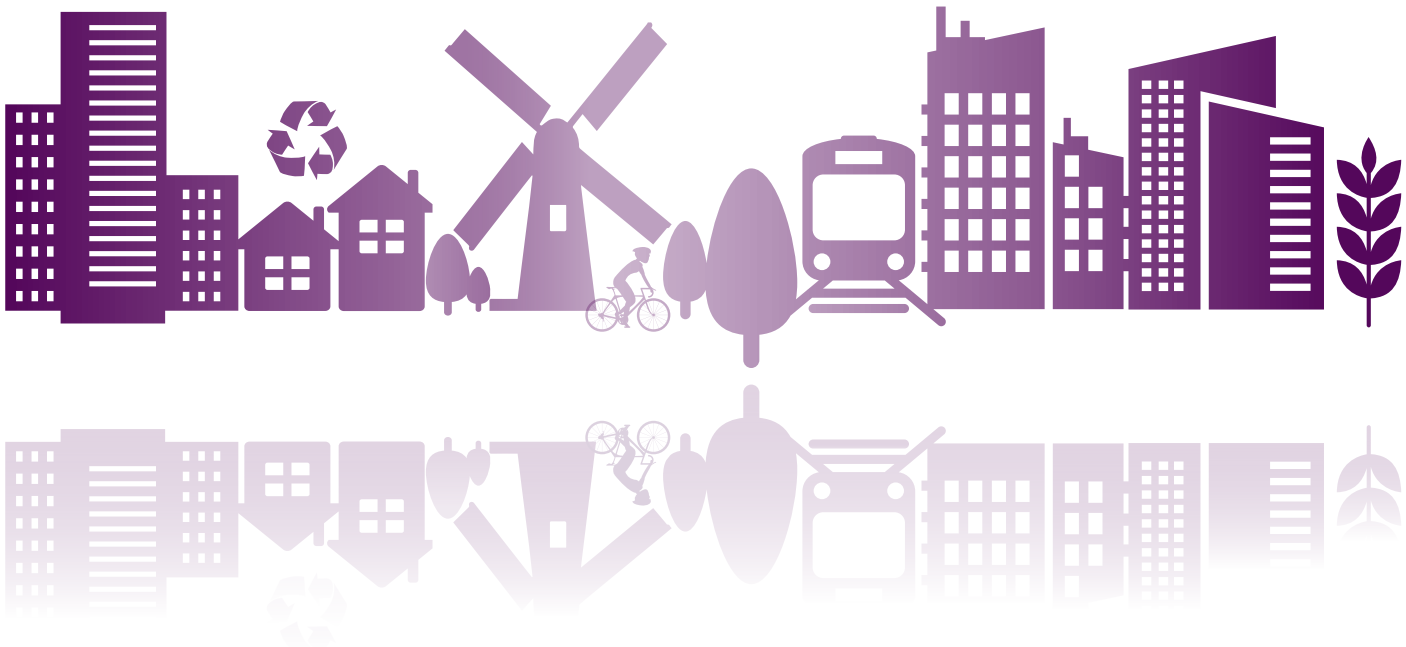
Comhairle Contae Fhine Gall
Fingal County Council

Codema
Dublin's Energy Agency



FINGAL COUNTY COUNCIL

DRAFT CLIMATE CHANGE ACTION PLAN

2019-2024

This Draft Climate Change Action Plan has been developed by the Dublin energy agency Codema on behalf of Fingal County Council, with the assistance and support of the Water and Environmental Services Strategic Policy Committee (SPC). The Chairperson of the SPC is Councillor Paul Donnelly.

The Draft Action Plan was also prepared having regard to *A Strategy towards Climate Change Action Plans for the Dublin Local Authorities*, published in 2017.

Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA)
The Draft Climate Change Action Plan has been prepared in accordance with the requirements of the Planning and Development (Strategic Environmental Assessment) Regulations 2004 and Article 6 of the Habitats Directive 92/43/EEC. The SEA and AA process, carried out in tandem with the preparation of the Draft Climate Change Action Plan, have ensured full integration and consideration of environmental issues throughout the action plan preparation process. Through these assessment processes, a number of the actions have been recommended for mitigation, and will be incorporated into the final plan. Please see Chapter 8 of the SEA environmental report for information on these measures.

The SEA Environmental Report and Screening Statement in support of the AA and Natura Impact Report are available as separate documents, to be read in conjunction with this Climate Change Action Plan.

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FOREWORD

MESSAGE FROM COUNTY MAYOR ANTHONY LAVIN

The Fingal County Council Climate Change Action Plan sets out to actively inform and engage the public through a range of innovative programmes and partnerships and, where possible, facilitate bottom-up, community-led solutions. The four Dublin Local Authorities - Fingal County Council, Dublin City Council, Dún Laoghaire-Rathdown County Council, and South Dublin County Council - are developing their Climate Change Action Plans collaboratively through Codema, Dublin's Energy Agency. These plans are being developed on the initiative of the local authorities' respective Environment Strategic Policy Committees.

The Fingal County Council Climate Change Action Plan will help to make Fingal climate-resilient and protect its critical infrastructure by reducing the impacts of current and future climate change-related events and by working in close collaboration with the other Dublin Local Authorities, regional authorities and national bodies. The actions in this plan will be continually monitored and updated by a dedicated climate action team working across all Council departments. We look forward to working with the newly established Dublin Metropolitan Climate Action Regional Office, which will ensure that that overall plan is fully updated every five years to reflect latest policy, technology and climate-related impacts.

MESSAGE FROM CHIEF EXECUTIVE PAUL REID

Climate change is one of the most pressing challenges facing governments today and Fingal County Council has put it at the forefront of its agenda. Fingal County Council's Climate Change Action Plan sets out how the Council will improve energy efficiency and reduce greenhouse gas emissions in its own buildings and operations, while making Fingal a more climate-resilient region, with engaged and informed citizens.

Five key areas have been identified in the Climate Change Action Plan, which has now been published as a joint initiative by the four Dublin Local Authorities, and Fingal County Council will strive to reduce the impacts of climate change.

Fingal County Council is already on track to meet an ambitious target of reducing its energy consumption by 33% by 2020, having achieved major savings over the past eight years. Since 2010, Fingal County Council has achieved energy efficiencies of 30.3%. The equivalent of 2,950 tonnes of CO_2 emissions has been saved so far in the drive to meet this objective. Fingal County Council will continue to work with key stakeholders to influence and support carbon reduction initiatives across the County's transport, commercial and residential sectors.

EXECUTIVE SUMMARY

For the first time, Dublin's four local authorities have joined together to develop Climate Change Action Plans as a collaborative response to the impact that climate change is having, and will continue to have, on the Dublin Region and its citizens. While each plan is unique to its functional area, they are unified in their approach to climate change adaptation and mitigation, and their commitment to lead by example in tackling this global issue.

This Climate Change Action Plan features a range of actions across five key areas - Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions and Resource Management - that collectively address the four targets of this plan:

- A 33% improvement in the Council's energy efficiency by 2020
- A 40% reduction in the Council's greenhouse gas emissions by 2030
- To make Dublin a climate resilient region, by reducing the impacts of future climate change-related events
- To actively engage and inform citizens on climate change

In order for Fingal County Council to achieve these targets, this Climate Change Action Plan sets out the current and future climate change impacts and greenhouse gas emission levels in the County, through the development of adaptation and mitigation baselines. It also examines the future impacts that climate change may have on the region and then sets out a first iteration of actions that will be used to reduce the source and effects of these impacts.

The adaptation baseline has identified that the effects of climate change are already impacting the Fingal area at a significant rate and are very likely to increase in their frequency and intensity. Dublin Bay's sea level appears to be rising faster than initially forecasted and has risen by twice the global average in the last 20 years. The number of days with heavy rainfall has also increased, and the amount of extreme flooding events in the County has risen in the last 10 years. Fingal has also experienced extreme temperatures, as witnessed recently in 2018, with Met Éireann issuing its first ever Status Red warning for snow in February, followed by one of the hottest summers on record during June and July. All these extreme weather events clearly highlight the need to reduce the impacts that climate change is having on the environment, the economy and the citizens of Dublin.

Photo Source: Tourism Ireland / Brendan Lyon

The mitigation baseline calculates the greenhouse gas emissions for the Council's own activities and also for the entire Fingal County (including a breakdown of the residential, transport and commercial sectors). It found that Fingal County Council produced 12,620 tonnes of CO_2 in 2017 and has reduced its emissions by 19% in the last 10 years. In addition, the Council has improved its energy efficiency by 30.3% and is currently on track to meet its 33% energy efficiency target by 2020.

The actions in this plan have been gathered to close the gap between the current baselines and the stated targets, and will be regularly updated and added to on the Dublin Climate Change platform (www.dublinclimatechange.ie). These actions have many co-benefits, such as improved health through cleaner air and active travel, a better environment through habitat protection, and a stronger economy from new markets and job opportunities.

However, given that the Council's buildings, operations and social housing account for less than 2% of the total emissions in Fingal, it highlights the need to tackle the remaining 98% of emissions produced county-wide. In recognising this challenge, Fingal County Council will work with key stakeholders to influence and support carbon reduction initiatives across the County's transport, commercial and residential sectors.

In addition, as public awareness is key to tackling both climate adaptation and mitigation, Fingal County Council commits through this plan to address the current knowledge-gap and will encourage citizens to act on climate change through a range of awareness and behavioural change actions.

This Climate Change Action Plan has been developed by the Dublin energy agency Codema on behalf of Fingal County Council, following an extensive process of research, policy analysis, one-to-one meetings and workshops with staff and regional working groups. It follows on from the publication of *A Strategy towards Climate Change Action Plans for the Dublin Local Authorities*, which was published in January 2017.

The actions in this plan are a starting point and will be regularly monitored and updated by a dedicated Climate Action Team, working with an Interdepartmental Steering Group representative of all Council Departments. They will be assisted by the newly established Dublin Metropolitan Climate Action Regional Office, which will ensure that the overall plan is fully updated every five years to reflect latest policy, technology and climate-related impacts. The new office will work with Codema, as technical support and research partner, to ensure that the plans continue to be informed by international best practice and regional research institutions.

ABOUT THE PLAN

Fingal County Council's Climate Change Action Plan sets out how the Council will improve energy efficiency and reduce greenhouse gas emissions in its own buildings and operations, while making Fingal a more climate-resilient region, with engaged and informed citizens. This will be achieved by a range of ongoing and planned actions in five key areas, which will be continuously monitored, evaluated and updated to 2030 and beyond.

