengths and weaknesses

There are some positive indications of consideration of climate change impacts and adaptation in the water sector. The WFD contains guidance on risk assessment, but does not include climate risk in the development of RBMPs. Basic climate checks are, however, becoming best practice. In addition, risk assessments carried out by local authorities, government departments and business take into consideration risks related to water (flooding, water shortages, interrupted supply, etc.), but do not include climate-related risks.

Adaptation actions are not being identified in the water sector in a systematic way. Some pilot activities have been conducted (e.g. coastal zone management) and some adaptation-relevant activities have been pursued, but without adaptation as the motivation (e.g. flood defences). Overall, there is no co-ordination of these activities and no shared lesson learning. The tools used to inform decision making in the area of water, particularly SEA and EIA, are not being used to assess climate risks or to identify adaptation options. Many activities are reactionary and not planned with climate change in mind, and with a focus on hard

engineering solutions rather than soft management approaches. However, the implementation of the Floods Directive, where the emphasis is on flood risk management, is focusing attention on a range of climate scenarios and includes a range of adaptation options, including hard and soft responses.

16.2.3 Action points

As in the case of planning, key opportunities to address climate change adaptation are in the established processes and tools that inform decision making related to water. The WFD and the Floods Directive provide very useful platforms and a statutory basis for integrating climate change concerns into water resource management. ICZM and marine spatial planning equally provide a very useful basis for integrating climate change adaptation, but lack the statutory basis to make it obligatory. Assessment tools used in managing water resources and supply, such as SEA and EIA, could be used to assess climate risks and identify adaptation options. NOTE: It may also be useful to consult the potential entry points identified for the sector or theme of most interest in the context document for additional ideas on next steps.

16.2.4 Proposed indicators

- Climate risk is fully integrated into future iterations of RBMPs, flood risk management plans, drought/water shortage plans and CZM plans.
- Guidance is provided for climate risk assessment and climate change adaptation integration in RBMPs, flood risk management plans, drought plans and CZM plans.
- Adaptation options are included, costed and evaluated in a meaningful way in management plans related to water, marine, coastal, flooding and drought management.
- Planned adaptation actions are implemented and a system for the reviewing effectiveness of implementation is established (including indicators).

16.3 Critical Infrastructure

This refers to the assets essential for the functioning of a society and economy and includes buildings, water, transport, energy, communications, land use, ecosystems, human health and well-being. Critical infrastructure can be understood to include the social and environmental infrastructure on which life depends (including biodiversity, ecosystem services, vibrant communities, etc.). There is no accepted definition of what critical infrastructure entails in Ireland, although the emphasis to date has been on physical, man-made infrastructure. Other forms of critical infrastructure include green infrastructure and grey (social) infrastructure. For the purposes of this assessment, critical infrastructure included energy, transport, communications and water.

16.3.1 Institutional arrangements

The institutional arrangements guiding climate risk assessment and the identification and implementation of adaptation actions in the context of infrastructure are yet to be defined. Responsibility for assessing risks has yet to be allocated to actors, including government departments, local authorities and the private sector. There is also a need to identify a lead agency to propose policy, recommend actions and co-ordinate implementation.

16.3.2 Strengths and weaknesses

The IAE has published a report on the risks posed to critical infrastructure from climate change (IAE, 2009). The report identifies key vulnerabilities in the areas of water supply, flood protection and energy supply and makes recommendations for each of these as well as recommending changes to design standards. This has contributed to a growing awareness of the impacts of climate change on ‘hard’ infrastructure.

Overall, progress is hindered by the lack of a common understanding of what constitutes critical infrastructure and an inadequate appreciation of the potential impacts of climate change. Responsibility for assessing and minimising climate-related risks needs to be defined and design standards urgently need to be revised to avoid placing infrastructural investment at risk. Again, use of existing risk and environmental assessment tools could play an important role in improving understanding of climate risk. Capacity to identify risks and appropriate adaptation options will need to be increased to ensure that any new

requirements to climate-proof infrastructure can be implemented effectively.

