

CLIMATE CHANGE & WATER MANAGEMENT

Introduction

Climate change is the greatest global environmental threat facing humanity. Ireland's climate is changing and the impacts are already being felt. Over the last century our average temperatures have risen and regional rainfall patterns have changed with more significant changes predicted by scientists in the coming years. Extreme weather events are expected to become more frequent and more intense. Climate change and water management are inextricably linked: Increased flooding in some areas and longer droughts in others, rising sea levels and a decline in water quality all pose significant challenges for Ireland.



© An Taisce

Water management planning requires a long-term approach which must consider climate change projections, particularly with regard to infrastructure development. The reform of water management required by the Water Framework Directive (WFD), which focuses on an integrated, river basin approach, presents the ideal opportunity to build resilience to climate change, cut energy consumption and protect our water resources.



Ennis, November 09 © Catherine O'Hara, Clare Co. Co.

Cover photo: Flooding in Clonakilty, June 2012 © Dennis Boyle

Impacts on Ireland's water resources

Flooding

Average annual national rainfall is increasing with the west, southwest and north of the country experiencing more frequent and intense rainfall. Winter rainfall is projected to increase by 10% by 2050 leading to a rise in river flow. Many densely populated areas of high economic activity are located in floodplains. These will be increasingly exposed to flooding, resulting in higher damages and re-construction costs. During the summers of 2007 and 2008, November



Flooding, November 2009 © Clare Co. Council

2009, October 2011 and July 2012 the worst floods in living memory occurred in parts of Cork, Clare, Galway, Westmeath and Limerick. In 2009, the centre of Cork city was flooded by the River Lee causing €141m in damage and leaving 40,000 homes without water.



Run-off loaded with sediment from forest clearfall site after heavy rainfall © ATUN-Joachim Schaefer

Decline in water quality & quantity

Increased winter rainfall leading to increased run-off will cause soil erosion and washing of pollutants from farming and forestry into rivers and lakes. Flood run-off from urban areas and more frequent overflows of drainage systems will cause pollution if raw sewage overflows from sewage treatment plants. Incursion by sea-water into groundwater reserves due to sea level rise will also be a threat.

Increasing temperatures will mean warmer summers, which in turn will increase water demand, leading to higher water extraction pressure during periods of low water levels. This along with a projected decrease in summer rainfall (12-17% by 2050) will lead to water shortages. Lower water levels and higher water temperatures will result in reduced dissolved oxygen in water, with associated algal blooms and increased concentrations of pollutants and bacterial content. The warming of lake and river waters may also endanger species that require cooler water such as salmon and Arctic Char.

These processes are likely to also threaten the quality of drinking water supplies, resulting in increased rates of water-borne illnesses (e.g. *Cryptosporidium*) and pushing up the costs of water treatment.

Coastal areas

The waters around Ireland are rising by 3.5cm per decade and studies have predicted a rise in global sea levels of up to 60cms by the end of the 21st century. The flood impacts of this will be most felt in the major coastal cities of Cork, Dublin, Galway and Limerick along with other low-lying areas. Increased temperatures may result in algal blooms in coastal bays and on beaches and pollution will affect wildlife and a range of economic and leisure activities such as bathing, angling, water-sports and aquaculture.

Invasive species



Fewer frost days, wetter soils and flooding will suit the spread of damaging invasive species such as Japanese Knotweed ©Roger Kidd

Climate change is likely to trigger species migration across the globe. As an island, Ireland's ecosystems are particularly vulnerable to an influx of alien species and pathogens which can rapidly invade aquatic ecosystems, destabilising habitats and threatening human economic activity.



Warmer waters will help the spread of damaging invasive species such as Asian clams © Nuala Freeman

What is in place and is it effective ?

National Climate Change Strategy

This government strategy was in place from 2007-2012 but has not been replaced at time of writing (May 2013). It states that long term planning for water resource management will be necessary to adapt to the impacts of climate change but does not detail how this should be achieved.



Proposed Climate Change Bill

The Government published the first draft of its promised climate law in February 2013. While it provides for national and sectoral action plans there is no explicit emissions reduction target for 2020 and no target at all for 2050. The Expert Advisory Body is not sufficiently independent and needs the Government's permission to publish its own reports. Unless the Bill is considerably strengthened before it becomes law it will not be able to drive sufficient action and ensure accountability. A good independent discussion of why legislation is needed can be found in the IIEA 2012 report 'Why legislate? Designing a climate law for Ireland'.



