An Roinn Cosanta
Department of Defence

Strategic Emergency Management

Guideline 4 - Climate Change Adaptation

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Climate Change Adaptation

Introduction

1. This document, *Strategic Emergency Management Guideline 4 – Climate Change Adaptation*, provides guidance that addresses:

a) Consideration of climate change projections for Ireland during the response to emergencies and in emergency planning,
(Ref. paras 11-16 and 28-30)

b) Ensuring that relevant likely impacts of climate change in Ireland on diverse sectors are addressed, in order to build resilience to climate change across Irish society and the economy,
(Ref. paras 5-6, 11-20 and Annex A)

c) Where to find information on climate change projections, predicted impacts, adaptation options, and national policy on climate change adaptation, in particular the National Adaptation Framework (NAF) (DCCAE, 2018a) and Sectoral Adaptation Plans (Government of Ireland, 2019b-j),
(Ref. paras 17-53)

d) National, regional and local coordinating structures for climate change adaptation, and
(Ref. paras 31-53)

e) Integration of national policy and approaches within the wider European Union (EU) and international policy on climate change adaptation.
(Ref. paras 4 and 54-61)

2. The guidance and information in this document is aimed primarily at the Lead Government Departments (LGDs) identified in the Strategic Emergency Management (SEM) National Structures and Framework.

3. The NAF identifies the need for greater alignment of strategic emergency planning and climate adaptation policy.

4. This is consistent with EU and International promotion of greater integration and coherence between stakeholders involved in emergency planning (particularly disaster risk reduction) and climate change adaptation.

Objective

5. Climate change is already occurring in Ireland, and is predicted to increase the frequency of some events of relevance to emergency planning, such as storms and floods. Early action is imperative in order to minimise risks to human life and health, economic development, property, infrastructure and ecosystems. The objective of climate change adaptation is to adjust to current or expected climate and its effects, moderating or avoiding harmful impacts.

6. In the context of emergency management, changing climatic conditions should, therefore, be considered in the development of emergency plans and during the recovery period following emergencies, in order to avoid or minimise damage in future.

Climate Change – risks and impacts

Global Climate Change

7. The 2018 Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C (IPCC, 2018) states that the impacts of human-induced global warming of 1°C are already being felt in the intensity and frequency of some climate and weather extremes. Globally, climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C, and will increase further if warming reaches 2°C. The rate at which the climate

is changing is increasing, as highlighted in the high level synthesis report prepared for the United Nations Climate Summit in New York in September 2019 (World Meteorological Organization, 2019).

8. Globally, observed and projected changes to the climate include:

- Increases in average air temperature and average sea surface temperature,
- Changes in precipitation patterns,
- Rising average sea level, and
- Changes in the frequency and character of weather extremes such as storms, flooding, sea surges and flash floods.

Climate Change in Ireland

9. Met Éireann manages and maintains Ireland's meteorological observational network to strict international criteria. These observations are quality-controlled and catalogued in Ireland's National Climatological Archive, also maintained by Met Éireann, where the data are freely available for climate analysis.

10.Assessments of such data sets show that changes in Ireland's climate are in line with global trends. Temperatures have increased by about 0.8°C over the period 1900-2012 – an average of about 0.07°C per decade. Due to the slow response time of the climate system, changes are projected to continue and increase over the coming decades. Even if emissions of greenhouse gases cease, some changes, such as sea-level rise, are projected to continue up to and beyond the end of this century.

Extreme weather and climate change

11.The most immediate risks associated with climate change to Ireland are predominantly those associated with changes in extremes, such as floods and storms. While we cannot attribute a single extreme weather event to the impacts of climate change (as yet – this is an area of active research), we can say with reasonable confidence that climate change will likely increase the frequency and intensity of future extreme weather events.

12.Climate change is often a compounding factor leading to subtle, but important, changes in the intensity, frequency and impact of extreme events, e.g. while the interaction between a storm surge and sea level during storm conditions may not have been an issue in the past, with additional sea level rise a storm surge may now breach defences.

Longer-term impacts

13.Climate change will also have diverse and wide-ranging longer-term impacts on Ireland's environment, society and economic development, including managed and natural ecosystems, water resources, agriculture and food security, human health and coastal zones.

14.Climate change may affect established emergency management plans, for example, by increasing uncertainty around year-to-year climate variability, or through the impact of gradual changes that can alter the thresholds at which an emergency arises, causing smaller climate and weather events to trigger more significant impacts e.g. recurring periods of dry weather may result in severe water shortages.