KEY TARGETS

33%
improvement in the Council's **energy efficiency** by 2020

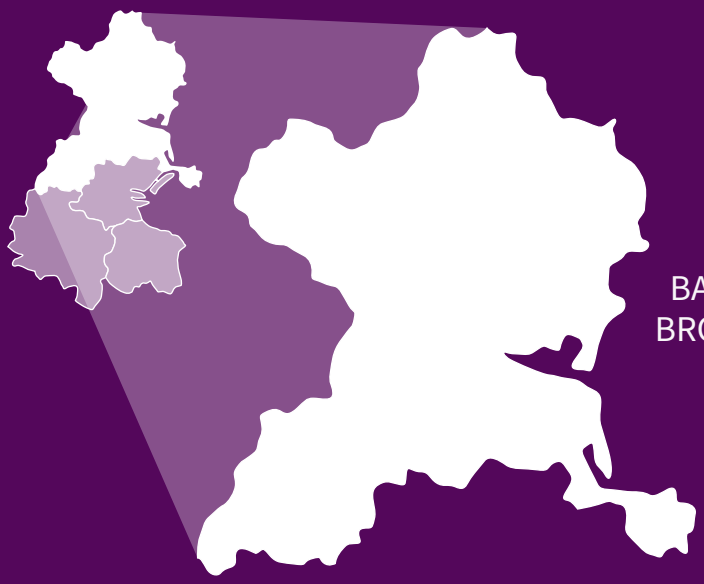
Make Dublin a **climate-resilient region** by reducing the impacts of future climate change-related events

40%
reduction in the Council's **greenhouse gas emissions** by 2030

GHG

Actively engage and **inform our citizens** on climate change

OVERVIEW OF FINGAL



MAIN RIVERS
WARD
DELVIN
CORDUFF
BALLYBOUGHIL
BROADMEADOW
SANTRY
TOLKA
LIFFEY
SLUICE
MAYNE

MAIN RISK AREAS:

SEA LEVEL RISE

FLOODING

EXTREME WEATHER EVENTS such as storms, cold spells, heat waves

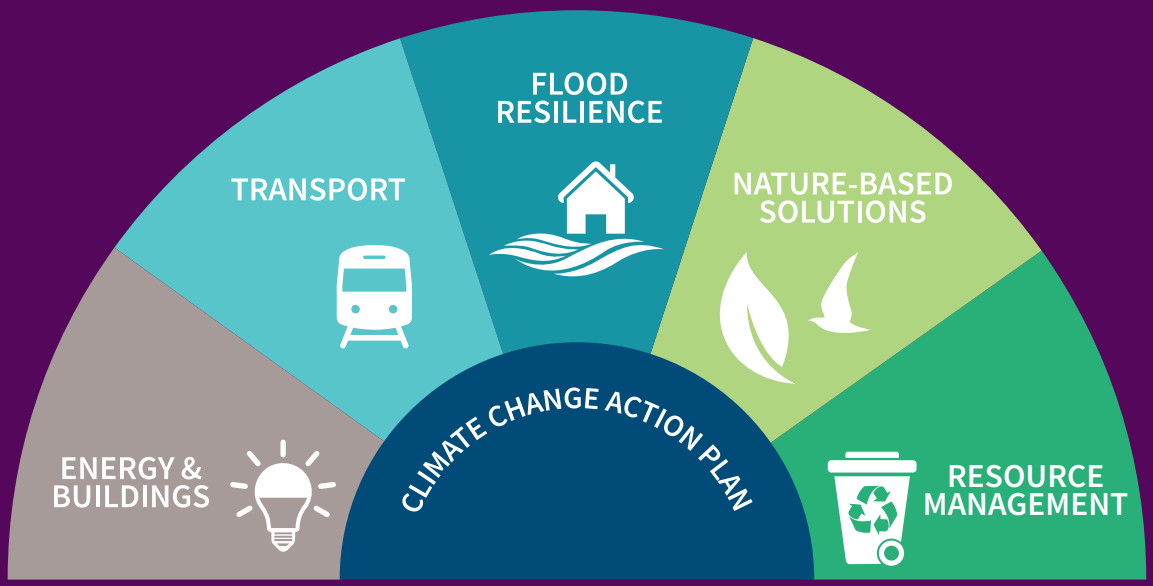
POPULATION
296,020

104,851
HOUSEHOLDS

88 km
OF COASTLINE

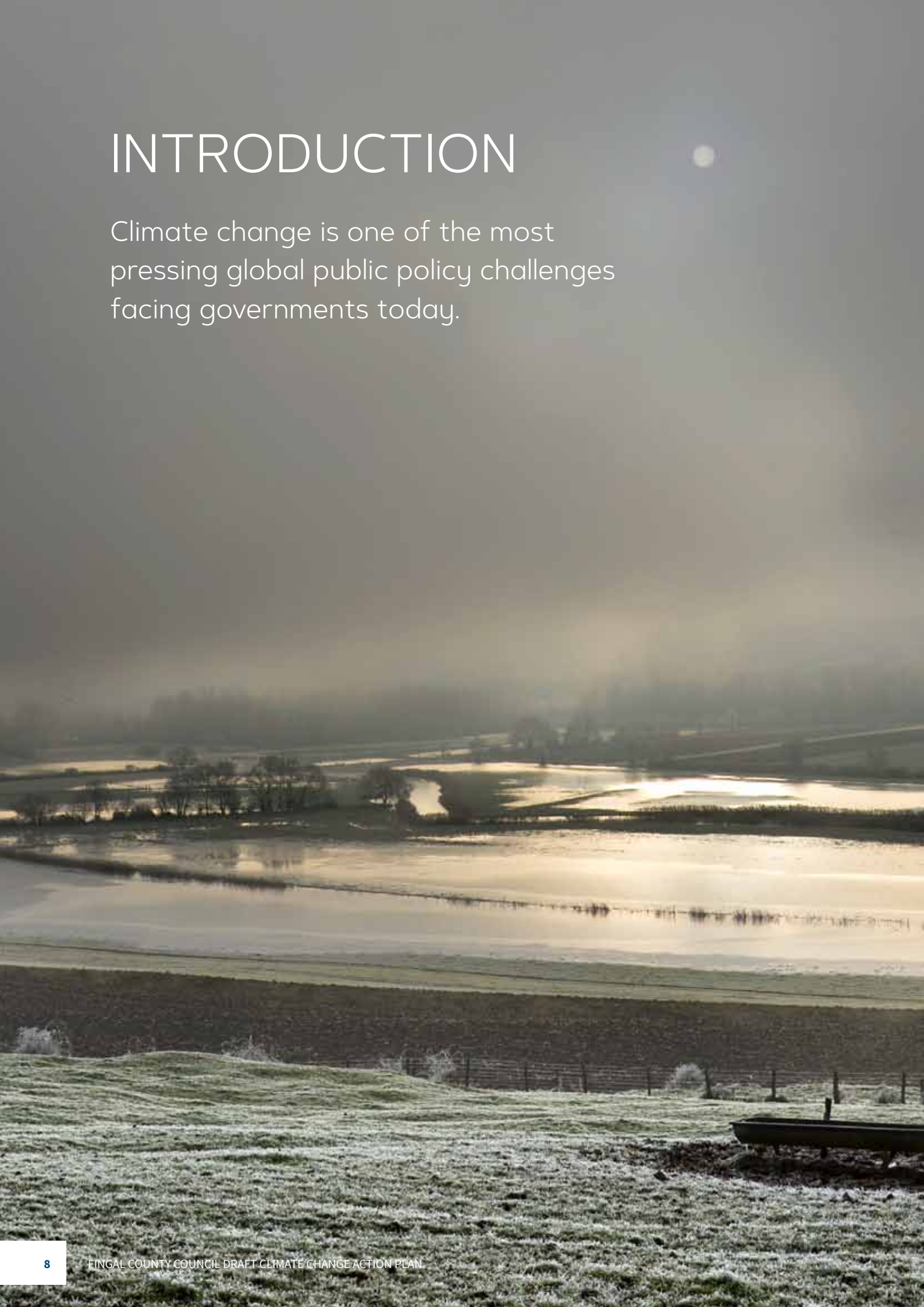
ACTION AREAS

The actions in this plan have been organised under the action areas shown below, reflecting Fingal County Council's range of services.



INTRODUCTION

Climate change is one of the most pressing global public policy challenges facing governments today.



THE FOUR MAIN TARGETS OF THIS PLAN ARE:

Climate change is one of the most pressing global public policy challenges facing governments today. Its impacts are already having far-reaching economic, social and environmental consequences. International agreements, most recently the Conference of the Parties (COP) 21 Agreement in Paris, have been developed to unify national governments in a commitment to reduce the human causes of climate change.

The Irish government has published the *Climate Action and Low Carbon Development Act 2015*[1], the *National Mitigation Plan*[2], the *National Adaptation Framework*[3] and *Project Ireland 2040* (the *National Planning Framework*[4] and the *National Development Plan*). These set out how Ireland will achieve its international and European commitments, and transition Ireland to a low carbon society. To provide local authorities with support in developing their Climate Change Action Plans (CCAPs), the Department of Communications, Climate Action and Environment (DCCAE) has developed the *Local Authority Adaptation Strategy Development Guidelines 2018*[5]. In addition, the government has established four Climate Action Regional Offices (CAROs), each led by a local authority.

The four Dublin Local Authorities (DLAs) - Dublin City Council, Dún Laoghaire-Rathdown County Council, Fingal County Council and South Dublin County Council - are developing their Climate Change Action Plans collaboratively through Codema, Dublin's Energy Agency. These plans are being developed on the initiative of the Councils' respective Strategic Policy Committees (SPCs).

Fingal County Council (FCC) is on track to meet the public sector target of a 33% improvement in energy efficiency by 2020. This is an average improvement in energy efficiency of approximately 3% per year in the Council's own buildings and operations. The DLAs are all signatories to the EU Covenant of Mayors for Climate and Energy initiative, which is a voluntary commitment by members to develop and implement Sustainable Energy and Climate Action Plans (SECAPs) and reduce their regions' greenhouse gases (GHGs) by 40% by 2030. FCC will apply this target to its own operations but will also influence a reduction in GHGs county-wide by leading by example and working with key stakeholders and decision-makers.

FCC will also help to make Fingal climate-resilient and protect its critical infrastructure by reducing the impacts of current and future climate change-related events and by working in close collaboration with the other DLAs, the Dublin CARO, regional authorities and national bodies.

These commitments to reducing the causes and impacts of climate change need to be integrated into the decision making for planning, policies and operational processes within the local authority. This can be achieved by providing staff with the training and tools required to make informed choices.

Finally, as citizens are crucial for solutions to climate change, FCC will set out to actively inform and engage the public, through a range of innovative programmes and partnerships and, where possible, facilitate bottom-up, community-led solutions.

THE FIVE KEY ACTION AREAS OF THIS PLAN

OPPORTUNITIES FOR MAKING FINGAL A LOW-CARBON, CLIMATE-RESILIENT COUNTY

ECONOMIC

1. By adapting to climate change now, we can ensure that all future plans are climate-proofed and associated opportunities are maximised
2. By becoming climate leaders, we are attractive to foreign direct investment from companies with a green corporate agenda
3. By using local solutions to mitigate and adapt to climate change, we can upskill our workers and generate employment
4. By implementing innovative solutions, we can avail of climate-related EU grants and reduce future fines
5. By using indigenous, sustainable sources for our energy needs, we can reduce our reliance on foreign fossil fuel markets

ENVIRONMENTAL

1. By using nature-based solutions to combat climate risks, we can increase the green infrastructure of the area
2. By improving our public transport and cycling networks, we reduce private car use, GHGs and pollution
3. By increasing resilience, we can protect our native flora and fauna
4. By implementing mitigation and adaptation actions now, we lessen the potential impacts on the environment in the future
5. By using nature-based solutions with, or instead of, hard engineering, we can reduce the associated costs of climate action

SOCIAL

1. By improving the energy efficiency of our social housing stock, we can reduce tenants' utility bills and lessen fuel poverty
2. By encouraging cycling and walking, we can improve the health of our citizens
3. By protecting against climate risks, we can reduce impacts on citizens, their properties and our services
4. By informing citizens on the impacts of climate change and possible solutions in their areas, we can create networks of climate-resilient neighbourhoods
5. By increasing nature-based solutions, we can make the area a healthier and more desirable place to live and work

CLIMATE ACTION – ADAPTATION & MITIGATION

This plan concentrates on the two approaches required to tackle climate change. The first, mitigation, consists of actions that will reduce current and future GHG emissions; examples of these include reductions in energy use, switching to renewable energy sources and enhancement of carbon sinks. The second approach, adaptation, consists of actions that will reduce the impacts that are already happening now from our changing climate and those that are projected to happen in the future.

These include flood protection, reduced impact of rising sea levels, increased resilience of infrastructure, and emergency response planning. The approaches are interconnected and should be planned together.

Mitigation and adaptation actions in this plan are based on both the current situation as defined in the baselines, the future risk projections and the remit of the Dublin Local Authorities.

