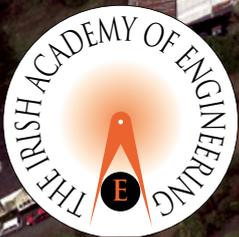

CRITICAL INFRASTRUCTURE

ADAPTATION FOR CLIMATE CHANGE



Policy Advisory – Progress Report Q1 2016



Ref. No. 02/04A/04.16

An ounce of prevention is worth a pound of cure.

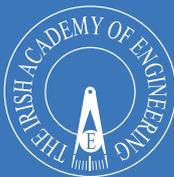
THE IRISH ACADEMY OF ENGINEERING

The Irish Academy of Engineering is an all-island body, concerned with long-term issues where the engineering profession can make a unique contribution to economic, social and technological development.

Its members are Irish Engineers of distinction, drawn from a wide range of disciplines, and membership currently stands at 145.

Drawing on the experience and knowledge of its distinguished members, the Academy works to facilitate communication and dialogue on engineering related matters. It regularly publishes reports and analyses, some jointly with other learned and professional bodies.

The Irish Academy of Engineering
22 Clyde Road, Ballsbridge, Dublin 4
Telephone: +353 1 665 1337
academy@engineersireland.ie
www.iae.ie



Cover image:

Flooding at Mallow, Co Cork, in 2009. Image courtesy OPW.

FOREWORD

The Irish Academy of Engineering (IAE) established a number of Working Groups to prepare the following series of complementary Policy Discussion Papers to assist policy makers in both jurisdictions on the island in the ongoing development of spatial planning policy, and to inform decision-making on associated major infrastructure development over the coming decades:

- ▲ Spatial Planning on the island of Ireland – Context and Challenges
- ▲ Dublin – Belfast Economic Corridor
- ▲ Atlantic City Regions - Development and Connectivity
- ▲ Sustainable Transport Infrastructure 2035
- ▲ National Broadband Strategy for Ireland
- ▲ Critical Infrastructure – Adaptation for Climate Change: A Progress Report (this Paper)

These Policy Discussion Papers have been prepared following research and wide ranging discussions with senior executives from the public and private sectors in both the Republic and Northern Ireland. They are available on the Academy's website www.iae.ie, together with all previously completed reports. A further Paper will be prepared by the Academy as an input to spatial planning, in relation to economic development across the North West cities on the island, Sligo, Letterkenny / Derry / Londonderry. In developing long term planning frameworks on the island it will be particularly important to ensure these support both reduction in GHG emissions and adaptation of critical infrastructure to cater for the impact of climate change.

Based on comments received on these Discussion Papers, the Academy intends preparing a single summary report as an input to the Department of Environment, Community and Local Government in its preparation of the proposed National Planning Framework (NPF). A similar report will be made to the Department for Regional Development in Northern Ireland in relation to any future review of its current Regional Development Strategy 2035.

INTRODUCTION

The impact of severe flooding caused by climate change on those directly affected is catastrophic. However the impact of climate change, with increased rainfall intensity and frequency at times of the year and potential drought at others; sea level rise; more severe storms; increase in wave height and storm surges, also poses potential significant risks for all of the essential services on which our modern society depends. Critical infrastructure such as water supply, sewage treatment, electricity and gas supply, communications services, transport, health and education facilities, are all at risk if we do not adapt to the reality which is climate change.

At the Paris climate change conference (COP21) in December 2015, 195 countries, including Ireland, adopted the first ever universal, legally binding global climate deal. It is now accepted internationally that climate change is a reality with potentially significant impacts for countries across the globe including Ireland.

In October 2009 The Irish Academy of Engineering published a report *Ireland at Risk. Critical Infrastructure - Adaptation for Climate Change* http://www.iae.ie/site/media/pressroom/documents/2009/Nov/17Ireland_at_risk_2.pdf

This report was widely communicated to Government Ministers and Departments, relevant state agencies and other stakeholders. Since publication progress has been made on a number of fronts, as detailed below, in addressing the concerns raised in the report and in implementing its recommendations.