Uncertainty

15.Improvements in our ability to project future climate scenarios are unlikely to ever completely eliminate uncertainties about the future. Uncertainty should not be read as an excuse for inertia in addressing climate change. There is overall agreement on the robustness of trends and projections of key climate variables and associated impacts such as temperature and sea level rise at global and continental scales. Rather than a barrier to action, uncertainty may be treated as a motivation to take a precautionary approach to climate change.

16.It is, therefore, important that climate change risk and vulnerability assessments are informed by the full range of possible climate futures, as predicted by existing climate models. It may be

useful to indicate a most likely scenario, but extremes such as worst and best case scenarios should also be considered.

Essential climate information for Ireland

17.Information on projected climate change for Ireland is available in Chapter 1 of the NAF (DCCAE, 2018a) and can be visualised on Ireland's climate information platform, Climate Ireland (www.climateireland.ie). Essential climate information for Ireland is summarised in Annex A.

18.For more detailed information about climate projections, as well as detailed information about the projected impacts of climate change in Ireland in various sectors, refer to:

- *A Summary of the State of Knowledge on Climate Change* (Desmond et al., 2017),
- *High-resolution climate projections for Ireland – a multi-model ensemble approach*, Environmental Protection Agency (EPA) Research Report No. 339 (Nolan & Flanagan 2020), and
- Climate Ireland www.climateireland.ie

19.Climate projections for Ireland are periodically updated in line with IPCC cycles of projection and reporting. Global projections of the impacts of climate change are currently being updated as part of the IPCC's Coupled Model Intercomparison Phase 6 (CMIP6) project to support the IPCC's next (sixth) Assessment Report due to be released in 2021.

20.Researchers in Ireland at the Irish Centre for High End Computing (in collaboration with Met Éireann), as well as contributing to the ongoing CMIP6 project (Nolan & McKinstry, 2020), are also downscaling the CMIP6 projections to provide more detailed climate projections for Ireland (Nolan & Flanagan 2020).

Climate Adaptation – definition and principles

Definition

21.Since 2015, the Climate Action and Low Carbon Development Act 2015 ('Climate Act') has provided a legal definition for adaptation in Ireland, as follows:

> *adaptation means any adjustment to-*
>
> *(a) any system designed or operated by human beings, including an economic, agriculture or technological system, or*
>
> *(b) any naturally occurring system, including an ecosystem, that is intended to counteract the effects (whether actual or anticipated) of climatic stimuli, prevent or moderate environmental damage resulting from climate change or confer environmental benefits.*

22.Adaptation is the approach for addressing the current and future risks posed by a changing climate. The aim of adaptation is to reduce the vulnerability of our environment, society and economy, and increase resilience. Adaptation can also bring opportunity through green growth, innovation, jobs and ecosystem enhancement as well as improvements in water, air quality, biodiversity, or climate change mitigation.

23.A large body of peer-reviewed literature demonstrates the benefits of early, anticipative, or preventative adaptation in investment decision making.

24.Annex B provides a short glossary of relevant terms in climate adaptation that may also be of use to LGDs in their role under the SEM.

What are adaptation actions / measures?

25.Adaptation actions range from building institutional and organisational capacity e.g. increasing awareness, sharing information and targeted training through policy- and finance-based options, and on to engineering and green solutions.

Examples of adaptation measures might include using scarce water resources more efficiently; adapting building or planning codes to future climate conditions and extreme weather events; building new or raising the level of existing flood defences; or choosing tree species and forestry practices less vulnerable to storms.

26.Adaptation actions / measures are typically categorised as *'soft'*, *'green'* and *'grey'* as follows (European Environment Agency [EEA], 2013):

- Soft adaptation involves alteration in behaviour, regulation, or system of management. Examples include: extending timeframes of plans further into the future; zoning development away from sensitive areas; and developing or strengthening building codes in hazard-prone areas.
- Green adaptation measures seek to utilise ecological properties to enhance the resilience of human and natural systems to climate change impacts. An example is the re-instalment of dune systems to act as buffers against coastal storm damage.
- Grey adaptation measures involve technical or engineering solutions to climate impacts; examples include the construction of sea walls and tidal barrages.