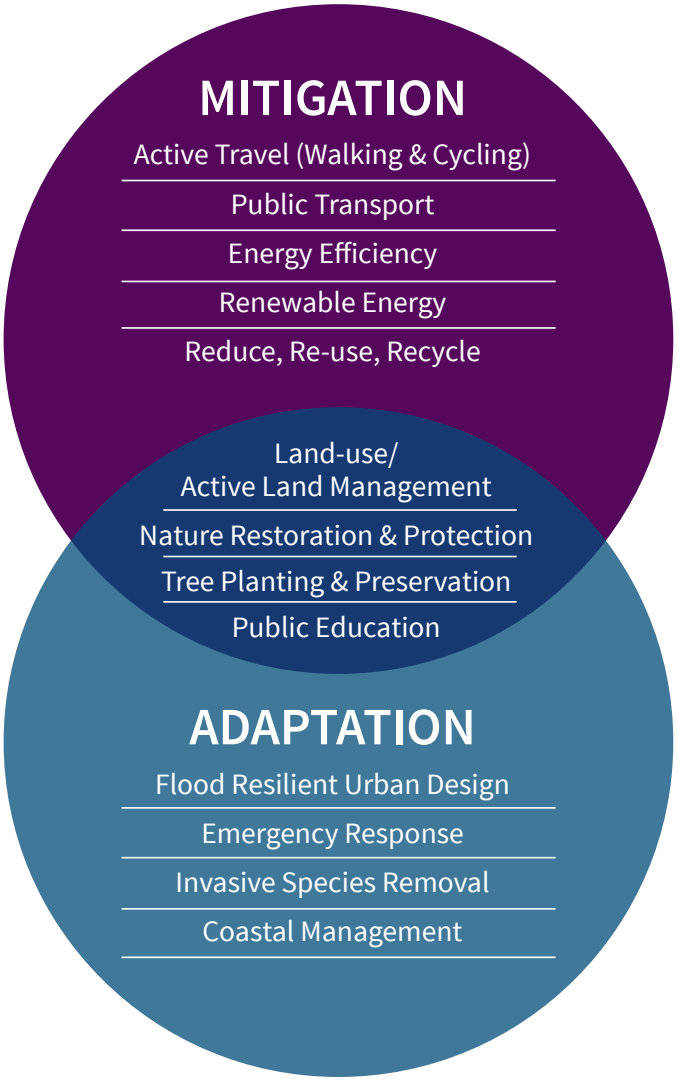


Figure 1 Examples of some Mitigation and Adaptation Solutions and their Crossovers

THE GLOBAL CONTEXT

Responding to climate change is becoming a priority of governments all over the world. Its impacts threaten livelihoods, the environment, security, and economic growth. The commitment of national governments to act on climate change is demonstrated by the unprecedented agreement of 195 states to sign the COP21 Paris Agreement. The recent Intergovernmental Panel on Climate Change (IPCC) Special Report 2018 has underlined the need to meet and exceed the Paris Agreement and achieve meaningful emission reductions before 2030.

> **Pathways limiting global warming to 1.5°C... would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems... These systems transitions are unprecedented in terms of scale, but not necessarily in terms of speed, and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options**
> - IPCC Special Report 2018[6]

GLOBAL RISKS & PROJECTIONS

The World Meteorological Organisation (WMO) has shown that 2017 was the worst year on record for extreme climate events[7]. Coastal cities bear the brunt of these storms and consequently face extensive recovery costs. However, strengthening storms are not the only form of extreme weather; droughts, increased rainfall, and freezing weather and snow also present risks to urban and rural areas.

In its Special Report 2018, the IPCC states:

> **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 increase further with 2°C.**
> - IPCC Special Report 2018[6]

The recently adopted United Nations Development Programme (UNDP) Sustainable Development Goals[8] underline the importance of climate change for an equal and equitable society. All 17 goals can be related to the impacts and opportunities of climate change, with Goal 7 *Affordable Clean Energy* and Goal 13 *Climate Action* being particularly relevant.

> **Our 2030 vision for Ireland is of a country: that is on-track to achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050, while also addressing the issue of energy poverty, supported by investment in renewable energy and sustainable transport, together with improvements in the energy efficiency of the built environment**
> - The Sustainable Development Goals National Implementation Plan 2018-2020[9]

In addressing these climate change impacts, we need to understand the risks. In the World Economic Forum's 2017 Report on Global Risk[10], four of the top five global risks were related to climate change - extreme weather events, water crises, major natural disasters and failure of climate change mitigation and adaptation. This highlights that climate change is not just an environmental issue, but also a social and economic one that calls for integrated and collaborative responses.

HEAT WAVES WILL OCCUR MORE OFTEN AND LAST LONGER

INCREASED RISKS OF **DROUGHTS** IN URBAN AND RURAL AREAS

HURRICANES, TYPHOONS AND CYCLONES WILL BECOME MORE FREQUENT

THE OCEAN WILL CONTINUE TO WARM AND ACIDIFY, AND GLOBAL **SEA LEVELS** WILL CONTINUE TO RISE

THE NATIONAL CONTEXT - IRELAND

The EU has recognised the risks of climate change and subsequently, Ireland has been set national targets under various EU directives that have been transposed as statutory instruments. These require that certain targets for energy efficiency, renewable energy and GHG reductions are achieved by 2020, namely:

- A 20% reduction in non-emissions trading scheme greenhouse gas emissions relative to 2005 levels
- Raising the share of EU energy consumption produced by renewable resources to 20% (adjusted to 16% for Ireland)
- A 20% improvement in the EU's energy efficiency
- In line with the National Energy Efficiency Action Plan (NEEAP), the DLAs are committed to achieving a 33% improvement in energy efficiency for their own operations

New targets for emission reduction have been set for 2030, which remain around 20% for Ireland. This Climate Change Action Plan has been developed with consideration to these international, European, and national agreements, directives, legislation and regulations. These include the Irish Government's *Climate Action and Low Carbon Development Act 2015*, *National Mitigation Plan* (NMP), *National Adaptation Framework* (NAF), and *National Planning Framework* (NPF). These various plans are cross-sectoral and involve cooperation between numerous national, regional and local bodies; these relationships are illustrated in Figure 2 below.

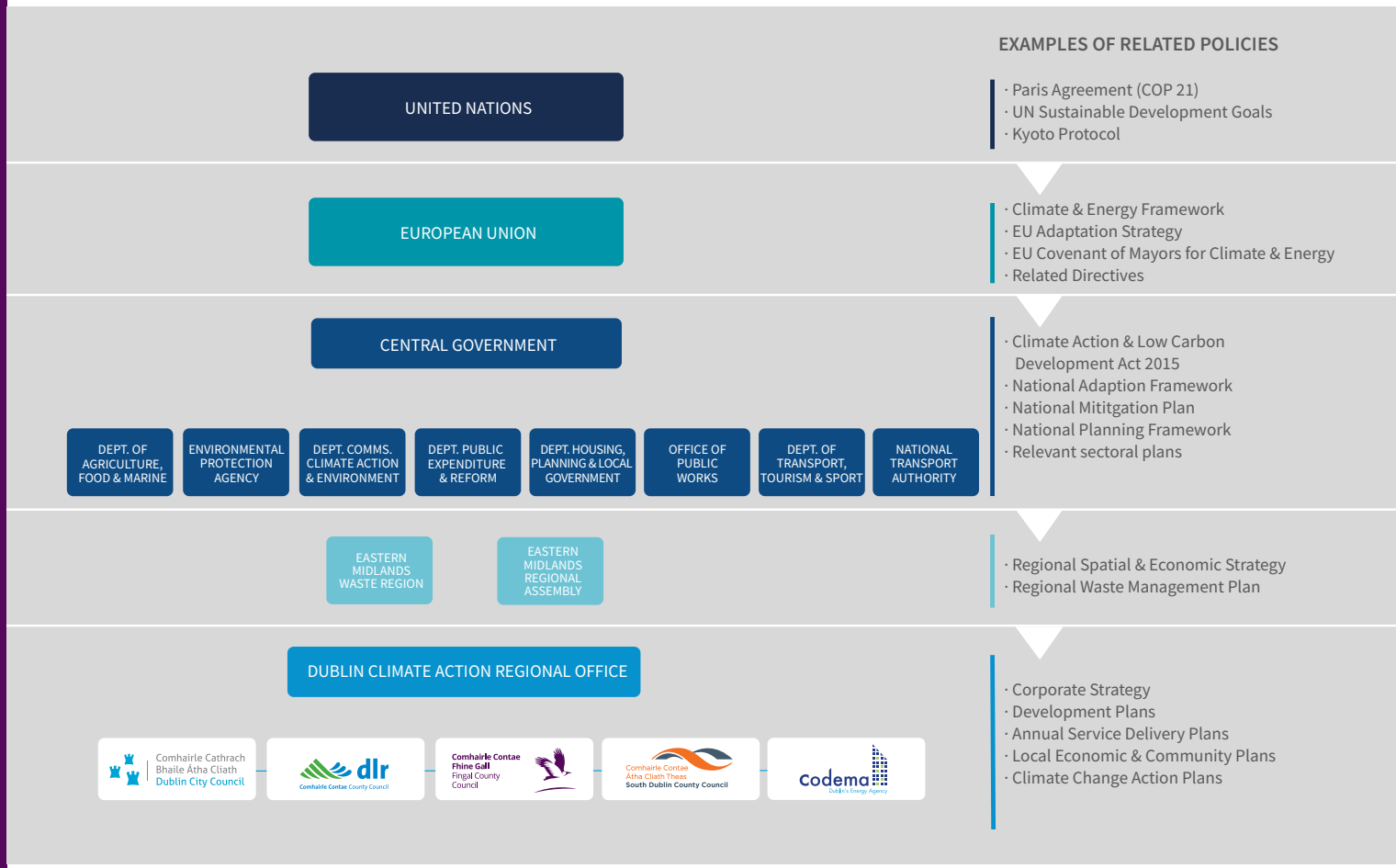


Figure 2 Institutional and Policy Context

THE REGIONAL CONTEXT

Globally, local governments are recognised to be the level of government best suited to address climate change, due to their role in the day-to-day activities of people. The Irish government has recognised this, and local authorities are actively working in consultation with the Department of Communications, Climate Action and Environment (DCCAE) to develop a regional approach to climate action through the establishment of four Climate Action Regional Offices (CAROs). The proposed approach groups local authorities based on similar geographical characteristics so that they can address the threats and impacts of severe weather events and ongoing climate change risks within their region. The Dublin CARO will focus on risks particular to urban areas.

THE ROLE AND REMIT OF FINGAL COUNTY COUNCIL

Due to provisions in the *Climate Action and Low Carbon Development Act 2015*, local authorities must have regard for the *National Adaptation Framework* and the *National Mitigation Plan* in the delivery of services and operations, and produce adaptation plans in accordance with guidance provided in the *Local Authority Adaptation Strategy Development Guidelines 2018*. In addition, they are asked to assume a leadership role within their local communities to encourage appropriate behavioural change. However, compared to other countries, local authorities in Ireland are limited in their service delivery and direct legal capacity, and key decisions are often made at the national rather than the local level.

Nonetheless, local planning authorities play an important coordinating role through the formulation and implementation of development plan policies and objectives, and particularly by influencing private sector development through the development management process. In effect, this process helps address mitigation and adaptation requirements, as policies and objectives are implemented in new developments on foot of permissions. County development plans, local area plans and Strategic Development Zone (SDZ) planning schemes can address climate change issues at a local level.

The actions in this plan have been gathered based on this remit. FCC's focus is on climate-proofing the areas for which it has direct responsibility. In areas outside its remit, FCC will work to support the implementation of the sectoral adaptation and mitigation plans developed by, but not limited to, the Department of Housing, Planning and Local Government (DHPLG), the Department of Transport, Tourism and Sport (DTTAS), the Office of Public Works (OPW), the Department of Agriculture, Food and the Marine (DAFM), and the Department of Communications, Climate Action and Environment (DCCAE), thereby supporting the whole of government approach to climate action. Recognising its role as a climate leader, FCC is committed to leading by example; key to this is implementing and monitoring this plan through the Dublin CARO.