The objective of this Policy Advisory is to highlight for Government, policy makers and owners of critical infrastructure, and as an input to development of the National Planning Framework, those concerns and recommendations from the Academy's 2009 report, relating to Ireland, which are still relevant and which we believe still need to be addressed.

ACADEMY 2009 REPORT RECOMMENDATIONS – PROGRESS TO Q1 2016

Note: Progress is recorded below against the numbered recommendations in the Academy’s 2009 report. In some instances, for simplicity, progress is reported against more than one recommendation.

1 A statutory plan – designation of a “Lead Agency”

The Department of Environment, Community and Local Government (DOECLG) has been designated as Lead Agency; a *Climate Action and Low Carbon Development Act 2015* was adopted by both houses of the Oireachtas in December 2015 and steps are underway to appoint an Expert Advisory Council to advise Government on both climate change mitigation and adaptation.

The Lead Agency role is complex, cross sectoral and multi-dimensional in nature and involves driving, co-ordinating and reporting on climate change adaptation and setting priorities for significant ongoing expenditure on infrastructure at a national level. It will be important for the Lead Agency to ensure that the various sectoral leads and the local authorities are aware of their responsibilities, discharge their obligations and report on implementation of risk assessment and adaptation plans. The three new Regional Assemblies, established by government in January 2015, will play an important role in co-ordinating response, where climate change risks and required adaptation measures which cross local authority boundaries are identified.

2 Establish an adaptation framework:

A *National Climate Change Adaptation Framework* was published in December 2012 and communicated to relevant stakeholders and a Climate Change Adaptation Steering Group has been put in place.

The 2012 Framework envisaged that draft Sectoral Adaptation Plans would be published by mid-2014 (Sectoral Plans are those to be prepared by relevant Departments or Agencies and cover much of the nation’s critical infrastructure such as water services, electricity, gas, communications, transport, health, education, etc.) These have yet to

be published. Local Authorities were made aware in 2015 that they are expected to prepare Local Climate Change Adaptation Plans. It is important that clear target dates be set for completion of all adaptation plans, that specific budgets be allocated for their implementation and that implementation be monitored and publically reported.

It would be advisable for a small number of local authorities to prepare pilot adaptation plans which would highlight issues surrounding preparation of such plans, enable these issues to be addressed and thus facilitate timely and more comprehensive plans be prepared by all local authorities.

3 Review engineering design standards and

16 Review design standards

While Climate Change Guidelines for Local Authorities are due to be published in the coming months, to the Academy’s knowledge, no significant progress has been made in reviewing engineering design standards.

Forecasted climate parameters in terms of rainfall intensity and frequency; sea levels and wave heights; storm frequency, wind speeds and air temperatures, differ from those currently used by design engineers across different sectors and disciplines. Current design parameters have been in place for very many decades and may no longer be appropriate to cope with the challenges of climate change. Construction in high risk areas without having flood resilient design standards and construction techniques in place to cope with the potential impact of climate change, is not recommended.

As a matter of urgency a study should be initiated by DOECLG involving engineers, climate change researchers, the NSAI and other relevant organisations, to identify the climate change design parameters that are critical to



Two views of Vartry Reservoir, Co Wicklow: empty, in a dry October 1990, and full in a wet September 2009. In future, we may have less water when and where we need it.

sustainable infrastructure design across the various infrastructure sectors. This would ensure sustainability of new construction; minimise damage to private and public sector assets and most importantly minimise disruption of services to the public. It would also facilitate adaptation review of existing critical infrastructure. If climate change risks increase to beyond what current models predict there will be need to review required design standards again.

4 Co-ordinate research and

5 Research for infrastructure:

Funding for climate change research was dramatically reduced during the economic crisis and now needs to be ramped up significantly with a focus on the needs of those designing, planning and producing policy for infrastructure and for critical infrastructure in particular. One approach to address this challenge would be for Science Foundation Ireland to establish and fund a Climate Change Research Centre which would have the brief and capacity to complete research and provide resulting advice to stakeholders in relation to both climate change adaptation and mitigation. Such a Centre could draw on the research capabilities of a wide range of existing academic, public and other bodies across the country.