Guiding principles for adaptation

27.A set of guiding principles for climate change adaptation (Annex C) were developed using international research to help to inform the approach to preparing sectoral adaptation plans under the NAF. These principles may also be of use to LGDs identified in the SEM National Structures and Framework. Sectors were recommended to use a six-step process in developing adaptation plans (Figure 1).

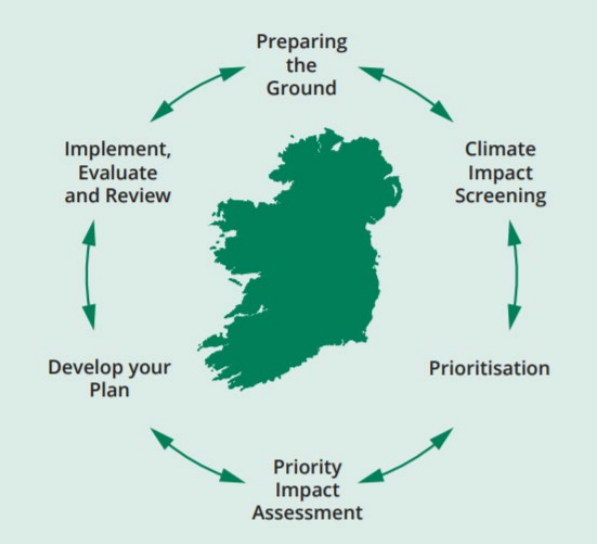

Figure 1. The six steps involved in developing a sectoral adaptation plan (DCCAE, 2018a).

Climate Adaptation measures in Emergency Planning

28.Effective climate adaptation can minimise risks and costs and also protect lives and property by building resilience into existing systems. This can ultimately help minimise the emergency response that is necessary in response to severe weather and other emergency events (see, for example, Department of the Environment, Community and Local Government, 2014).

29.A good illustration of this principle is the use of assessments of long-term changes in flood intensity and frequency based on climate projections in developing flood risk prevention strategies. This can build long-term resilience into flood defences.

30.Adaptation measures relevant to emergency planning could include:

- Community education and engagement to raise awareness of risk and promote protective action,
- Identifying vulnerable locations, groups and individuals,
- Deployment of early warning systems, or
- Facilitating data collation and data sharing between stakeholders in emergency planning and climate adaptation.

Climate Adaptation – overview of national policy

31.The following section provides LGDs with a broad overview of climate adaptation policy in Ireland, with links to relevant plans, policies and guidance documents.

32.The Climate Act sets out the key statutory requirements in relation to adaptation. These are:

- The preparation by the Minister for Communications, Climate Action and Environment of a National Adaptation Framework (NAF); and
- The preparation of sectoral adaptation plans by Government Ministers in policy areas under their remits.

Both the NAF and Sectoral Adaptation Plans must be approved by Government in line with requirements in the Climate Act.

National Adaptation Framework

33.Ireland's first statutory National Adaptation Framework (NAF) (DCCAE, 2018a) was prepared under the Climate Act and published in January 2018. The NAF specifies the national strategy for the application of adaptation measures in different sectors and by local authorities in their administrative areas in order to reduce the vulnerability of the State to the negative effects of climate change, and to avail of any positive effects that may occur. The NAF will be reviewed before December 2022 in line with the Climate Act.

Climate Action Plan 2019 (CAP 2019)

34. Chapter 16 of the Climate Action Plan 2019 (CAP 2019) (Government of Ireland, 2019a) addresses climate adaptation, primarily in the context of the ongoing implementation of the NAF. Climate adaptation will also be covered in future iterations of the CAP.

Sectoral Adaptation Plans

35.Under the NAF, seven Government Departments with responsibility for 12 priority sectors were required to prepare sectoral adaptation plans in line with the requirements of the Climate Act (Annex D). These plans were approved by Government in October 2019 (Government of Ireland, 2019b-j).

36. The Department of Communications, Climate Action and Environment (DCCAE) published *Sectoral Planning Guidelines for Climate Change Adaptation* (DCCAE, 2018b) to assist sectors in developing their sectoral plans and to ensure that a consistent approach to this task was taken across government.

37.LGDs should be aware of sectoral adaptation plans in relevant areas and ensure that contact and communication is maintained between officials in their Departments working on emergency planning and climate adaptation.

38.All sectoral plans are available online and can be accessed at the following link[1].

Local Adaptation Strategies

39.Under the NAF, all 31 local authorities in Ireland also developed their own adaptation strategies. Implementation of each local adaptation strategy is the responsibility of the local authority that developed it.