CLIMATE ACTION REGIONAL OFFICE (CARO)

The newly-established Dublin Metropolitan Climate Action Regional Office is one of four regional climate change offices that have been set up in response to Action 8 of the 2018 *National Adaptation Framework* (NAF) – *Planning for a Climate Resilient Ireland*. Under the NAF, sectoral adaptation plans are to be developed and implemented that will affect the work of the DLAs. As such, the Dublin CARO will liaise with respective government departments to align actions undertaken by the DLAs with sectoral adaptation plans.

The role of the Dublin Metropolitan CARO is to:

- Assist the local authorities within the region in preparing their own Climate Change Action Plan
- Develop education and awareness initiatives for the public, schools, NGOs and other agencies engaged in driving the climate change agenda and contribute to the National Dialogue on Climate Action on a local and regional basis
- Link with third-level institutions in developing a centre of excellence for specific risks – in the case of the Metropolitan Region, this will be for urban climate effects
- Liaise and interact with the Dublin energy agency Codema

THE ACTION PLAN PROCESS

THE ACTION PLAN PROCESS

The methodology used for this plan was based on the International Council for Local Environmental Initiatives (ICLEI) Five Milestone Approach[11], which was developed as a guide to assist members of ICLEI in writing their Climate Change Action Plans. It is a 'plan, do, check, act' process designed specifically for the development of CCAPs. The Milestones were further adapted to meet the specific needs of the Dublin Local Authorities (Figure 3) and harmonised with the process as described in the *Local Authority Adaptation Strategy Development Guidelines 2018*. It should be noted that the current process incorporates Milestones 1 to 3 to produce this plan, while Milestones 4 and 5 concern the plan's implementation and monitoring; this will be developed further in subsequent iterations.

Figure 3 ICLEI Five Milestone Approach, Adapted for the Dublin Context

MILESTONE 1: INITIATE

IDENTIFY CLIMATE CHANGE IMPACTS AND RISKS

A changing climate is impacting the environmental, social and economic wellbeing of the region; the risks that Fingal encounters are related to its geographic and demographic characteristics. Future projections for climate change indicate that the County will face increasing risks associated with rising temperatures, sea level rise, flooding and an increase in the frequency and intensity of extreme weather events.

A climate change adaptation baseline and risk assessment is needed to determine the frequency and intensity of extreme weather events and trends, and to highlight the sectors in Fingal most vulnerable to future risks from a changing climate.

A more in-depth analysis about climate change impacts and risks may be found in both the Adaptation Baseline (under Milestone 2 - Research) and in Appendix I - Climate Change Risk Assessment.

DEVELOP A CLIMATE CHANGE STRATEGY

With these high-level risks identified, Codema and the Dublin Local Authorities produced *A Strategy towards Climate Change Action Plans for the Dublin Local Authorities*, which included a public consultation process. This recognised the need for each of the four DLAs to act on current risks and minimise the projected impact of future ones with mitigation and adaptation actions.

Action areas associated with the remits of the DLAs were identified in order to begin collecting data and actions, and set out how the plans would be developed.

MILESTONE 2: RESEARCH

MEET WITH STAFF AND ARRANGE WORKSHOPS

To develop the adaptation and mitigation baselines, Codema engaged FCC staff through one-to-one meetings, and facilitated a preliminary workshop to introduce the staff to the action plan process, develop risks and impacts, and collect baseline data.

These one-to-one meetings and the first workshop included over 60 staff across the four DLAs. The workshop provided an opportunity for staff to collaborate with each other. DLA staff were asked to elaborate on the key climate change vulnerabilities facing the Dublin Region, and to begin gathering actions needed to address these areas.

COLLECT BASELINE DATA

Codema carried out an adaptation risk assessment on behalf of FCC, which identifies and assesses the current climate change risks facing Fingal. With support from the Sustainable Energy Authority of Ireland (SEAI), Codema also developed an energy and emissions baseline, which shows the current level of emissions and energy efficiency for FCC's own operations, and the emissions for the whole of Fingal. Research into people's attitudes and awareness was used in order to inform the stakeholder engagement actions of the plan. The following section shows these baselines.

PUBLIC AWARENESS

PUBLIC AWARENESS

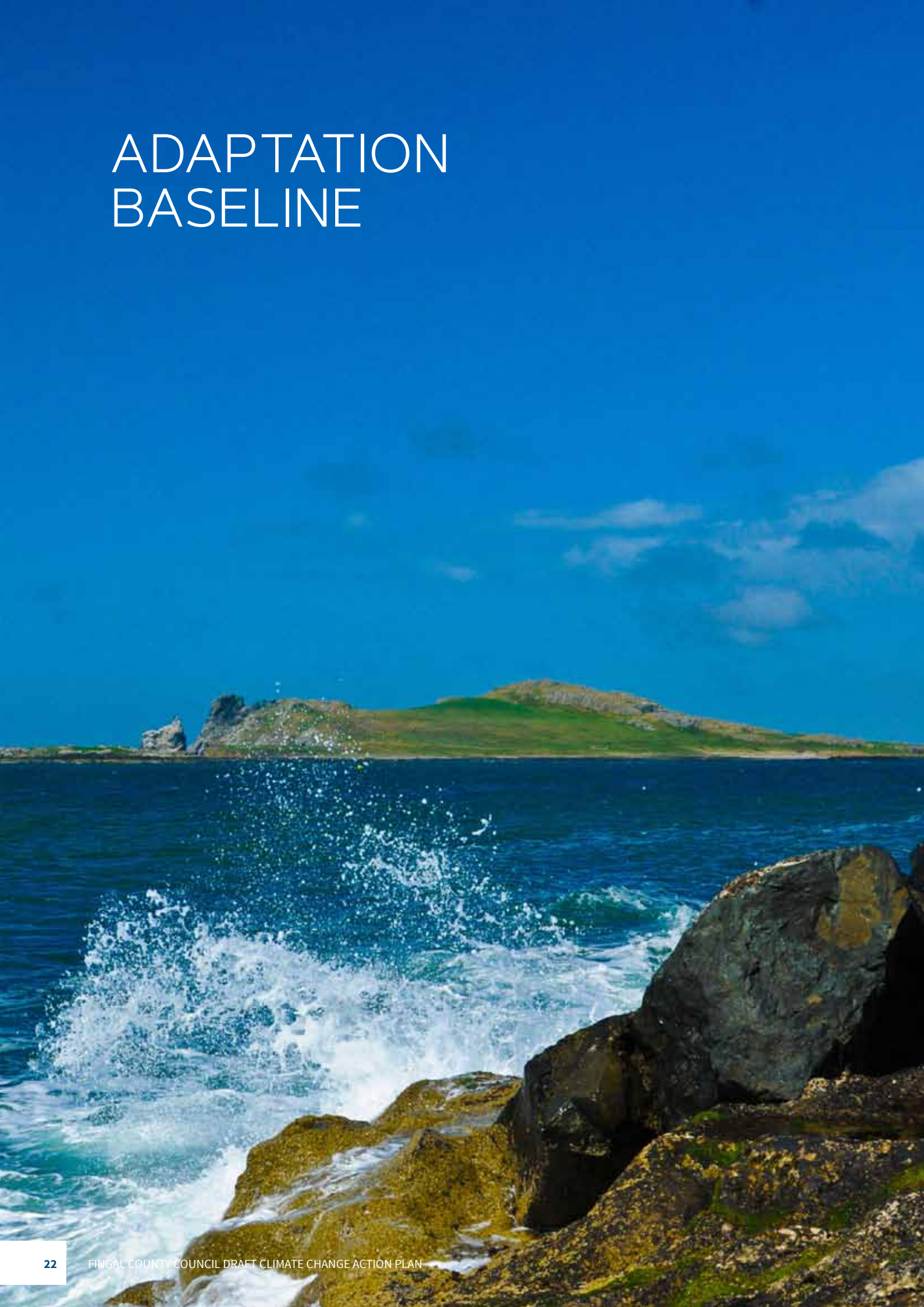
One of the biggest challenges to tackling climate change is public acceptance of the risks and the associated demand for solutions to reduce these risks through policy and services. There are two types of solutions - top-down, such as governmental policy and regulations, and bottom-up, led by citizen demand for change. For a successful route to reduce climate risk, both levels of solution need to be addressed.

A 2018 special Eurobarometer report[12] surveyed each member state across differing social and demographic groups and recorded public attitudes to climate change. The survey found that 94% of Irish respondents considered climate change to be entirely or partly due to human activity, with an average of 86% agreeing that extreme weather events (such as heat waves and extreme cold, floods and heavy rainstorms) are to some extent due to climate change. In terms of the impacts of climate change, 64% of Irish respondents thought that there would be increased food and water shortages by 2050. In addition, 97% agreed that measures to promote energy efficiency should be implemented as a solution to climate change, and 90% agreed that subsidies for fossil fuels should be reduced. In addition, 89% of Irish respondents agreed that tackling climate change can present opportunities for jobs and boost the economy, highlighting that there is an appetite for change and a consensus on the seriousness of future impacts.

Over the course of two weekends at the end of 2017, the Citizens' Assembly discussed how the state could make Ireland a leader in tackling climate change[13]. The Assembly heard presentations from a range of experts in areas such as the science of climate change and international policy. Over 1,200 submissions were received from the general public, advocacy groups, professionals and academics. At the end of the process, the Assembly voted on 13 recommendations, all of which were overwhelmingly agreed. The recommendations demand top-down action from the government, in order to encourage and facilitate bottom-up actions from Irish citizens. By prioritising public transport over road networks, higher carbon taxes, provisions for community-owned energy developments and feed-in tariffs for domestic energy production, the conditions would be in place to allow the growth of bottom-up solutions. The Assembly also underlined the need for public bodies to take a leadership role by climate-proofing their own facilities, reducing energy use and applying low-carbon solutions to their services. In addition, risk assessments of critical infrastructure were seen as essential to increase the state's resilience to adverse climate impacts.

This CCAP is cognisant of the role that the DLAs must play in increasing citizen awareness and participation in climate solutions and the unique position that local government holds in interacting with its citizens. The protection of critical infrastructure, facilitating bottom-up solutions and applying regulations, where possible, are at the centre of this plan and will be strengthened in future iterations.

ADAPTATION BASELINE



ADAPTATION BASELINE

Dublin's energy agency Codema has produced this adaptation baseline in line with the guidelines contained in the *Local Authority Adaptation Strategy Development Guidelines 2018* and *The National Adaptation Framework*. This Climate Change Action Plan has been peer reviewed to the requirements of the *Local Authority Adaptation Strategy Development Guidelines 2018*.

The objective of this baseline is to document the occurrence of past climatic events, their frequency, the specific areas in Fingal that are most vulnerable, and the risks associated with such events. This adaptation baseline also highlights the need for emergency planning to be continually updated in line with extreme weather events.

From the adaptation baseline, we can assess the current and future risks that will affect Fingal. These risks are assessed and addressed by putting actions in place to build a more resilient County that is robust, resourceful and is able to adapt in response to changes in climate and in times of crisis. The actions are a mix of grey and green solutions, which try to balance engineered solutions with nature-based resilience. A more exhaustive list of all actions, including adaptation actions, may be found in each of the action areas contained in this Climate Change Action Plan.

BACKGROUND AND METHODOLOGY

Ireland has a total population of 4,761,865, of which approximately 1.9 million people live within five kilometres of the coast; within this, 40,000 reside less than 100 metres away from the sea[14]. Ireland has a number of climate challenges, such as coastal flooding, sea level rise, coastal erosion, pluvial flooding, extreme weather events and extreme temperatures. The Dublin Region, being an urban area, has different challenges and risks compared to more rural areas.