6 Establish water resource authorities:

Irish Water has been established and has taken responsibility for management of all water services on a national basis. The Minister for Environment, Community and Local Government in October 2015 approved the *Water Services Strategic Plan – A Plan for the Future of Water Services*. This plan sets the strategic objectives for delivery of water services over the next 25 years to 2040 and references the challenges posed by climate change for delivery of a sustainable service. The plan sets a target date of Q2 2016 for preparation of a *Climate Change Adaptation and Mitigation Strategy for water services*. The plan also commits Irish Water to producing a *National Water Resources Plan* which will establish the long term water supply strategy based on sustainable sources and treatment systems.

The overall management by one body, of individual rivers has been mooted by some as the best way to manage the country's rivers. The Academy recognises the complexities from both a political and operational viewpoint of such an approach and recommends that any significant change to the current approach of close and ongoing co-operation between the various parties involved in the management of different aspects of a river, be

treated with caution. However the Academy does believe there is need for one organisation to be responsible for co-ordinating the work of the various parties involved and for resolving any differences that may arise.

7 Plan for competing demands and 8 Plan for future water supplies:

Irish Water plans to prepare a *National Water Resources Plan* due to be completed in Q3 2017. This latter plan will address the current fragmented nature of water supply infrastructure, with almost 1,000 independent water supplies, setting out a plan for rationalisation which will take account of climate change impacts on water resources.

A new challenge, resulting from the future impact of climate change, will be to establish priorities to deal equitably with competing demands for available water resources. Both climate change and demographic projections predict a serious imbalance between areas where rainfall will be most plentiful (west and northwest) and areas of greatest demand (east and southeast). There will also be competing demands for water from the agriculture, fisheries, tourism, power generation and industry sectors which will be impacted on by climate change, which will need to be addressed. Ireland needs to position itself as a good place for industries which need a reliable high quality water supply, to locate. The Academy understands that Irish Water is prioritising the planning approval of a new major water source for the Eastern & Midlands region which is required to secure water supplies including climate proofing.

9 Implement universal water charging:

Water charging has been introduced and the installation of water meters where practical is nearing completion. The Academy supports this approach. Approximately 820,000 domestic water meters have been installed since August, 2013 and billing of over 1.5 million domestic customers has been in place since early 2015. The Academy believes that water charging should be seen as addressing climate change adaptation and promoting water conservation, and should be based on usage rather than being a fixed charge as

currently implemented. Government has indicated that the current approach to water charging will remain in place until 2019. The outcome of the February 2016 election raise questions over future government policy in relation to water charging.

10 Complete risk assessment for water quality:

The Environmental Protection Agency (EPA) monitors and reports on the quality of water in rivers and in water supplies nationally. With climate change there is significant risk of flooding of sewerage infrastructure, more soil and peat erosion, landslides and spread of agricultural pollutants, all of which would damage water quality. Irish Water's *Water Services Strategic Plan – A Plan for the Future of Water Services* references such climate change risks and a *Climate Change Adaptation and Mitigation Strategy* for water services is due to be completed in Q2 2016.

11 Assess flood risks and 17 Produce asset risk registers

All owners of critical infrastructure should be required to carry out climate change risk assessment for infrastructure assets under their control, identifying the frequency of exposure to a hazard, resilience to exposure and consequence of failure. This will enable adaptation plans to be prepared and priorities decided in relation to adaptation expenditure.

The academy believes that this requirement will be addressed in the sectoral adaptation plans, referred to in the *Climate Action and Low Carbon Development Act 2015*, to be prepared by relevant Ministers of the Government. The Academy concurs with this intention but is concerned at the uncertain timescale for their completion and the lack of clarity on what these plans should encompass. This process needs to be urgently progressed.

There needs to be national agreement on standards, methodologies and actions to ensure that risk assessments are carried out to appropriate standards and to provide guidelines to local authorities and other stakeholders for their implementation. (See also 3 and 16 above).



Winter storm Lahinch 2014: well designed defences will be essential to protect infrastructure and homes from rising sea levels and storm surges. Photograph © George Karbus

It will be important to ensure that the climate change resilience of a particular piece of critical infrastructure be reviewed on a holistic basis taking account of access, remote operation, reliance on other infrastructure such as electricity supply and communications services etc.