16.3.3 Action points

Future climate change policy or legislation should clarify responsibility for carrying out climate risk assessment and, for integrating climate change adaptation into decisions related to critical infrastructure, offers a real opportunity to better address climate-related risks. In addition, changes to design standards and better use of existing risk and environmental assessment tools could play a useful role. Ongoing reforms in planning should also facilitate consideration of the longer-term impacts of climate on planned and existing infrastructure. Follow-up to the IAE's work on assessing the risks to critical infrastructure should also provide opportunities for raising awareness and catalysing action. Further action is needed to fully understand the role of the insurance industry as a means of offsetting climate-related risks to critical infrastructure.

16.3.4 Proposed indicators

- Defining of roles and responsibilities for climate risk assessment of critical infrastructure.
- Revised design standards for infrastructure, integrating climate change risks and adaptation responses.
- Risk assessment, cost–benefit analysis and environmental assessment methodologies and tools to incorporate climate change.
- Impacts of climate change on infrastructure and effectiveness of adaptation actions are regularly monitored and reviewed.

PART C – Results, Recommendations and Conclusions

17 Results and Recommendations

This chapter presents the key results of the NAC assessment and information gathered from the context review. Recommendations are made that could strengthen capacity to plan for the impacts of climate change and increase resilience by implementing appropriate responses. The main results and recommendations are structured in terms of five cross-cutting themes that emerged from the context review and the NAC assessment:

1. Facilitating factors;
2. Science/Policy interface;
3. Information, communications and awareness raising;
4. Multilevel governance; and
5. Policy integration.

17.1 Facilitating Factors

The main drivers for climate change adaptation in Ireland are international UNFCCC negotiations, EU policies, national and international research on climate change impacts, vulnerability and adaptation, awareness that other countries are already advanced in developing their adaptation strategies, and the perception of climate change impacts for particular sectors of the economy and society. These factors have led to the increased level of interest and understanding of the topic of adaptation at the political level, yet sectoral and local levels and the wider public seem broadly unaware of the topic.

- **Recommendation:** Initiate sectoral and public awareness and debate on the topic of adaptation.

17.2 Science/Policy Interface

The provision of scientific information to underpin adaptation actions is a prerequisite to developing resilience to climate change. Such information will appear in the form of impact, vulnerability, risk, adaptive capacity and cost–benefit assessments. Some of these assessments have already been completed for Ireland and more are planned. The NAC assessment noted that enough information exists to start climate change adaptation planning and to implement priority actions; however, it is critical to maintain research efforts on climate change and its expected impacts to ensure robust and iterative research frameworks. It will also be essential to put in place a review process to ensure quality and to update information.

A framework approach to adaptation planning represents a logical and coherent approach for Ireland. Some of the elements of such an approach are already in place, namely observation and monitoring systems, modelling and prediction, and impact assessment. However, a number of significant gaps remain to be addressed, including vulnerability assessment, risk assessment and management, and costs and benefits analysis.

A national vulnerability assessment (assessing the sensitivity of sectors, populations, ecosystems and geographical areas to climate change impacts) is being undertaken. This assessment will also help in the process of determining national-level adaptation priorities. This is an essential next step in further developing climate change adaptation policy, planning and implementation. In the current constrained economic context, it is even more pressing that nationally agreed priorities are set with a view to focusing limited resources on key sectors and areas. Recognising that priorities are likely to change over time as impacts are better understood and adaptive capacity increases, a system will need to be put in place for reviewing and adjusting priorities. Any review system that is put in place must be cognisant of international and EU developments, in particular in relation to vulnerability indicators and reporting requirements.

- **Recommendation:** Completion of a national vulnerability assessment to enable adaptation planning and the implementation of adaptation actions.

An assessment of climate risks in key economic sectors should also be carried out. Responsibility and a process for doing so should be addressed. The NAC prioritisation exercise focused on the three key areas of water, planning and critical infrastructure. Similar conclusions and recommendations are common to each area.

17.2.1 Water

There is a readiness to address climate change risk in the fields of water resource management, water supply, water quality, and marine and coastal resource management. The catchment-based approach to water quality and quantity is providing a coherent approach to water management in Ireland, which must be built on such that these different areas of responsibility are co-ordinated.