Fingal covers an area of 456 km^2, and comprises of 88 km of coastline, which stretches from Howth Head right up to Balbriggan, encompassing villages, recreational areas and valuable protected natural habitats such as the Rogerstown Estuary.

Further in from the coast, the County is characterised by a mix of arable land, grassland, hedgerows, river valleys and urban areas. The major rivers in the County include the Ward River, Delvin River, Broadmeadow River, Sluice River, Mayne River, Tolka River, Santry River, and Liffey River. It is also important to note that there are a number of watercourses, most of which flow directly to the Irish Sea or via estuaries.

According to the most recent Census (2016), Fingal currently has a population of 296,020, with 104,851 households, and these figures are expected to rise in the future. The 2016 Census highlights that by 2031, population in the Greater Dublin Area (GDA) will increase by just over 400,000, and this increase would account for approximately two thirds of the total projected population growth in Ireland[14]. A rise in population will increase the impacts of climate change due to additional pressure on drainage systems that are already working at full capacity. Also, it is estimated that Ireland will need an additional 550,000 more homes by 2040, compared to 2017[4], and this will lead to a decrease in pervious or green surfaces, exacerbating flooding due to enhanced run-off.

As explained in the previous section, this plan follows the ICLEI Five Milestone Approach. As part of the second milestone (Research), information was collected from a range of departments to gather actions in each area, through a series of meetings between Codema and staff from all internal departments of Fingal County Council. There was also a series of collaborative workshops with staff from across all four DLAs. Additional data and information was also gathered from multiple national sources, including the Office of Public Works (OPW), Met Éireann and the Environmental Protection Agency (EPA).

BASELINE

Table 1 on the next page summarises the climatic events recorded by Met Éireann that have occurred in the Dublin Region over the last 32 years. These events were recorded due to their unique intensity and abnormal weather patterns. The effects (see description) of these major events are not purely economic; they also highlight social and environmental impacts and vulnerabilities, as further described in the following sections.

Table 1 Major Climatic Events in Dublin (Source: Met Éireann & Flooding.ie)

TYPE	DATE	DESCRIPTION
Hurricane Charley	August 1986	Pluvial – Worst flooding in Dublin in 100 years.
Pluvial & Strong Winds	February 1990	Heavy rain and consequently flooding, with long periods of strong winds. All weather stations reported gale gusts.
Pluvial/Fluvial	June 1993	100 mm of rain fell in Dublin and Kildare (more than three times the normal amount).
Extreme Temperatures	June - August 1995	Warmest summer on record, with mean air temperatures over two degrees above normal in most places. Temperatures rose to around 30°C on a number of days and night time minimum temperature remained above 15°C for many weeks.
Windstorm	December 1997	Conditions were severe in much of Leinster, especially the south and east. In the Dublin area, there were record gusts of 150 km/h, with maximum 10-minute winds of storm force.
Fluvial	November 2000	250 properties flooded in Dublin, 90.8 mm of rain fell. Significant disruption and damage, especially in the area of the Lower Tolka catchment.
Coastal	February 2002	Second highest tide ever recorded. This caused sea defences to be overtopped. 1,250 properties flooded in Dublin, €60M worth of damage.
Fluvial	November 2002	Similar to the 2000 flood, 80 mm of rain fell in Dublin. This led to high river levels in the River Tolka, which caused extensive flooding along the catchment.
Extreme Temperatures	Summer 2006	Warmest summer on record since 1995.
Pluvial	August - September 2008	76 mm of rain fell at Dublin Airport. Severe flooding in areas, many of which had no previous history of such flooding. Over 150 residential properties were inundated, as well as commercial premises, public buildings, major roadways, etc.
Pluvial	July 2009	This was a 1-in-50-year event. Several areas within the Dublin Region were severely affected.
Extreme Cold	December 2010	It was the coldest of any month at Dublin Airport in 50 years. Casement Aerodrome's temperature plummeted to -15.7°C on Christmas Day, the lowest temperature ever recorded in the Dublin Region.
Pluvial/Fluvial	October 2011	This was between a 1-in-50 and 1-in-100-year event across the majority of Dublin. Properties and roads were flooded, some electricity customers had no power supply in the County.
Coastal	January 2014	The highest tide ever recorded, at 3.014 metres ODM recorded at Alexandra Basin.
Storm Darwin	February 2014	1-in-20-year event, with gusts of 100-110 km/h in Dublin. Considerable damage to housing and other buildings. 8,000 ha of forests damaged. Status: Yellow.
Storm Ophelia	October 2017	First storm to come from a southerly direction, with damaging gusts of 120 to 150 km/h. 100 large trees blown over in the Dublin Region and significant damage to buildings throughout the country. Status: Red
The Beast from the East and Storm Emma	February – March 2018	Met Éireann issued its first Status Red warning for snow on record. Closure of all schools in the country, many businesses affected, water and power restrictions or outages. Status: Red
Extreme Temperatures	Summer 2018	Drier and warmer weather than normal throughout Ireland, with drought conditions in many areas, including Dublin. Temperatures reached 28°C with above average sunshine and heat wave conditions. Water restrictions were in place for the country for the majority of the summer. Status: Yellow
Storms Ali and Bronagh	September 2018	Storm Ali brought widespread, disruptive wind, which led to the delay or cancellation of most flights to and from Dublin Airport. Storm Bronagh passed over the east of Ireland bringing heavy rain. Mean wind speeds between 65-80 km/h and gusts between 110-130 km/h. Status: Orange

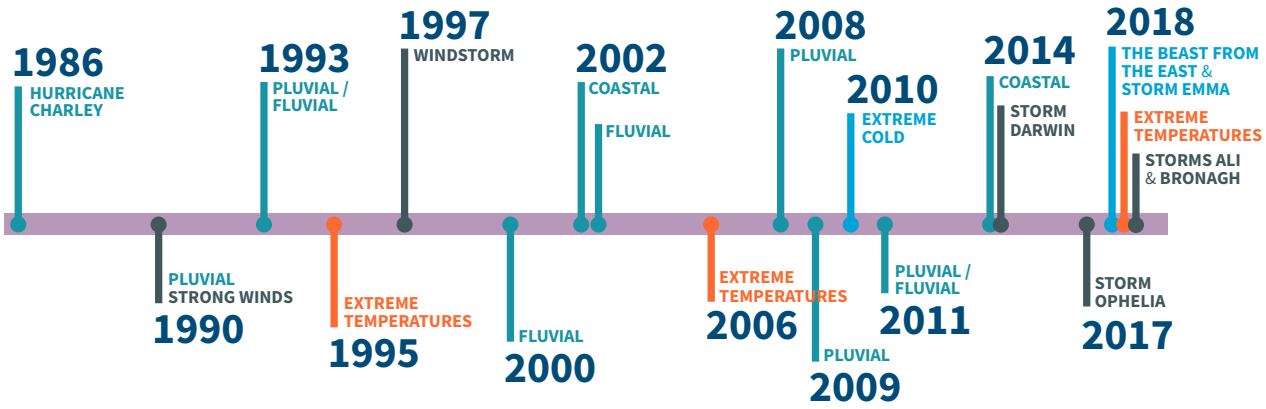


Figure 4 Timeline of Major Climatic Events in Fingal

CLIMATIC EVENTS, TRENDS & RISKS

Fingal's urban and rural geographic and demographic characteristics make it vulnerable to certain risks. As a rural environment, Fingal is home to agriculture, horticulture, equine industries, centres of food production and agri-food businesses. A changing climate can result in an increase in climatic events and will put Fingal's rural environment at risk. Whilst as an urban environment, the Dublin Region creates its own unique micro-climate and this can intensify current and future climate impacts. An example of this is the urban heat island effect, making it warmer than the surrounding semi-urban and rural areas. This is mainly due to heat absorption from built-up areas in the urban environment, waste heat generated from urban activities and a lack of tree cover, which can reduce temperatures in the Fingal area through shading. Flood risks are also higher in urban areas due to the amount of impervious surfaces and lack of vegetation (pervious surfaces); this results in enhanced rainwater run-off, which may result in flooding.

Risks may be categorised as:

1. **Economic loss**, which includes damage to infrastructure and the disruption of daily activities
2. **Social loss**, including damage to human life, health, community and social facilities
3. **Environmental and heritage loss**, which takes into consideration the sensitivity of the environment (the natural, cultural and historical environment), habitats and species.

Risks in urban environments are exacerbated, which means we need to assess the impacts of not only extreme weather and climatic events, but also climatic trends, such as urban flooding, sea level rise and increasing temperatures. These events and trends should not be considered as independent, as they influence each other. The slow, gradual increase in temperatures and sea level rise will contribute to the increased frequency and intensity of extreme weather events and flooding.

Table 2 on the following page shows a 30-year overview of different climate variables (cold snaps, heat waves, storm surges, coastal erosion, etc.), which are grouped into three types of events and trends (extreme weather events, sea level rise and flooding). This table summarises the current effects of the climate change variables, projected changes in the next 30 years, and confidence in these projections.

The climatic events and trends that Fingal is facing are:

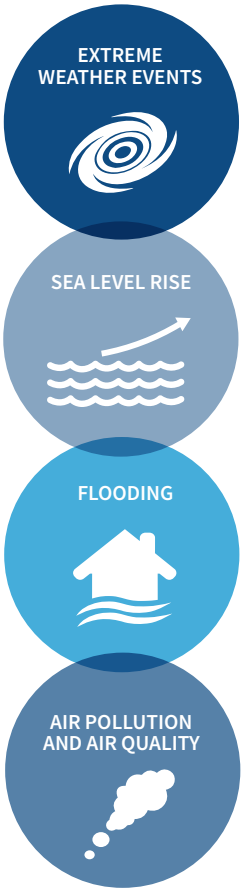
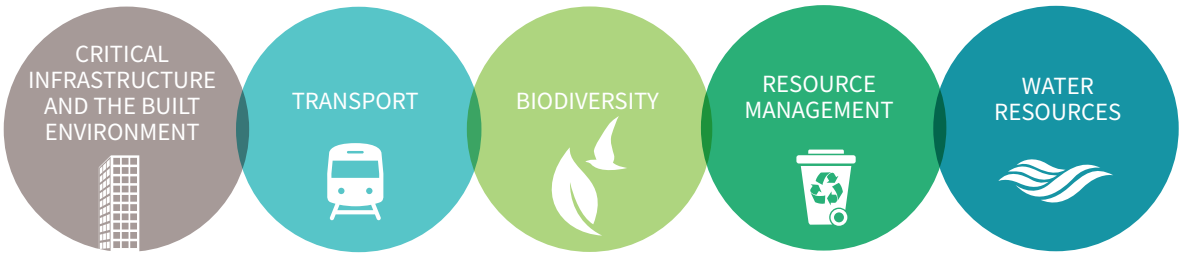