An issue which has come more to the fore since publication of the Academy's 2009 report is the difficulty people have in obtaining flood risk insurance in areas which have benefited from significant public investment in flood defence measures. Discussions between government and the insurance industry on this matter are ongoing. Decisions in this area should be based on an objective assessment of risk using the technical expertise and knowledge available in the country.

12 Delineate flood plains and 14 Manage and control development:

The Office of Public Works (OPW) has completed production of a national catchment flood risk assessment and management (CFRAM) programme which includes predictive flood risk maps for rivers, the output of which is available to local authorities, infrastructure owners and other interested parties. The challenge now is for planning authorities to strictly enforce planning guidelines (*The Planning System and Flood Risk Management*) and to ensure that further inappropriate development does not take place in flood plains, repeating past mistakes. However, despite the significant benefits of CFRAM, it must be recognised that with Pluvial flooding all areas can be at risk, and designs should cater for the potential for more intense rainfall events in any part of the island.

There will be need to consider new flood mitigation approaches such as proactively delineating certain areas as flood basins to accommodate flood waters; recognition that certain areas and properties cannot practically be protected from flooding; increase in appropriate forestry in certain areas to slow runoff etc.

13 Implement coastal protection plans:

Predictive flood risk maps for the country's coastal areas are included in the OPW's CFRAM programme. However coastal erosion is likely to be exacerbated by climate change. This is particularly important for coastal towns and cities. There is need to develop, across the relevant government departments, comprehensive coastal zone management programmes to address this risk and to protect against coastal flooding where this is practical. However it must also be recognised that in some instances coastal protection measures may not be technically, environmentally or economically feasible.

15 Improve flood warnings:

A new more comprehensive weather modelling and forecasting system is due to be developed by MET Eireann. The output from this new weather forecasting system combined with more comprehensive river flow and tide gauge information, should enable more timely and accurate information be provided to all stakeholders including the general public, on the probability, timing and extent of flood events. This information should be provided publicly on line in a transparent and easily understood manner.

18 Review power requirements:

The energy regulator, in consultation with the energy industry, should commission and publish reports on how energy demand is likely to be affected by climate change to ensure any required changes to energy policy can be implemented in a timely manner.

MAIN RECOMMENDATIONS:

Since publication of the academy's report in October 2009 progress has been made across a number of the recommendations made, in particular in relation to legislation, policy and structures. However much remains to be done in relation to what is certainly the biggest ongoing risk to the nation's public and private infrastructure assets and to infrastructure services.

Now that the national climate change framework and legislation are in place there is need to focus on implementation. The cost of delay in terms of risks to critical infrastructure, essential services and private property continues to increase, and the sooner the adaptation challenge is addressed head on the better. Our recommendations are as follows:

Recommendations

Build climate change adaptation into every aspect of the National Planning Framework.

Given the scale and complexity of the ongoing risks posed by climate change to Ireland's infrastructure and to society, it is essential that climate change adaptation is included as an integral element of the upcoming National Planning Framework.

Drive, co-ordinate, monitor and report on implementation of climate change adaptation plans.

As the Lead Agency, the Department of Environment, Community and Local Government faces particular challenges in driving, co-ordinating, monitoring and reporting on implementation of climate change adaptation plans. It will be particularly important to ensure that the various sectoral leads and the local authorities, are aware of their responsibilities and discharge their obligations.

Review engineering design standards

As a matter of urgency a study should be initiated by DOECLG involving engineers, climate change researchers, the NSAI and other relevant organisations, to identify the climate change design parameters that are critical to sustainable infrastructure design across the various infrastructure sectors.

Carry out climate change risk assessment and prepare climate change adaptation plans for critical infrastructure

All owners of critical infrastructure, both public sector owners via their relevant Minister and private sector owners via their relevant regulator, should immediately be required to prepare climate change risk assessment reports as a precursor to preparation of adaptation plans.



The Irish Academy of Engineering
22 Clyde Road, Ballsbridge, Dublin 4
Telephone: +353 1 665 1337
academy@engineersireland.ie
www.iae.ie

Published by: the Irish Academy of Engineering
ISBN: 978-0-9935995-0-7