40.Local adaptation strategies were developed in line with *Local Authority Adaptation Strategy Development Guidelines*, published by DCCAE (2018c).

41.Local adaptation strategies are published online and have been consolidated on Climate Ireland at the following link.

[1] https://www.gov.ie/en/policy-information/37d691-adapting-to-climate-breakdown/#sectoral-adaptation-plans

The NAF and Emergency Planning

42.The impacts of climate change will influence both adaptation planning and national emergency planning for extreme weather events. The NAF seeks to ensure coherence between these responses, while aligning with the key responsibilities outlined under the SEM National Structures and Framework and its associated guideline documents.

43.In this context, outcomes from the current EPA-funded research project 'Enhancing Integration of Disaster Risk and Climate Change Adaptation into Irish Emergency Planning' may be relevant to future iterations of this guidance and to the emergency / incident types identified in the SEM National Structures and Framework.

44.One way to develop and maintain alignment of climate adaptation with emergency planning would be to climate-proof plans related to emergencies assigned to a sectoral department as LGD under the SEM National Structures and Framework.

45.A number of the sectoral adaptation plans produced in 2019 contain specific actions aimed at climate proofing existing emergency planning within LGDs.

46.Further communication and coherence between emergency planning and climate adaptation policy can improve the efficiency of data collection and build up a more complete picture of national progress and priorities.

Coordinating structures for national and local adaptation

National Adaptation Steering Committee

47.The National Adaptation Steering Committee, chaired by the Department of the Environment, Climate and Communications (DECC), coordinates sectoral adaptation planning across government. The Steering Committee provided advice and guidance to the relevant sectors in respect of the development of sectoral adaptation plans, and now monitors implementation of these plans. The Committee also aims to foster cooperation on cross cutting issues and the use of consistent and common information on matters such as climate risks, climate change data and analysis for policy development.

48.Membership of the Committee includes sectors under the NAF, the EPA, Met Éireann, the Department of Public Expenditure and Reform, the Department of Finance, and the National Standards Authority of Ireland, with additional expert support, as necessary. The local government sector is represented by the County and City Management Association and the regional assemblies.

49. Development and implementation of sectoral adaptation plans and local authority adaptation strategies are actions in CAP 2019. Departments report on implementation of actions in CAP 2019 to the Climate Action Delivery Board, in the Department of the Taoiseach, which in turn publishes quarterly summaries of progress in addressing these actions. In addition, Annual Transition Statements include a chapter on progress in delivering national climate adaptation policy.

Climate Action Regional Offices (CAROs)

50.In recognition of the need to build capacity to engage on climate action and of the obligation placed on local government to develop and implement climate action measures, four Climate Action Regional Offices (CAROs) were established in 2018:

- Atlantic Seaboard North CARO,
- Atlantic Seaboard South CARO,
- Dublin Metropolitan Region CARO, and
- Eastern and Midlands CARO.

51.The offices are operated by a lead local authority in each region (Annex E). Activities across CAROs are coordinated through the CARO Group, which includes representation from all four CAROs, DECC, the EPA, and Climate Ireland. The CARO structure is overseen by the National Local Authority Climate Action Steering Group, chaired by the Local Government Management Agency, with high-level representation from DECC, the EPA, OPW, Met Éireann and the lead local authorities responsible for the CAROs.

Climate Ireland

52.The provision of accurate and authoritative information is crucial in ensuring that Ireland can transition effectively to a climate resilient future by 2050 and beyond. Government, local authorities, communities and the private sector need to be supported in planning ahead and responding effectively to the challenges of climate change. Web-based climate change adaptation platforms are considered a vital means of sharing evidence, experience and knowledge.

53.Ireland's climate information platform, 'Climate Ireland', was developed through three stages of EPA-funded research conducted at the Science Foundation Ireland Centre for Energy, Climate and Marine, University College Cork. Climate Ireland since moved from a research phase to an operational phase, and now provides:

- Tailored information to support awareness and understanding of climate adaptation,
- Essential climate information (observed and projected) to support impact and risk assessment, and
- Decision making frameworks and tools to support local authority and sectoral adaptation plans / strategies.

Climate Adaptation – European and international policy

54.The 2013 EU Adaptation strategy[2] aims to contribute to a more climate-resilient Europe and to enhance preparedness and capacity to respond to the impacts of climate. The strategy has three objectives:

1. Promoting action by Member States,
2. Promoting better informed decision-making, and
3. Promoting adaptation in key vulnerable sectors.