Table 2 Climate Variables Projection: 30 Year Overview

CLIMATIC EVENTS & TRENDS	PARAMETER	OBSERVED	CONFIDENCE	PROJECTED CHANGES
Extreme Weather Events	Cold Snaps	Increasing average air temperatures may result in a decrease in the frequency of cold snaps	Medium	Projections for 2050 indicate an increase in mean annual temperature, in the range of 1-1.6 °C. This will result in milder temperatures and a decrease in the frequency of cold snaps
	Heat Waves	Average air temperatures are increasing and may result in an increase in the frequency and intensity of heat waves	High	Eight heat waves have been recorded in Ireland over the last 30 years (more than 5 days at temperatures exceeding 25°C). Projections for 2050 predict a mean annual temperature increase of 1-1.6°C, which will intensify the temperature and duration of heat waves
	Dry Spells	Precipitation is becoming more seasonal and is likely to cause drier periods in the summertime	High	Ireland as a whole will experience drier summers, with a decrease of up to 20% in summer precipitation under a high emission scenario. This will result in longer periods without rainfall, which will affect water-sensitive regions and sectors
	Extreme Rainfall	The number of days with rainfall greater than 0.2 mm and 10 mm has gradually been increasing	Medium	The frequency of extreme rainfall is expected to keep on increasing over the years, especially in the autumn and winter seasons
	Wind Speeds	Wind speeds are increasing slightly in the winter periods and decreasing over the summer time	Low	Long term trends cannot be determined accurately; although it is anticipated that wind speed will change in a minor way, the frequency of wind storms is expected to increase in the winter periods and decrease in summer
Sea Level Rise	Sea Level Rise	Seas and oceans surrounding Ireland are rising and will keep doing so	High	Future projections indicate a sea level rise of an average of 3-4 mm per year worldwide, but a 6-7 mm rise per year in Dublin Bay was recorded between the years 2000 and 2016
	Wave Height	Sea waves and wave height are determined by wind speed and direction. As wind speeds and wind storms become more frequent, wave heights also increase	Medium	Projected changes in wave heights remain uncertain. However, significant wave heights (the mean height of the highest 1/3 of waves) show an increasing trend of 14 cm per decade
	Tides	Increasing sea levels are resulting in record high tides (greater than 2.9 metres)	High	Sea levels will continue to rise and will result in increased levels of high tides
	Coastal Erosion	Rising sea levels and increasing storm surges are likely to increase coastal erosion	Medium	20% of Ireland's coastline is currently eroding, with the east and south coasts being the most vulnerable
	Storm Surges	Surges can become more frequent as extreme weather events, such as intense rainfall and high wind speeds, become more frequent	Low	The frequency of intense cyclones and strong winds is expected to rise in the north-east Atlantic. By 2050, storm surge heights between 50 and 100 cm are likely to increase in frequency
Flooding	Coastal & Tidal	As both sea level rise and wave heights increase, the frequency of coastal and tidal flooding also increases	High	A rise in both sea levels and wave heights is projected to increase, which will lead to an increase in coastal flooding
	Fluvial	Increased rainfall intensity, high river flows and high tides contribute to an increase in fluvial flooding	High	Projections show both high tides and the intensity of rainfall days are increasing, which, in turn, will result in an increase in fluvial flooding
	Pluvial	Increased rainfall intensity will likely lead to an increase in pluvial flooding	Medium	It is predicted that the probability of flood events occurring will increase and the number of heavy rainfall days per year is also projected to increase, resulting in a greater risk of pluvial flooding

To better understand the impact that future climate risks have on Fingal, five impact areas were identified, which include all the different sectors in the County. These are:



These were chosen to mirror the action areas used throughout this Climate Change Action Plan (Energy and Buildings, Transport, Nature-Based Solutions, Resource Management and Flood Resilience), which reflect FCC's remit.

The influence of future risks on the impact areas was assessed through the use of risk matrices. Risk matrices calculate the overall future risk incurred by the different sectors in Fingal. The projected changes (Table 2) give an overview of the future risk that Fingal is likely to face in the coming years. A future risk may be defined as a product of likelihood and consequence:

Future Risk = Consequence x Likelihood

The consequences of the future risks (the level of damage caused by a climatic event or trend) range from critical to negligible consequences:

The likelihood is the probability of these future risks occurring, and these range from almost certain, likely, possible, unlikely to rare:

Both the likelihood and consequences are given a range of ratings from one to five and the result of their product is the future risk, which can be either high (most urgent to address), medium or low risk:

Consequence	
Critical	5
Major	4
Moderate	3
Minor	2
Negligible	1

x

Likelihood	
Almost Certain	5
Likely	4
Possible	3
Unlikely	2
Rare	1

=

Future Risk	
High Risk	[15-25]
Medium Risk	[7-14]
Low Risk	[1-6]

Risk matrices for different climatic events and trends may be found in the risk section of extreme weather events, sea level rise and flooding. Further analysis about risk matrices and the method by which they are calculated may be found in Appendix I. A more in-depth analysis of these risks and their consequences on the delivery of the local authority's services and functions will be carried out. Future iterations of this Climate Change Action Plan will benefit from this assessment and this information may be gathered through the facilitation of climate change risk workshops for the Dublin Local Authorities.

EXTREME WEATHER EVENTS

The Fingal area has experienced an increase in extreme weather events, and this is evident from the Timeline of Major Climatic Events (illustrated earlier in this chapter in Figure 4). While we cannot attribute all these events to climate change, they are the most evident consequence of climate change.

Their effects are in the form of prolonged periods of extreme cold or heat, which cause snow and heat waves, hurricane gusts due to violent winds, and heavy rainfall resulting in flooding.

Globally, temperatures are increasing and are expected to continue increasing during summer times, with extreme cold spells in the winter months. Meanwhile, average precipitation is expected to decrease during the summer and autumn period, with extreme rainfalls in the winter time. The frequency of extreme wind conditions, particularly during the winter, is also expected to increase.

BASELINE ASSESSMENT

The Dublin Region has experienced extreme weather events within the last 15 years; many of these are summarised in Table 1 earlier in this chapter. In February and March 2018, Dublin experienced its greatest snowfall since the winter of 1982, with depths of up to 55 cm. This was coupled with extreme cold and blizzard-like conditions, as a result of Storm Emma coming from the Atlantic, and the 'Beast from the East', which also impacted most of Europe. Met Éireann issued its first-ever Status Red warning for snow nationwide, which led to severe disruption to the County for a prolonged period. The continuous heavy snowfalls and deep snow drifts resulted in the closure of all schools across the country. Many businesses in Fingal were forced to close, and many homes and businesses also experienced power outages. High demands were placed on the country's water network, with as many as 1.2 million households and businesses in and around Dublin affected by water outages or curtailments in the days after Storm Emma[15].

Dublin's rainfall is also changing; in the last decade, the number of days with rainfall greater than 0.2 mm has been gradually increasing, as are days with over 10 mm of rain. This can be seen in Figure 5 below. Furthermore, data from Met Éireann shows that from 1961-2010, there was a 5% increase in average yearly rainfall[16,17].

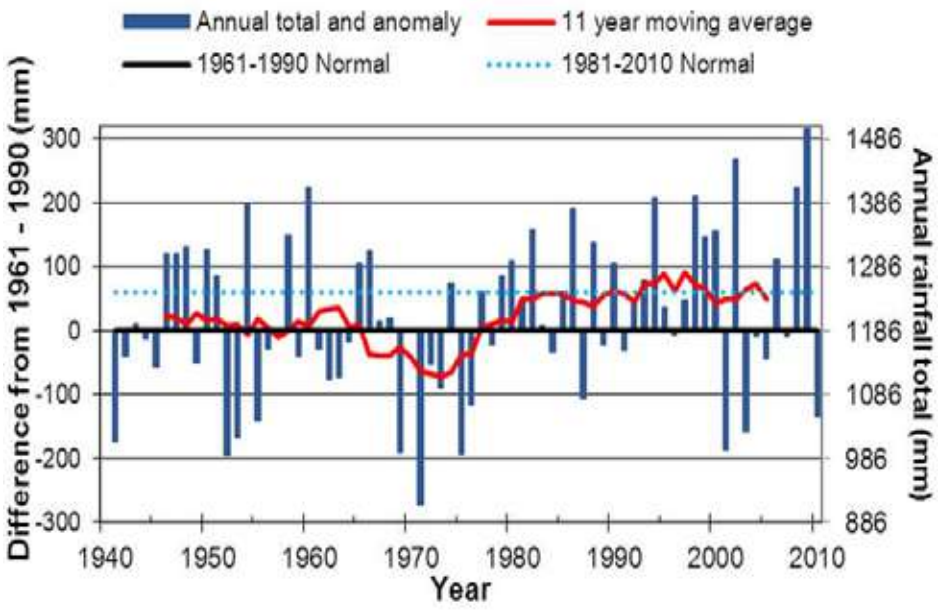


Figure 5 Annual Rainfall (1941-2010) (Source: Met Éireann / Dwyer)

As seen in Figure 6 below, Met Éireann has already identified a 0.5°C increase in temperature, based on available data from 1961-2010, and these temperature rises are set to continue. Based on medium to low emission and high emission scenarios, *"Projections indicate an increase of 1–1.6°C in mean annual temperatures, with the largest increases seen in the east of the country."*[18] This will see new challenges for Fingal in terms of the urban heat island effect and loss of biodiversity. In addition to surface temperature, sea temperature will also increase, having an adverse effect on the marine environment.

Wind is characterised by speed and direction, which allows us to measure the strength and frequency of weather systems as they move across Ireland. Consistent wind speed data is only available for the last 15-20 years, due to changes in measurement equipment and techniques, so long term trends cannot be determined accurately[19].

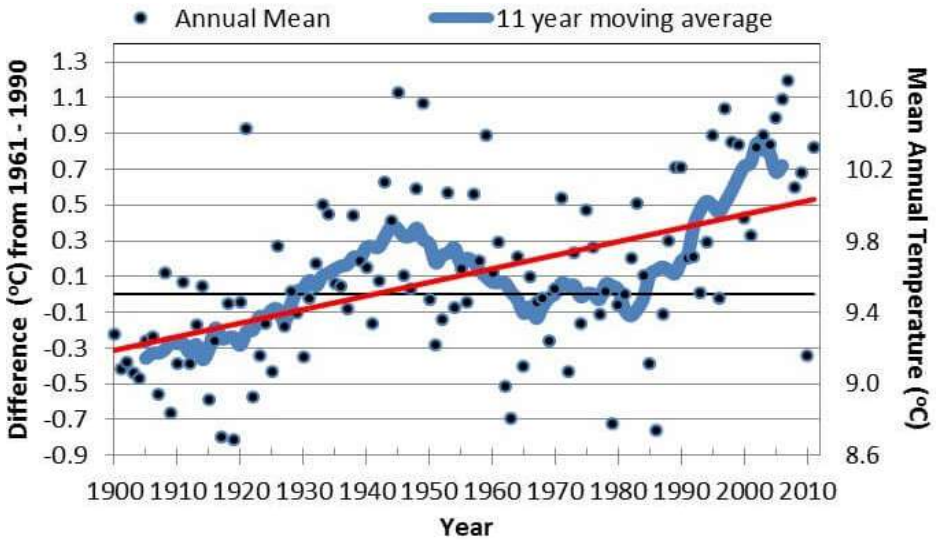


Figure 6 Mean Surface Air Temperature (1900-2011) (Source: Met Éireann / Dwyer)

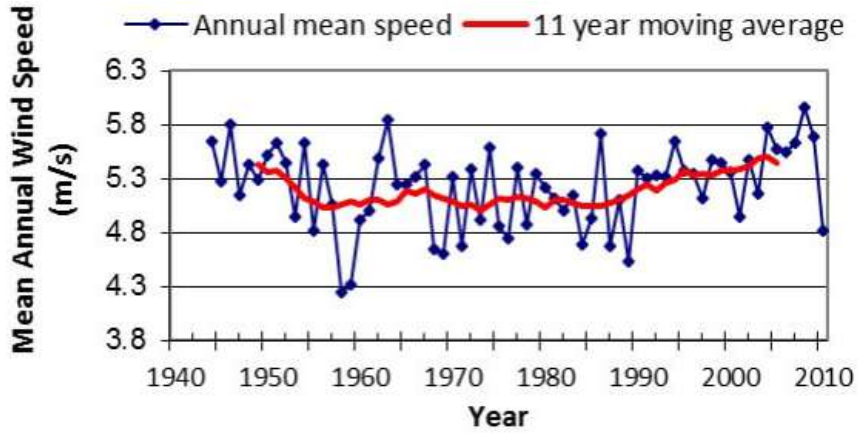


Figure 7 Dublin Airport Wind Trends (1944-2010) (Source: Met Éireann / Dwyer)

EXTREME WEATHER RISKS

Fingal's temperatures are already increasing, and parts of Fingal experience urban heat island effects due to its physical characteristics (e.g. prevalence of concrete buildings retaining heat) and a lack of cooling and shading from natural vegetation. Rising temperatures impact the County's air quality, which degrades as the concentration of pollutants increase. Recently, in the summer of 2018, Ireland experienced extreme temperatures, which caused heat wave and drought conditions, and resulted in a hosepipe ban for most of the summer, due to water shortages throughout the country.