The provision of national-level guidance on integrating climate change adaptation actions into water-related plans and decision making is achievable and would enable the consideration of adaptation options in the area of water. It is too early in Ireland's adaptation process to assess actions and implementation. However, improved learning from current measures could be improved. It will be important to include measures for reviewing the effectiveness of the implementation of adaptation measures from the outset.

Early warning systems (EWSs) are important risk reduction strategies for extreme events such as flooding. With the projected increase in the severity of flooding, EWSs are needed to reduce the vulnerability of social, economic and biological systems. EWSs need to be integrated into flood risk management activities, which should, in turn, be integrated into existing emergency planning and response mechanisms.

- **Recommendation:** Develop flood risk EWSs as part of the national emergency planning and responses.

17.2.2 Planning

Climate change risk has yet to be systematically assessed in the area of planning, though the development plan provides a potentially useful vehicle through which to progress adaptation planning. There is plenty of scope for developing an effective approach to risk assessment and management by building on existing legislation, tools and mechanisms such as EIA, SEA, AA and RIA. All existing tools are flexible enough to take adaptation into account if the correct guidance is provided. Planning processes also have the necessary key elements (consultation, review, etc.) to accommodate adaptation planning. Ireland is at an early stage in the adaptation process but no further time should be lost in assessing the risks posed by climate change when making decisions related to planning and investment. It is expected that government departments, local authorities and the private sector will be the primary implementers of adaptation actions. Key to understanding the implementation process will be the need to track developments over time, which will necessitate the development of process or progress-type indicators.

17.2.3 Critical infrastructure

Climate risk has started to be assessed in relation to critical infrastructure. A study by the IAE provides a good template, but more work is needed to assess the risks posed by climate change to existing and planned infrastructure. If not, significant levels of investment are likely to be placed at risk from climate-related events. It will be important to integrate analysis from different sectors to optimise resource use. Adaptation options related to critical infrastructure have yet to be considered in a comprehensive way. The focus to date has been on hard engineering options, such as flood walls and sea defences, with less emphasis on softer management alternatives or on the role of insurance. Adaptation to climate change is a new policy area in the context of critical infrastructure. Some measures, motivated by factors other than climate change, may be increasing resilience but could equally be increasing the risk of maladaptation.

Common recommendations across each of the three areas assessed are:

- **Recommendation:** Develop system of risk management based on risk assessment.

- **Recommendation:** Develop guidance on how to assess and manage climate change risk.

As government departments, sectors, regional and local authorities begin to develop and implement adaptation plans, these will have to be costed and included in budget estimates for negotiation with the Department of Finance. Existing tools such as costing tools should be built on to assess the short and long-term costs and benefits of adaptation responses to climate change.

- **Recommendation:** Initial cost–benefit analysis, based on an appropriate methodology, needs to be undertaken to understand at the national level the implications of various adaptation options.

Finally, it will be important to inventory adaptation actions as they start to be implemented in order to share experiences, learn lessons and to avoid maladaptation. This will include assigning responsibility for this action at national and local levels with a clearly defined lead institution. It could include the building of an adaptation database or inventory of adaptation measures, which is open and accessible to all end-users (e.g. as part of the Climate Information Platform).

- **Recommendation:** development of system to inventory adaptation actions, processes and case studies.

17.3 Information, Communications and Awareness Raising

The implementation of successful adaptation actions is dependent on the availability of accurate and reliable data and information, which is properly communicated to the appropriate stakeholders. In Ireland, well-established systems for data monitoring and gathering are in place. However, the further development and enhancement of these is required, including formalisation of the mandate for a lead organisation and stronger co-ordination. Political commitment is needed to sustain resources for data gathering and monitoring systems into the future.

Well-developed systems for information analysis also exist. However, a move away from a project-based approach to a more sustainable programmatic approach to analysis, which allows capacity to be maintained and developed, is desirable.