55.Under Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action, Ireland will be required, from 2021, to report on adaptation actions for a wide range of sectors, one of which is 'civil protection and emergency management'. It will also be necessary to report efforts towards integrating climate adaptation policy into disaster risk management plans and strategies.

56.As part of the European Green Deal[3], a new EU Adaptation Strategy is being developed, and will be launched in 2021.

57.Ireland participates in a number of EU and international groups addressing climate change adaptation such as the Working Group on Adaptation under the European Commission's Climate Change Committee, the National Reference Centre – Climate Change Impacts, Vulnerability and Adaptation of the EEA and the Task Force on Climate Change Adaptation of the Organisation for Economic Co-operation and Development.

[2] http://eur-lex.europa.eu/legal content/EN/TXT/PDF/?uri=CELEX:52013DC0216&from=EN

[3] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

58.The European Climate Adaptation Platform, Climate-ADAPT (https://climate-adapt.eea.europa.eu/), assists access to and sharing of information about expected climate change and current and future vulnerability of regions and sectors in Europe, adaptation strategies and adaptation case studies, and tools to support adaptation planning.

59.Additionally, the EU PLACARD project (https://www.placard-network.eu/) established a coordination and knowledge exchange platform to support multi-stakeholder dialogue and consultation between the climate change adaptation and disaster risk reduction communities (Leitner et al., 2019). It forms part of a wider European recognition of the need to enhance coherence between climate change adaptation and disaster risk reduction policy and practice (EEA, 2017).

60.The Paris Agreement of the United Nations Framework Convention on Climate Change incorporates a global goal to enhance adaptive capacity, strengthen resilience, and reduce vulnerability to climate change.

61.A Call for Action: Raising Ambition for Climate Adaptation and Resilience was launched at the UN Climate Action Summit in 2019, and has been endorsed by Ireland.

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Abbreviations

CAP 2019	Climate Action Plan 2019
CARO	Climate Action Regional Office
Climate Act	Climate Action and Low Carbon Development Act 2015
CMIP6	IPCC's Coupled Model Intercomparison Phase 6
DCCAE	Department of Communications, Climate Action and Environment
DECC	Department of the Environment, Climate and Communications
EEA	European Environment Agency
EPA	Environmental Protection Agency
EU	European Union
IPCC	Intergovernmental Panel on Climate Change
LGDs	Lead Government Departments identified in the SEM National Structures and Framework
NAF	National Adaptation Framework
OEP	Office of Emergency Planning, Department of Defence
SEM	Strategic Emergency Management

Annexes

Annex A: Essential Climate Information for Ireland

Observed and projected climate change for Ireland, and examples of impacts of such change.

Parameter	Observed	Projected	Example of Biophysical Impacts
Temperature	▪ Average temperatures have increased by 0.8°C since 1900, an average of 0.07°C per decade. ▪ The number of warm days (over 20°C) has increased while the number of cold days (below 0°C) has decreased.	▪ Projections indicate an increase in average temperatures across all seasons (0.9-1.7°C). ▪ The number of warm days is expected to increase and heat waves are expected to occur more frequently.	▪ Incidences of cold stress are likely to decrease while incidences of heat stress will increase. ▪ The duration of the growing season will increase, occurring earlier and extending farther.
Precipitation	▪ Increase in average annual national rainfall of approximately 60mm or 5% in the period 1981-2010, compared to the 30-year period 1961-1990. ▪ The largest increases are observed over the west of the country.	▪ Significant reductions are expected in average levels of annual, spring and summer rainfall. ▪ Projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn (approx. 20%).	▪ The increased occurrence of dry spells will result in increased pressure on water supply. ▪ An increase in the frequency of extreme precipitation events will result in increased fluvial and pluvial flood risk.
Wind Speed and Storms	▪ No long-term change in average wind speed or direction can be determined with confidence. ▪ The number and intensity of storms in the North Atlantic has increased by approx. three storms per decade since 1950.	▪ Projections indicate an overall decrease in wind speed and an increase in extreme wind speeds, particularly during winter. ▪ The number of very intense storms is projected to increase over the North Atlantic region. Projections suggest that the winter track of these storms may extend further south and over Ireland more often.	▪ Increases in extreme wind speeds may impact on wind turbines and the continuity of power supply. ▪ Infrastructure will be at risk due to the increased occurrence of intense storms (e.g. winter 2013/2014).
Sea Level and Sea Surface Temperature	▪ Historically, sea level has not been measured with the necessary accuracy to determine sea level changes around Ireland. However, measurements from Newlyn, in southwest England, show a sea level rise of 1.7cm per decade since 1916. These measurements are considered to be representative of the situation to the South of Ireland. ▪ Sea surface temperatures have increased by 0.85°C since 1950, with 2007 the warmest year in Irish coastal records.	▪ Sea levels will continue to rise for all coastal areas, by up to 0.8 m by 2100. The south of Ireland will likely feel the impacts of these rises first. ▪ Sea surface temperatures are projected to continue warming for the coming decade. For the Irish Sea, projections indicate a warming of 1.9°C by the end of the century.	▪ Significant increase in areas at risk of coastal inundation and erosion. ▪ Increased risk to coastal aquifers and water supply. ▪ Change in distribution fish species; ▪ Implications for fisheries and aquaculture industries.