URBAN HEAT ISLANDS
Urban heat islands occur as a result of the high thermal capacity of buildings. Research has shown that built-up urban areas retain heat for longer periods of time than rural areas; consequently, urban areas are often 5 to 10 degrees warmer than rural areas.

As shown in the Timeline of Major Climatic Events (Figure 4), the frequency of extreme cold spells in Ireland has increased, and in the Dublin Region there are additional risks due to these extreme temperatures. Prolonged periods of cold can result in pipes freezing and then bursting when temperatures rise, potentially resulting in flooding and disruptions to water supply, as experienced during Storm Emma, where homes in parts of Fingal such as Rush, Skerries, Lusk and the Naul were left without water.

These extreme weather events pose significant risks to critical assets such as electricity infrastructure. Violent gusts of wind during Storm Ophelia caused damage to power networks, resulting in 385,000 homes and businesses being left without electricity across Ireland. Such strong winds also put Fingal at risk of coastal flooding, due to sea surges caused by both sea level rise and extreme weather. Due to the characteristics of Fingal, prolonged heavy rainfall events typically result in urban flooding, which is mainly caused by a lack of pervious surfaces. Flooding also puts groundwater supplies at risk, as these can be contaminated due to the high infiltration of flood water.

FUTURE RISKS

Met Éireann predicts that Ireland as a whole will experience wetter and milder winters, with a 10-15% increase in rainfall, and drier summers[16,17]. "*Projections suggest average temperatures will continue to increase, with warming across all seasons. A warming climate may cause stresses to vulnerable populations, such as children and the elderly. Areas to the east are expected to see the strongest increase over the coming decades.*"[17] Meanwhile, precipitation projections indicate an increase of up to 20% in heavy rainfalls during the winter and autumn seasons[17].

Although no long-term wind speed trend can be accurately determined, it has been projected that extreme wind speeds will increase during the winter periods[17]. This would greatly affect critical infrastructure such as communication and transportation, which may be disrupted by the violent winds. Also, this increase in extreme wind events, coupled with sea level rise and coastal storms, may lead to increased wave heights and could result in habitat loss and damage, due to coastal and soil erosion.

EXTREME WEATHER ADAPTATION ACTIONS

The aim of compiling extreme weather adaptation actions is to reduce the effects of these events. Some of these adaptation actions are also addressed in other sections (Flooding and Sea Level Rise).

Some of the actions that have been adopted by Fingal County Council include:

- Communication at national and local level with the general public, promoting appropriate behaviour and actions to be taken to limit impacts during extreme weather events
- Emergency planning strategies, continually aligned with extreme weather events
- Monitoring and forecasting of extreme weather events, which include accurate and timely weather-related alerts, real-time time surveillance, evaluating and monitoring
- The use of nature-based solutions (SuDs) to reduce the increased risk from heat waves and flooding
- Energy-efficient buildings to ensure preparedness to extreme temperatures. All new developments in Ireland have to be energy-efficient, and must comply with nearly Zero Energy Building (nZEB) standards after the 31st of December 2020 and public sector bodies must be compliant by the 31st of December 2018 for all new buildings

RISK MATRIX

Table 3 Extreme Weather Events Risk Matrix

IMPACT AREAS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Critical Infrastructure & the Built Environment	Projected increases in temperature, wind speeds, cold snaps and rainfall will put a stress on the built environment, particularly on critical infrastructure (such as electricity and communication networks) and residential developments (with the most vulnerable populations being particularly at risk)	Cold Snaps	4	3	**12**
		Heat Waves	2	4	**8**
		Dry Spells	3	5	**15**
		Extreme Rainfall	4	3	**12**
		Wind Speeds	5	2	**10**
Transport	Increases in wind speeds, cold snaps and rainfall will put a stress on transport networks, which may lead to disruption of transport services during extreme events	Cold Snaps	5	3	**15**
		Heat Waves	2	4	**8**
		Dry Spells	2	5	**10**
		Extreme Rainfall	3	3	**9**
		Wind Speeds	4	2	**8**
Biodiversity	Projected increases in temperature, wind speeds, cold snaps and rainfall will put an increased stress on biodiversity, by causing damage, habitat loss and increasing the prevalence of invasive species	Cold Snaps	5	3	**15**
		Heat Waves	4	4	**16**
		Dry Spells	4	5	**20**
		Extreme Rainfall	3	3	**9**
		Wind Speeds	3	2	**6**
Waste Management	Projected increases in temperature, heat waves and droughts may increase the risk of fires in landfill sites and can also increase the prevalence of vermin and odour	Cold Snaps	2	3	**6**
		Heat Waves	4	4	**16**
		Dry Spells	4	5	**20**
		Extreme Rainfall	5	3	**15**
		Wind Speeds	1	2	**2**
Water Resources	Projected increases in temperature, cold snaps and rainfall will affect flows and quality of water resources. Temperature increases and dry spells will result in a reduction of water resource availability, whilst cold snaps can cause disruption of water services	Cold Snaps	5	3	**15**
		Heat Waves	4	4	**16**
		Dry Spells	5	5	**25**
		Extreme Rainfall	5	3	**15**
		Wind Speeds	1	2	**2**

SEA LEVEL RISE

The rise in sea levels in Ireland is mainly due to climate change, and the seas and oceans surrounding our island are rising at approximately 35 mm per decade[20]. The main cause of sea level rise is an increase in temperatures; as these temperatures increase, our oceans absorb more of this heat and expand. As the oceans become warmer, glaciers and polar ice caps start to melt and cause sea levels to rise.

Coastal flooding is influenced by sea level rise, and since Fingal is a coastal County, rises in sea level and coastal tides would significantly impact the County and its infrastructure. Continual rise of sea levels and the increase in the frequency, magnitude and intensity of coastal storms will further exacerbate existing complications of flooding, coastal erosion and deposition.

Coastal and estuarine flooding are both very much affected by sea level rise. Changes in sea levels will cause the extent of estuaries to increase and thus result in the infiltration of tides further upstream in rivers. This would mean that areas along rivers that are already at risk of flooding will be at increased risk of sea level rise. Rising sea levels also provide a higher base for storm surges, which increase their intensity.

Approximately 20% of Ireland's coastline is eroding[20]. These coasts are particularly more susceptible to erosion, as they are typically made up of unconsolidated sediments, as is the case along the eastern coast (Dublin). Areas at risk in Fingal include Sutton, Baldoyle, Portmarnock, Malahide, Portrane and Skerries.

BASELINE ASSESSMENT

As a coastal County, Fingal is facing rising sea levels. Mean Sea Level (MSL) is the average of all the high and low tides over the course of a year. Over the last 15 years, the Annual Average Sea Level (AASL) in the Dublin Region has been rising faster than initially projected (Figure 8). Data collected by Dublin City Council shows the AASL for the years 2014, 2015 and 2016 were 78, 138 and 114 mm Observed Difference in Mean (ODM) respectively. This compares to values in the period between 2000 and 2004, which were much closer to 0 mm ODM.

The highest tide ever was recorded in Dublin City was on the 3rd of January 2014, reaching 3.014 metres at Malin Head. The second highest tide recorded was on the 1st of February 2002, at 2.950 metres at Malin Head. These were the highest tides recorded for the last 400 years, and possibly longer for Dublin Bay. To reduce vulnerability to sea level rise, a minimum safety of four metres above present sea level in the east coast of Ireland has been recommended by the Royal Irish Academy Irish Committee on Climate Change; this accounts for a rise in sea level of 0.5 metres, a storm surge of 2.95 metres, and a safety margin[21].

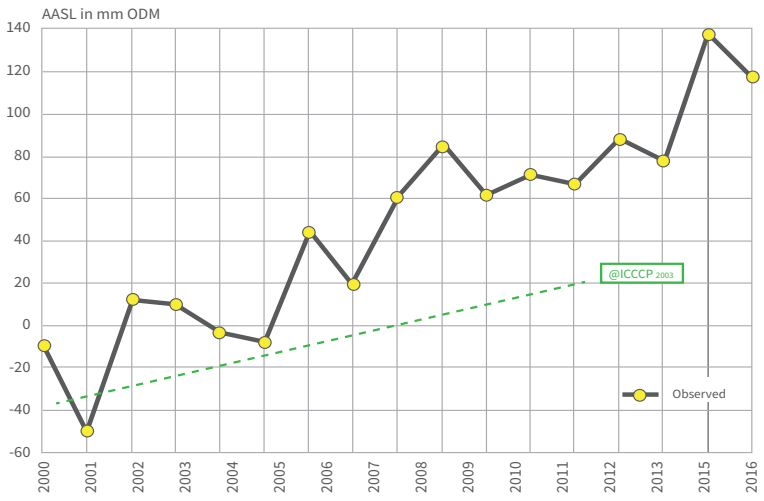


Figure 8 Dublin Annual Average Sea Level 2000-2016 (Source: DCC)

It is important to note that sea level rise, while an important phenomenon to understand for Fingal, is only one element that contributes to flooding issues in the County. It is also important to understand the other elements which, when combined with rising sea levels, contribute to flooding. This includes combinations of extreme tide levels, which are made up of astronomic tides and storm surges (fluctuations in water level due to atmospheric pressure, wind speed, seiches, etc.) and wave action.

SEA LEVEL RISE RISKS

Current risks associated with sea level rise have been published by the OPW, and can be categorised as economic, social and environmental risks. Areas that are particularly at risk from sea level rise in Fingal include Sutton, Baldoyle, Portmarnock, Malahide, Portrane and Skerries. The risks associated with sea level rise in Fingal are:

- **Coastal deposition and damage to existing defences** from increased wave heights at the coastline. This will greatly affect coastal habitats, with estuaries and wetlands particularly vulnerable
- **Changes in coastal morphology**, changes in sea level with an increase in intensity of coastal storms tend to exacerbate coastal erosion and deposition risk
- **Risks to wastewater infrastructure,** sea level rise can result in overflows from combined drainage systems being unable to function, resulting in increased flood risk on land. Also as wastewater treatment plants and sewage pumping stations are often located close to the coast, these facilities are at particular risk
- **Damage to critical infrastructure** and housing from coastal flooding and sea level rise. This results in economic and social risks to the County, especially since housing and major infrastructure are along the coast
- **Increased wave heights and high tides,** producing damage further inland and upstream