The need for a national Climate Change Information Platform has been identified and initial work has begun. This should complement work ongoing at the European Climate Adaptation Platform – 'Climate-Adapt' CLIMADAPT.[46] The pilot portal will be funded by the EPA and will use a phased approach to developing a fully interactive Climate Information Platform responding to end-user needs. Once again, political commitment and resourcing will be required to ensure this is realised and sustained into the future.

Ensuring that information is reaching key stakeholders who need it is a challenge. Communication and awareness raising on climate impacts and adaptation has been quite weak to date. There is a need to include adaptation in public awareness campaigns on climate change. The establishment of the Climate Information Platform will also help to improve understanding of climate impacts and adaptation and the measures that can be taken to reduce risk.

- **Recommendation:** Ongoing development of the knowledge base, which should be formalised through a lead organisation and strong co-ordination. Commitment to sustain resources for data gathering and monitoring systems.

- **Recommendation:** Effective dissemination of appropriate information to stakeholders through a suitably resourced national Climate Information Platform.

17.4 Multilevel Governance

Adaptation generally occurs at the local level. However, to be effective at this level requires enabling conditions at higher administrative and spatial levels. This effectively means collaboration and co-ordination across a number of government bodies and agencies and down to the sectoral and local levels. This will entail bringing the Government, private sector and public interest groups together through mechanisms that can bring about horizontal and vertical co-ordination.

The responsibility for climate change policy and implementation is horizontally spread across a number of government departments and agencies. Some

46. http://climate-adapt.eea.europa.eu/

mechanisms and tools are already in place to co-ordinate some of these activities, which need to be set up on a statutory basis to oversee all activities (mitigation and adaptation).

For the implementation of adaptation activities at the sectoral and local levels, resources, appropriate guidance and capacity building will be key issues to be addressed. Some activities will require little additional resources to be implemented; they will, however, need to be steered from the national level and have to be well co-ordinated. In this respect, vertical integration (i.e. the linking of bottom–up and top–down approaches to adaptation) will be a key consideration for the successful implementation of adaptation strategies.

An authoritative body tasked with co-ordination should be established and a process for co-ordinating relevant sectors (horizontal), local government (vertical) and other stakeholders (inter-sectoral) put in place. Processes to allow co-ordination to be reviewed and to improve over time should be given full consideration and addressed in key climate-change-related policies and legislation.

- **Recommendation:** Establish a national high-level body on climate change adaptation and mitigation, drawing on a pool of relevant expertise.

A number of mechanisms exist for active participation in environmental decision making in Ireland and bodies such as Comhar SDC and the Citizens Information Services play valuable roles in national and local-level decision making. While some blockages exist in the system, the vertical integration between layers of governance would be a useful advance.

- **Recommendation:** Establish a multilevel stakeholder group to ensure vertical co-ordination.

17.5 Policy Integration

The most effective strategy for adaptation planning is to integrate climate change adaptation into policies, plans, programmes and projects at all levels of government and across all sectors. This will bring climate change adaptation into all levels and sectors of decision making, which is crucial for the implementation of adaptation. Key areas worthy of mention are national strategic planning documents such as the NSS, the National Sustainable Development Strategy, the DEHLG Statement of Strategy and the EPA state of the environment reports, each of which highlights the need to integrate climate change into other policies and plan making and which should be capitalised on.

A number of sectors are already engaging with climate change impacts and adaptation. Entry points in the form of policy, legislation, guidance, technical support groups, etc., have been identified for all sectors regardless of their level of engagement with climate change adaptation, which should further assist in the process of policy integration. However, it is also evident that other areas have yet to engage with the process. This suggests that awareness raising and communications within these sectors of climate change impacts and adaptation need to be enhanced, with a view to integrating climate change into their decision-making processes.

- **Recommendation:** Integration of climate change adaptation into all policies, plans, programmes and projects across all government department/ sectors/levels – local to national and inter-sectoral involving non-governmental actors, business, etc.