Annex B: Glossary

Adaptation: A change in natural or human systems in response to the impacts of climate change. These changes moderate harm or exploit beneficial opportunities and can be in response to actual or expected impacts.

Adaptive capacity: The ability of a sector to design or implement effective adaptation measures, using information on possible future climate change and extreme weather to moderate potential damage, take advantage of opportunities or to cope with the consequences.

Baseline: A state against which a change is measured. For example, a 'current baseline' is made up of observable, present-day conditions.

Capacity: The combination of all the strengths and resources available within a community, society or organisation which can reduce the risk, or the effects, of a disaster. It can also be described as 'capability'.

Capacity building: In the context of climate change adaptation, capacity building describes developing the right skills and capabilities to help countries adapt to climate change.

Climate: The climate can be described simply as the 'average weather', typically looked at over a period of 30 years. It can include temperature, rainfall, snow cover, or any other weather characteristics.

Climate change: Refers to a change in the state of the climate, which can be identified by changes in average climate characteristics or a change in variability of climate characteristics that persist for an extended period, typically decades or longer.

Climate model: A numerical representation of the climate system based on the physical, chemical and biological properties of its components, their interactions and feedback processes and accounting for some of its known properties.

Climate projection: A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission / concentration / radiative forcing scenario used, which is in turn based on assumptions concerning, for example, future socio-economic and technological developments that may or may not be realised.

Climate proofing: Protecting development investments and outcomes from the impacts of climate change. It reduces the vulnerability of projects by analysing the risks that climate change poses and taking steps to counteract them.

Climate resilient pathways: Iterative processes for managing change within complex systems in order to reduce disruptions and enhance opportunities associated with climate change.

Confidence: In a scientific context, confidence describes the extent to which the findings of an assessment are considered valid, based on the type, amount, quality, and consistency of evidence.

Ecosystem Services: The benefits to society from resources and processes provided by ecosystems. These can include pollination and disease control, providing food and fuel, regulating the flow of water through land to both prevent flooding and filter clean drinking water and the aesthetic and amenity value of the countryside.

Emissions scenario: A plausible representation of the future development of emissions of substances that are potentially radiatively active e.g. greenhouse gases or aerosols, based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socio-economic development, technological change, energy and land use) and their key relationships. Concentration scenarios, derived from emission scenarios, are used as input to a climate model to compute climate projections.

Extreme weather: Includes unusual, severe or unseasonal weather or weather at the extremes of the range of weather observed in the past.

Greenhouse gases: A number of gases whose presence in the atmosphere traps energy radiated by the Earth; this is called the greenhouse effect. These gases can be produced through natural or human processes. Greenhouse gases include carbon dioxide, methane, fluorinated gases and nitrous oxide. See also Section 1 of the Climate Action and Low Carbon Development Act 2015 for a legal definition.

Impact: In the context of climate change, an effect of climate change e.g. flooding, rails buckling etc.

Likelihood: The chance of an event or outcome occurring, usually expressed as a probability.

Mitigation: Action to reduce the likelihood of an event occurring or reduce the impact if it does occur. This can include reducing the causes of climate change e.g. emissions of greenhouse gases.

Natural Adaptive Capacity: The ability of a species or natural system to adjust to climate change and extreme weather, with the effect that potential damage is moderated.