Lough Carra algal bloom. Increased water temperatures contribute to increased algal blooms © Lynda Huxley

National Climate Change Adaptation Framework

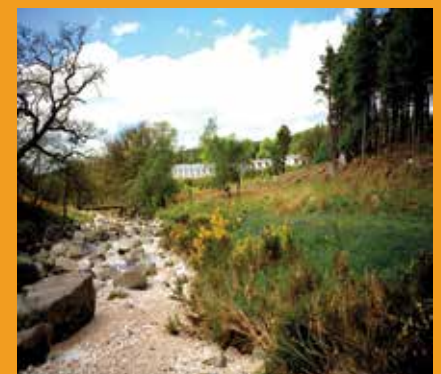
This sets out a broad government approach to managing the anticipated harmful impacts of climate change but doesn't contain any legally binding required actions or deadlines.

EU Floods Directive

This sets out a framework for the management of flood risk primarily through the requirement to prepare flood maps by 2013 and flood risk management plans by 2015. The main focus of this legislation is quite rightly on human safety and it does not specifically provide for the management of aquatic habitats. The Irish response to flood management to date has largely been driven by 'hard' (engineering-based) solutions (e.g. concrete flood barriers). The implementation of the Floods Directive presents an opportunity to examine the feasibility of 'soft' solutions such as wetland conservation/creation and other attenuation strategies.

River Basin Management (RBM) Plans

The 2009-2015 RBM Plans broadly recognise the main predicted impacts of climate change for Ireland and acknowledge that water management measures in the Plans 'need to take account' of these changes, but no specific actions for this are proposed.



Dry river bed, very low water levels, River Liffey, Co. Wicklow, May 2012 © Yaqoub BouAynaya

Recommendations

Measures to mitigate climate change, but also to adapt to it, must be fully integrated with water management. The 2009-2015 RBM Plans missed the opportunity to do this so it is imperative that the next cycle of Plans (2016-2021) do so. However, in the interim, planning and action in support of drought, flood and run-off management should be initiated.

SWAN proposes a suite of measures including an Action Plan to meet multiple objectives for flood and drought risk alleviation and adaptation; for water quality and for biodiversity.

Strategy to alleviate the impacts of climate change on Ireland's water resources

A 'Strategy to Alleviate the Impacts of Climate Change on Ireland's Water Resources' should be developed as a matter of urgency. This should contain:

- A list of measures already in place for the mitigation of climate change-related pressures on water resources and the associated monitoring programme



Water monitoring ©Hugh Feeley

- Details of all the responsible agencies, their respective roles and mechanisms for co-ordination and integration of work
- Targets for climate impact alleviation measures to be achieved by 2015 (before the beginning of the next RBM Planning cycle 2016-2021)
- Cost/benefit analysis to select measures for dealing with both intermittent and long-term impacts of climate change on aquatic ecosystems. The analysis should be done with public participation

and should include environmental and resource costs to ensure that selected options are the best interest of society as a whole.

Monitoring

A strategic national network of continuous aquatic monitoring stations to measure the nature and rate of climate-derived change in water systems must be urgently put in place, focusing on indicators of climate change e.g. lake and river temperatures. This information is necessary to detect changes and as the basis for future planning.



Atlantic salmon ©Mike Brown

Atlantic salmon under threat

Atlantic salmon are legally protected under the EU Habitats Directive and is classed as vulnerable in Ireland under the ICUN Red List of species. Climate change effects on Atlantic salmon are:

(source Heritage Council)

- 'Reduced marine survival because of food chain effects
- Reduced survival and growth in summer because of poorer feeding conditions resulting from increased summer temperatures and reduced flows
- Possible adult migration delays due to reduced flows and increased temperatures
- Decreased spawning success because of increased sedimentation and scouring.'



Upland wetland, Sheeps Head, Co. Cork © Matt Mills, idesigns

Action Plan to address climate change impacts on water management

Using the cost-benefit analysis above, the Action Plan should prioritise the following measures to determine those that must be carried out immediately (pre-2016) and which should be included in the 2016-2021 RBM Plans.