For effective integration there is a need to develop guidance to assist policy makers, planners, developers and local authorities to assess climate risks (and benefits), identify and cost adaptation options and implement appropriate strategies. There is potential to use established tools and processes and, in most cases, simple amendments or additions to existing national guidelines would suffice to ensure that existing assessment tools incorporate climate change considerations. This applies in particular to risk assessment, cost–benefit analysis, SEA, EIA and RIA. Some of these tools are very well known; however, they are not currently being used in the context of climate change adaptation. Accordingly, their potential for integrating climate change adaptation into decision making at all levels needs to be acknowledged and further developed. In the context of anticipated

changes at the level of the EC in relation to some of the parent directives, it can be expected that existing guidelines and procedures in the context of climate change adaptation will need to be addressed in the near future.

- **Recommendation:** Develop guidance and update assessment tools to enable climate change adaptation to be adequately incorporated into policies, plans, programmes and projects.

There is also a need to track developments in adaptation planning over time, with a view to determining progress and ultimately the effectiveness of actions. As adaptation to climate change is a new and emerging area of work, there is no best practice – all actors are still engaged in a learning-by-doing process. This makes it critical to learn from experiences elsewhere and to document and review outcomes and the effectiveness of approaches taken. This will effectively mean the development of adaptation indicators that are fit for purpose.

- **Recommendation:** Develop process/ effectiveness indicators for monitoring and review purposes.

- **Recommendation:** Make experiences and best practices available to potential end-users.

18 Conclusions

The results of the NAC assessment indicate that we are in the early stages of the adaptation process, but we are not starting from zero and there is good-quality information and established processes and tools to build on.

To date, research activities have focused on understanding climate change and its impacts on key sectors. This report builds on existing reports and studies and provides a strong basis for next steps, such as vulnerability and risk assessment, costs and benefits analysis, adaptation planning and the implementation of adaptation actions. This corresponds to the phases of adaptation as defined by the UNFCCC.

We have enough information to start to plan for the positive and negative impacts of climate change and no time should be lost in progressing to this step in order to avoid economic, social and environmental losses. The most effective strategy for adaptation planning is to integrate climate change adaptation into policies, plans, programmes and projects at all levels of government and across all sectors. This will allow the prioritisation of adaptation actions and the identification of the resources necessary to implement them in an effective manner. Within the current economic context, it is even more pressing to focus on issues of national importance and plan for projected climate change in the medium to long term.

In order to make this strategy effective, there is a need to develop guidance to assist policy makers, planners, developers and local authorities to assess climate risks, identify adaptation options and implement appropriate strategies. Decision makers need to be aware of the range of risk response strategies available to them, including management, prevention and transfer through insurance mechanisms and how and when to apply such options.

There is potential to use established tools and processes to assess climate risks and to integrate adaptation into policies, plans, programmes and projects. In most cases, simple amendments or additions to existing national guidelines would suffice to ensure that existing assessment tools incorporate climate change considerations. This applies in particular to risk assessment, cost–benefit analysis, SEA, EIA, RIA and AA.

There is also a need to be able to track developments in adaptation planning over time, with a view to determining progress and ultimately the effectiveness of actions. As adaptation to climate change is a new and emerging area of work, there is no best practice; all actors are still engaged in a learning-by-doing process. This makes it critical to learn from experiences and to document and review outcomes and impacts achieved. Thus, from the outset, it would be very useful to put a process indicator in place for adaptation planning, which could be reported on, for example, as a service indicator.

Multilevel and multi-sectoral governance is critical to the effective climate change adaptation. Central elements include the integration of climate change adaptation into existing policies, plans and programmes. This can only be achieved through effective co-ordination across government departments and agencies and down to regional and local authorities, businesses and communities. This will require the clarification and designation of roles and responsibilities at national, regional and local levels.

This assessment clarifies the need to establish systems for prioritisation, information management and risk assessment. These systems need to be designed in such a way that they are flexible and responsive to changes in our understanding of climate impacts and improvements in adaptive capacity over time. Indicators for tracking effectiveness, and review (to include lessons learned) need to be incorporated into these systems to enable them to be responsive to evolving needs. The study also shows that a number of policy options are open to risk, including management, prevention and transfer. In the context of the risk of

extreme events, such as flooding, strategies such as EWSs should be considered with a view to reducing vulnerability across social, economic and environmental sectors of Irish society.