No regret (adaptation) options: Activities that would provide immediate economic, social and environmental benefits and continue to be worthwhile regardless of future climate. They would therefore be justified under all plausible future scenarios, including without climate change.

Planned adaptation: Adaptation as the result of a deliberate policy decision and most likely includes action that is required to return to, maintain, or achieve, a desired state.

Resilience: The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate variability or change.

Annex C: Guiding Principles for Adaptation

The following principles summarise the main success factors for adaptation, according to international research:

Ownership: A clear commitment at senior levels within relevant organisations to pursuing adaptation from the outset. In the longer term, sufficient personnel and financial resources for adaptation must be made available.

Vulnerability-based assessment: Each sector and region should begin its adaptation planning with a clear understanding of sensitivities and vulnerabilities to current and future climate change.

Openness and knowledge transfer: Sharing best practices in adaptation, improving data collection of adaptation relevant information, as well as the communication of this information are all essential. Scientific information must be presented in a way that is understandable, consistent and meets the requirements of the specific target audience.

Foster cooperation: A working partnership with relevant and affected stakeholders throughout the entire adaptation process is an important prerequisite for successful adaptation. The objectives and the areas of responsibility of the participants must be clearly determined and communicated.

Account for uncertainty: Uncertainties are an inherent part of all projections of climate change and its impacts. They will never be fully eliminated, but adaptation measures will be required nonetheless. A precautionary approach to adaptation should be adopted. Allowing for uncertainty can improve adaptation decisions by making them more robust in the face of uncertainties.

Climate projections: Both past weather events and projections of possible future climatic and socio-economic changes should be analysed. In order to understand the uncertainty in the potential impacts of climate change, a range of projections relating to different emissions projections should always be drawn upon for the estimation of climate trends.

Identify a wide range of adaptation options: A comprehensive range of adaptation options should be considered at the outset (green, grey and soft).The available options should be described in as much detail as is reasonably possible in terms of their objectives and direct and indirect effects.

Prioritise adaptation actions: It will not be practical to undertake all adaptation options identified. Implementation of adaptation actions must be prioritised according to relevant criteria such as efficiency, cost-effectiveness, risk and urgency and ensuring a just transition. The local authority and sectoral adaptation guidelines discuss how to both prioritise climate risks at the appropriate scales and, following this, how identified adaptation options should be prioritised for implementation.

Monitoring progress: It will be necessary to establish appropriate monitoring mechanisms and indicators so as to ensure the effectiveness of sector specific adaptation responses. Such mechanisms will also ensure efficient use of resources while allowing flexibility in how plans are implemented.

Annex D: Sectoral Departments under the National Adaptation Framework (NAF)

Under the National Adaptation Framework, Departments were selected to lead on the development of adaptation plans for 12 key sectors, which can be grouped under four major themes.

Theme	Sector	Lead Department *
Natural and Cultural Capital	Seafood	Department of Agriculture, Food and the Marine
	Agriculture	
	Forestry	
	Biodiversity	Department of Housing, Local Government and Heritage
	Built and Archaeological Heritage	
Critical Infrastructure	Transport infrastructure	Department of Transport, Tourism and Sport
	Electricity and Gas Networks	Department of Communications, Climate Action and Environment
	Communications networks	
Water Resource and Flood Risk Management	Flood Risk Management	Office of Public Works
	Water Quality	Department of Housing, Local Government and Heritage
	Water Services Infrastructure	
Public Health	Health	Department of Health

*Department names as at the time of publication of sectoral plans in 2019.

Annex E: Climate Action Regional Offices

The regions, local authorities encompassed, and lead local authority for each of the four Climate Action Regional Offices (CAROs) in Ireland.

Climate Action Region	Local Authority Functional Areas	Lead Authority
Atlantic Seaboard North	Donegal, Sligo, Mayo and Galway City and Galway County	Mayo County Council
Atlantic Seaboard South	Clare, Limerick, Kerry, Cork County and Cork City	Cork County Council
Dublin Metropolitan Region	South Dublin, Fingal, Dun Laoghaire-Rathdown and Dublin City	Four local authorities to work together with the lead rotating; however Dublin City Council undertaking administrative and financial management
Eastern and Midlands Region	Louth, Meath, Wicklow, Wexford, Kildare, Carlow, Kilkenny, Laois, Offaly, Westmeath, Longford, Leitrim, Tipperary, Cavan, Monaghan, Roscommon and Waterford	Kildare County Council

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