Increase natural water retention and cleaning capacities

Measures that increase natural water storage and cleaning capacities often overlap and therefore offer maximum benefit. A prime example is the restoration of floodplains which helps to re-establish their functions as buffer zones and water storage areas during flood and dry periods and as a purification medium by trapping pollution or water run-off from hill slopes. SWAN proposes the following actions which fulfil this function:

- Remove or block obsolete drainage systems to further promote attenuation

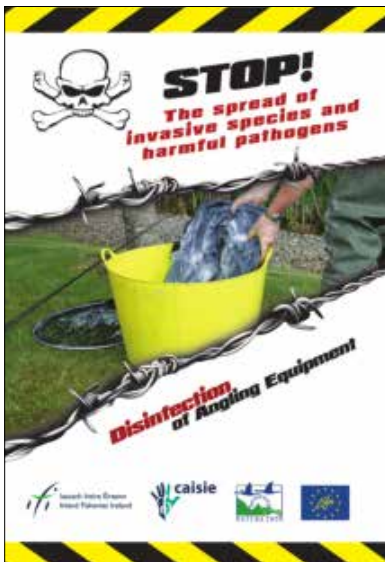
- Prohibit construction on flood plains or areas at risk of inundation
- Improve the regulation of private road construction in rural areas (such as to access forestry, peat, and mobile phone masts, etc.), as these have the capacity to reduce natural attenuation and increase sediment run-off in high rainfall
- Protect and restore wetlands, especially in floodplains
- Ensure the establishment of optimum river bank vegetation cover to increase resistance to water flow in river channels and floodplains
- Promote soil conservation best practice in agriculture and forestry, which assists in decreasing erosion and run-off and increasing water retention
- Implement better slurry management practices to lower the risk of nutrient and bacterial contamination from run-off
- Expand the use of Sustainable Drainage Systems (SuDS) to manage storm water and minimise the risk of overflow from sewer systems. SuDS ponds can provide the added benefit of creating amenities for local communities e.g. Camac Valley in Dublin.



Fishing Lakes, Corkagh Park, Camac Valley, Dublin. © Corkagh Park Fisheries/South Dublin County Council

Measures to increase ecosystem resilience and manage invasive species

In order to increase the resilience of ecosystems, the landscape must offer functioning habitats. Aquatic habitats, if in 'good status', will provide refuges for native wildlife and crucial migration corridors. Actions to promote this objective:



- Protect wetlands and riparian ecosystems, which support species threatened by climate change
- Prohibit the construction of new barriers to migration like dams and require the removal or modification of obsolete barriers to facilitate the passage of fish
- Actively manage invasive species via measures to minimise the risk of new arrivals and to prevent their spread.

EXAMPLE OF WATER AND ENERGY SAVINGS

Simple and available water saving devices, like efficient shower heads and low flush toilets, could reduce household water consumption by up to 40%, and avoid over 77 million tonnes of CO₂ eq/year. This would reduce households' energy bill by 26 billion Euro/year in the EU. Much higher water savings can be achieved with additional measures.

Measures that integrate water, climate & energy policy objectives

Tackling water scarcity and floods is best done by reducing water use and adapting land use particularly in floodplains. Such strategies help reduce our exposure to water scarcity and extreme flood events and at the same time help to achieve legal environmental targets.

Reducing water and energy use is the most cost-effective approach to achieving multiple objectives. Therefore, SWAN proposes the following actions:



Using a barrel to collect rainwater is a simple and inexpensive rainwater harvesting option

- Plan for extreme weather conditions when planning or upgrading existing water and wastewater systems and also identify the means to flood-proof current waste water treatment plants
- Urgent attention must be given to under-capacity/non-compliant waste water treatment plants
- Introduce measures to reduce pressures on water supplies and to encourage water conservation including a public awareness campaign; promote the uptake of efficient devices and the introduction of metered

domestic water charges as soon as possible (which are designed sensitively to address social concerns); identify and implement wide measures to effect behavioural change

- Support ambitious water and energy standards for buildings
- Support rainwater harvesting which could feed into domestic non-drinking water supplies for toilet flushing and would reduce run-off from buildings
- Investigate the feasibility of dry toilets
- Conduct analysis of all locations for which engineering works for flood protection are proposed and investigate the feasibility of better environmental alternatives e.g. floodplain restoration, especially when flood protection works will impair the wildlife or amenity value of a waterway
- Introduce measures to ensure that the water sector itself reduces greenhouse gas emissions. The water and energy saving potential is very significant (see example). There is potential to reduce the carbon footprint and energy bill of water treatment plants as up to 40% of water is being lost from the distribution network.

Further reading

The status of Ireland's climate, EPA, 2012.

A summary of climate averages for Ireland, Met Éireann, 2012.

Climate change, heritage and tourism: implications for Ireland's coast and inland waterways, The Heritage Council, 2009.

Ireland in a warmer world, Community Climate Change Consortium for Ireland, 2008.

Climate change-Refining the impacts for Ireland, EPA, 2008.