There is a need to strengthen and maintain efforts in climate observations, monitoring and gathering, modelling and projections, and analysis. A continuous, comprehensive database of climate observations and enhanced capacity in decadal and high-resolution modelling is vital to enable us to understand the expected impacts of climate change and to be able to plan for them. This requires long-term commitment and resourcing, building on the very solid basis established to date. The development of a Climate Information Platform to make this information available to end-users, ranging from the public to local authorities and the private sector, will be a critical input into risk assessment and adaptation planning. This system will also need to be adequately resourced and managed to enable informed decision making.

It is most likely that developments and policy directives at EU level, and at the international level under the UNFCCC, will further shape emerging policy and legislation in relation to climate change adaptation in Ireland.

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Appendix 1 List of People Consulted

Name	Organisation
Áine Ryall	University College Cork
Alan Quirke	Forfás
Anne Irwin	Community Workers Cooperative
Anne Marie O'Hagan	Hydraulics and Maritime Research Centre, University College Cork
Beatrice Kelly	Heritage Council
Cathal O'Mahony	Coastal and Marine Resources Centre, University College Cork
COFORD, Department of Agriculture, Fisheries and Food	
Colm Murray	Heritage Council
Conor Murphy	National University of Ireland Maynooth
Department of Agriculture, Fisheries and Food	
Department of Finance	
Department of Health and Children	
Department of the Environment, Heritage and Local Government	
Department of Transport	
Elizabeth Cullen	Irish Doctor's Environmental Association
Eoin Mclaughlin	Comhar, National Sustainable Development Council
Erik O'Donovan	Irish Business and Employers Confederation
Eugene Hendrick	Coford, Department of Agriculture, Fisheries and Food
Frank McGovern	Environmental Protection Agency
Gavin Harte	Sustainable Development Consultant
Gemma O'Reilly	Environmental Protection Agency
Ger Mullally	University College Cork
Glenn Nolan	Marine Institute
Irish Aid, Department of Foreign Affairs	
Jackie McGloughlin	National University of Ireland Maynooth
Jeremy Gault	Coastal and Marine Resources Centre, University College Cork
Jim Bowman	Environmental Protection Agency
Jim Casey	Office of Public Works
John Coll	National University of Ireland Maynooth
John Sweeney	National University of Ireland Maynooth

Name	Organisation
Jonathan Healy	Forfás
Maria Falaleeva	Coastal and Marine Resources Centre, University College Cork
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Pat Barry	Irish Green Building Council
Pat Finnegan	Grian
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Appendix 2 Key Definitions

- ***Adaptation*** can be defined as any adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harm or exploits beneficial opportunities (IPCC, 2007a).
- ***Adaptive capacity*** is the ability to cope with the impacts of climate change. This is a function of the assets available and the ability to carry out a number of key functions, including assessing climate impacts and vulnerability, prioritising adaptation needs, co-ordinating key actors and institutions, gathering, analysing and disseminating information, and assessing climate risk (definition based on the World Resources Institute framework).
- ***Vulnerability*** can be defined as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity (IPCC, 2007a).
- ***Resilience*** of social-ecological systems is determined by their ability to absorb disturbance, their ability for self-organisation, and the capacity to learn and adapt (Tomkins and Adger, 2004).
- ***Climate risk*** refers to the risk posed to a human system by a climate-related hazard. The level of risk relates to the severity and probability of occurrence of the hazard and the way in which its consequences are likely to be mediated by the social vulnerability of the human system in question. Risk differs from vulnerability in that risk relates to a characteristic of a system or a decision where the probability of certain states or outcomes has occurred or may occur is precisely known (Harley et al., 2008).
- ***Maladaptation*** occurs when adaptation measures either:
  - Do not increase resilience/adaptive capacity or reduce vulnerability (e.g. inappropriate, not proportionate or cost-effective solutions);
  - Are unsustainable (e.g. environmentally unsustainable);
  - Conflict with other policy objectives (e.g. artificial snow making or air conditioning as adaptation responses that increase GHG emissions); or
  - Displace negative impacts to more vulnerable ecosystems (IPCC, 2001; UNDP, 2009; EEA, 2009).

Governance refers to the distribution of authority upwards (top–down approach) or downwards (bottom–up approach), but it can also be dispersed across multiple territorial levels and among a variety of private and public actors (Rosamund, 2004).

Multilevel governance refers to vertical environmental policy integration (across all levels of governance) and horizontal policy integration (across sectors) (Lafferty, 2004).

Policy integration refers to the degree to which climate change issues are considered and integrated into existing policy areas.

Appendix 3 Acronyms and Annotations

AA	Appropriate Assessment
AEOS	Agri-Environment Options Scheme
AR4	Fourth Assessment Report
AR5	Fifth Assessment Report
ASG	Adaptation Steering Group
CAP	Common Agricultural Policy
CCMA	County and City Managers' Association
CCRP	Climate Change Research Programme
CDM	Clean Development Mechanism
CER	Commission for Energy Regulation
CFRAM	Catchment Flood Risk Assessment and Management
CFRMP	Catchment Flood Risk Management Plan
CIRCLE-2	Climate Impact Research & Response Coordination for a Larger Europe (2nd Generation)
CIS	Common Implementation Strategy
COFORD	The Council for Forest Research and Development
ComReg	Commission for Communications Regulation
COP	Conference of the Parties
CZM	Coastal Zone Management
DAC	Development Assistance Committee
DAFF	Department of Agriculture, Fisheries and Food
DAHG	Department of Arts, Heritage and the Gaeltacht
DCENR	Department of Communications, Energy and Natural Resources
DECC	Department of Energy and Climate Change (UK)
DECLG	Department of the Environment, Community and Local Government
DEFRA	Department for Environment Food and Rural Affairs (UK)
DEHLG	Department of the Environment, Heritage and Local Government
DETI	Department of Enterprise, Trade and Innovation
DFA	Department of Foreign Affairs
DG	Directorate-General
DOHC	Department of Health and Children
DOD	Department of Defence
DOT	Department of the Taoiseach

DRR	Disaster risk reduction
EAP	Environmental Action Programme
EC	European Commission
EEA	European Environment Agency
EGAD	EU Expert Group on Adaptation
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPAIG	The EPA's network of interest groups
EPBRS	European Platform for Biodiversity Research Strategy
ETS	Emissions Trading Scheme
EU	European Union
EUSDS	EU Sustainable Development Strategy
FAO	Food and Agriculture Organization
FAP	Forest Action Plan
FAR	First Assessment Report
FP	Framework Programme
FS	Forestry Strategy
GAEC	Good Agricultural and Environment Conditions
GDP	Gross Domestic Product
GHG	Greenhouse gas
GMES	Global Monitoring for Environment and Security
GSI	Geological Survey of Ireland
GTF	Government Task Force on Emergency Planning
HEA	Higher Education Authority
HFA	Hyogo Framework for Action
IASG	Impacts and Adaptation Steering Group
ICZM	Integrated Coastal Zone Management
IPCC	Intergovernmental Panel on Climate Change
NAC	National Adaptive Capacity
NCCS	National Climate Change Strategy
NDP	National Development Plan
NESC	National Economic and Social Council
NGO	Non Governmental Organisation
NPWS	National Parks and Wildlife Services
NSDS	National Sustainable Development Strategy

NSS	National Spatial Strategy
OPW	Office of Public Works
RBD	River Basin District
RBMP	River Basin Management Plan
REPS	Rural Environmental Protection Scheme
RIA	Regulatory Impact Assessment
SEA	Strategic Environmental Assessment
SEAI	Sustainable Energy Authority of Ireland
UNFCCC	United National Framework Convention on Climate Change
WFD	Water Framework Directive
WMO	World Meteorological Organisation
WRI	World Resources Institute

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil, Pobal agus Rialtais Áitiúil.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail;
- scardadh dramhuisce.

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

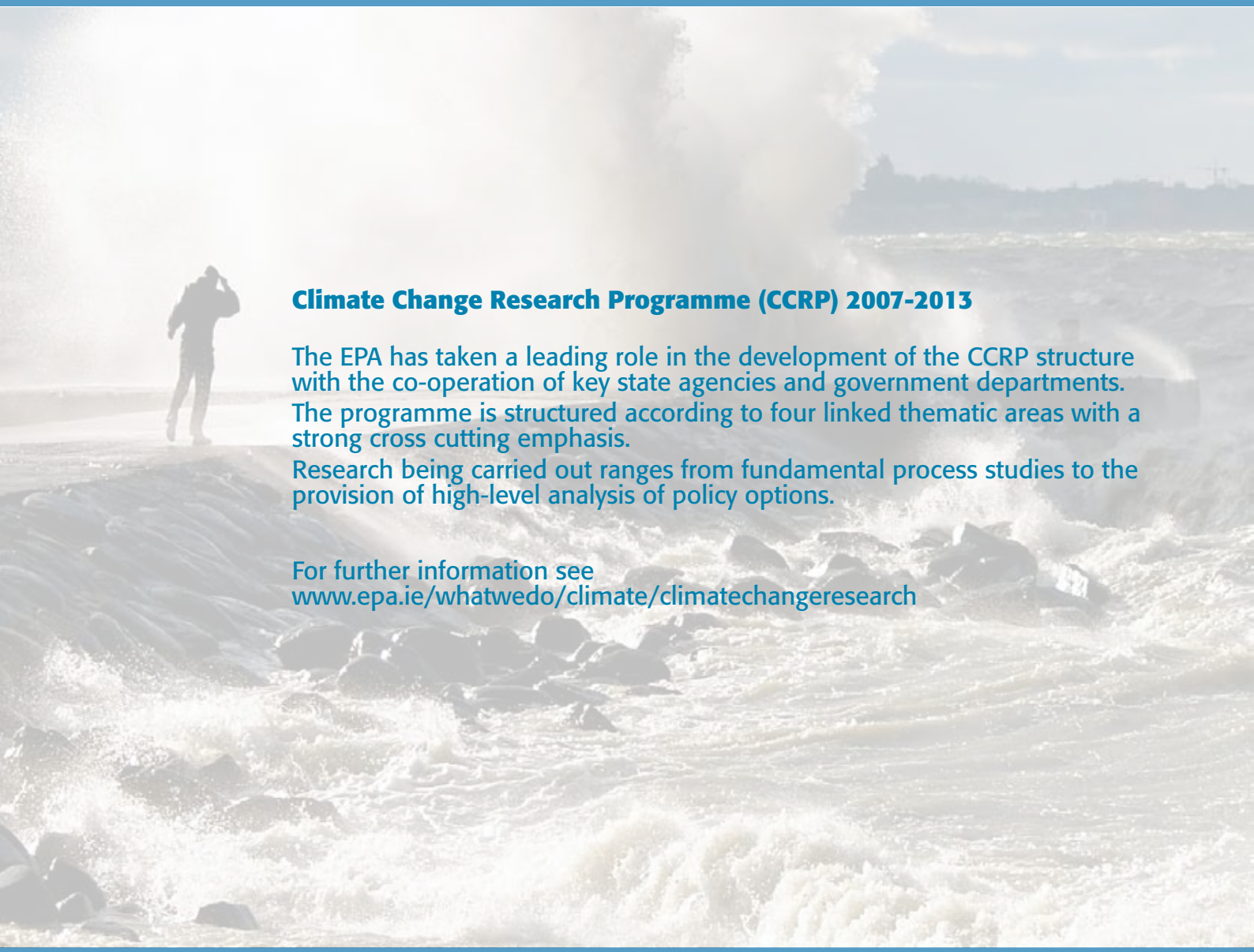
STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.



Climate Change Research Programme (CCRP) 2007-2013

The EPA has taken a leading role in the development of the CCRP structure with the co-operation of key state agencies and government departments.

The programme is structured according to four linked thematic areas with a strong cross cutting emphasis.

Research being carried out ranges from fundamental process studies to the provision of high-level analysis of policy options.

For further information see
www.epa.ie/whatwedo/climate/climatechangeresearch

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