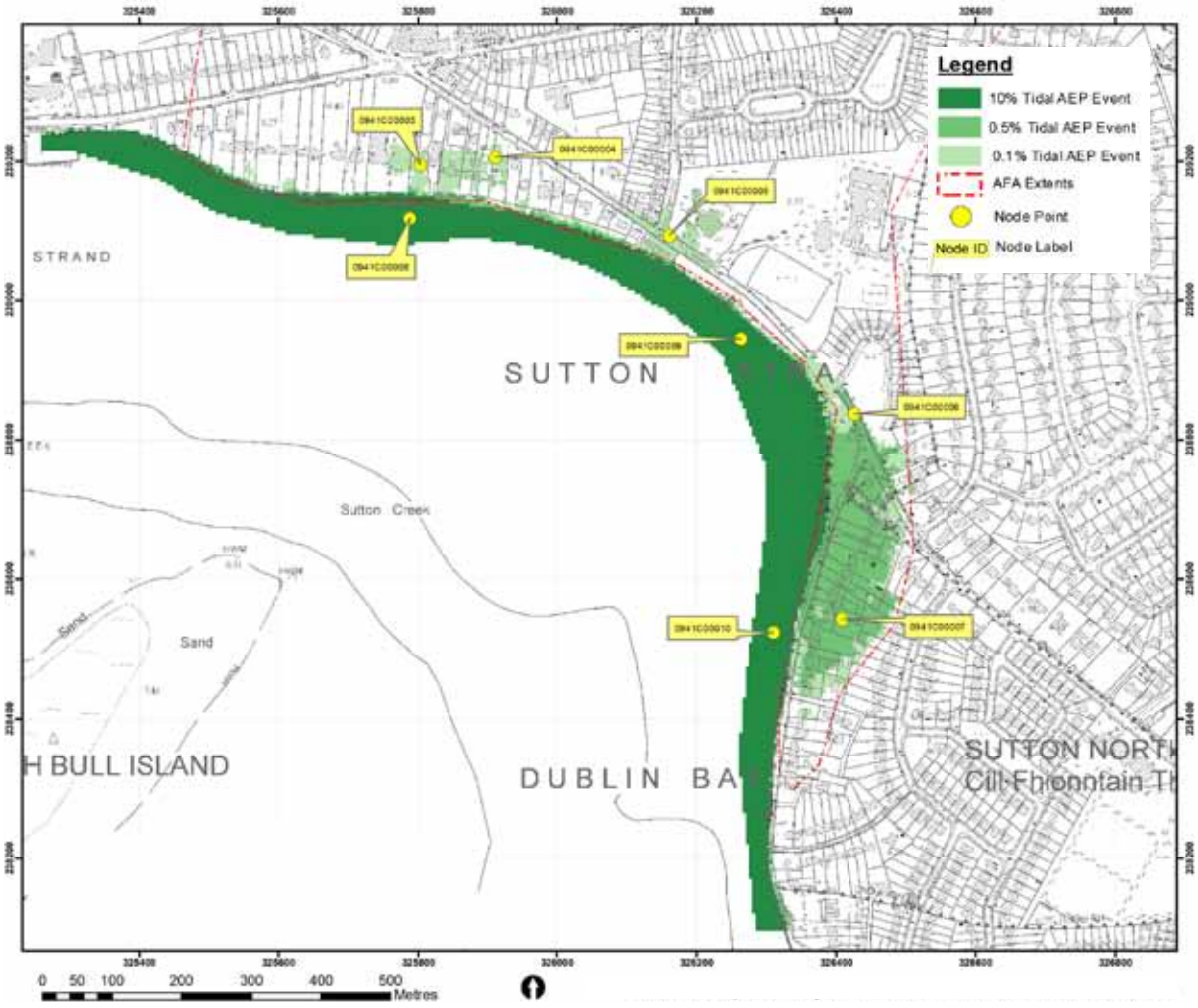


Figure 9 Areas Currently at Risk of Sea Level Rise in Fingal due to Predicted Sea Level Rise (Source: Adapted from OPW/RPS)

FUTURE RISKS

"In terms of relative land vulnerabilities, Dublin, Louth and Wexford are at highest risk. Under a projected sea level rise of 6 m, it is estimated that close to 1,200 km^2 of land area would be at risk."[17] Future projections indicate continued sea level rise will be 3-4 mm per year globally[20], but 6-7 mm per year is the recorded average sea level rise in Dublin Bay for the period between 2000 and 2016. This, coupled with increased wave heights, tides and frequency of coastal storms, means that coastal communities will face increased economic, social and environmental vulnerabilities. At the same time, intense rainfall will also see fluvial influences in the tidal area downstream.

Figure 9 on the previous page highlights some of the areas along Fingal's coastline that are at risk in green; this is an area of economic and environmental importance to the County.

An increase in temperature results in a rise in sea surface temperature, which results in the continual increase in sea level rise. A rise in sea levels also has a knock-on effect for other risks, as it increases the intensity of storm activity and wave action. Models comparing 1900-1961 data show that for the period between 2031-2060, storm surge heights of between 50-100 cm will increase in frequency[17]. This will make Fingal very vulnerable, and would result in increased loss of land, damage to infrastructure and coastal flooding. The amount of rainfall (specifically in the summer) is expected to decrease as a result of climate change, and Fingal (especially the agricultural sector in the County) will become more reliant on groundwater to supply freshwater as a result.

RISK MATRIX

Table 4 Sea Level Rise Risk Matrix

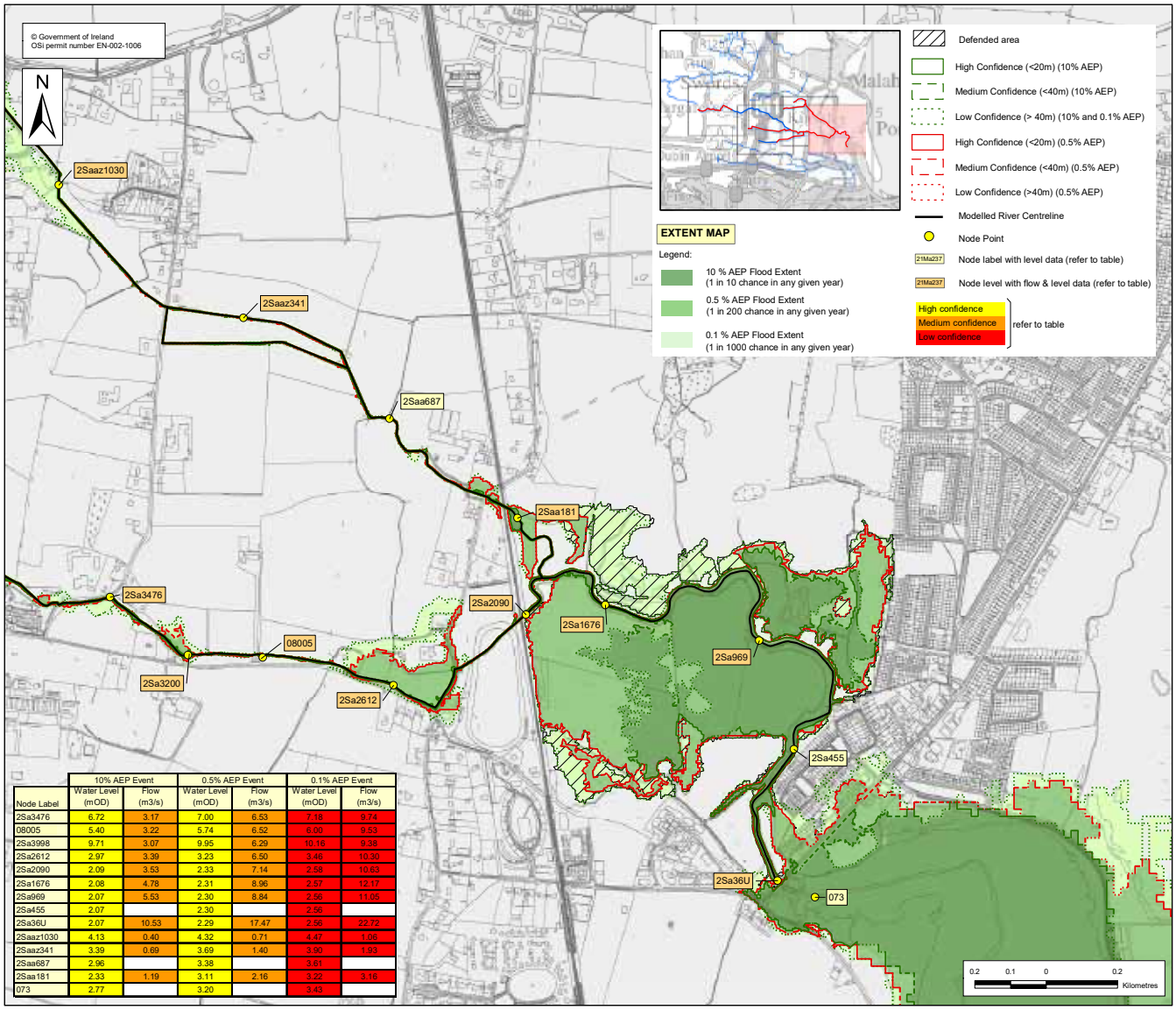
IMPACT AREAS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Critical Infrastructure & the Built Environment	Increases in sea levels and wave overtopping, along with increased occurrence of coastal storms, will put the built environment at risk. This will include residential housing and critical infrastructure, which are typically built along the coast	Sea Level Rise	4	5	**20**
		Wave Height	4	3	**12**
		Tides	4	4	**16**
		Coastal Erosion	3	3	**9**
		Storm Surges	4	2	**8**
Transport	Projected rises in sea level, wave heights and occurrence of coastal storms will put transport services (such as roads and the DART) that are along the coast and close to tidal rivers at increased risk	Sea Level Rise	4	5	**20**
		Wave Height	4	3	**12**
		Tides	3	4	**12**
		Coastal Erosion	3	3	**9**
		Storm Surges	4	2	**8**
Biodiversity	Rising sea levels, wave heights and occurrence of coastal storms will greatly affect coastal habitats, with estuaries and wetlands being particularly at risk	Sea Level Rise	5	5	**25**
		Wave Height	4	3	**12**
		Tides	3	4	**12**
		Coastal Erosion	4	3	**12**
		Storm Surges	4	2	**8**
Waste Management	Increases in sea levels and tides will put pressure on sanitation systems (these are typically situated at low levels) located close to the coast	Sea Level Rise	4	5	**20**
		Wave Height	4	3	**12**
		Tides	4	4	**16**
		Coastal Erosion	2	3	**6**
		Storm Surges	2	2	**4**
Water Resources	Rising sea levels, wave heights and tides put water supply and aquifers at risk. Therefore, sea level rise will need to be constantly managed to avoid flooding	Sea Level Rise	4	5	**20**
		Wave Height	3	3	**9**
		Tides	4	4	**16**
		Coastal Erosion	2	3	**6**
		Storm Surges	3	2	**6**

SEA LEVEL RISE ADAPTATION ACTIONS

The priority of these actions is to reduce and address the current and future effects of sea level rise. Some of the solutions that have been adopted by Fingal County Council include:

- Approaches that reduce coastal flooding and erosion through the addition of artificial sediments, dune rehabilitation and restoration
- Grey solutions, which include infrastructure such as seawalls that protect nearby infrastructure from coastal flooding and sea level rise. Infrastructure for adaptation is designed to best available information and data, and takes into consideration current and projected flood levels
- Restoration of wetland ecosystems along the coast, in order to provide natural protection against flooding and erosion
- Policy and planning regulatory measures including the control and management of new developments in areas at risk. Implementing the OPW Flood Risk Guidelines and recommendations of the OPW flood risk studies, such as the Fingal East Meath Flood Risk Assessment and Management Studies (FEM FRAMS) and Catchment Flood Risk Assessment and Management studies (CFRAMs)

Most rivers in County Dublin are tidal rivers, and as is the case in the river shown below, as sea levels increase, the risk from storm surges (both upstream and downstream) also increases.



Node Label	10% AEP Event Water Level (mOD)	10% AEP Event Flow (m3/s)	0.5% AEP Event Water Level (mOD)	0.5% AEP Event Flow (m3/s)	0.1% AEP Event Water Level (mOD)	0.1% AEP Event Flow (m3/s)
2Sa3476	6.72	3.17	7.00	6.53	7.18	9.74
08005	5.40	3.22	5.74	6.52	6.00	9.53
2Sa3998	9.71	3.07	9.95	6.29	10.16	9.38
2Sa2612	2.97	3.39	3.23	6.50	3.46	10.30
2Sa2090	2.09	3.53	2.33	7.14	2.58	10.63
2Sa1676	2.08	4.78	2.31	8.96	2.57	12.17
2Sa969	2.07	5.53	2.30	8.84	2.56	11.05
2Sa455	2.07		2.30		2.56	
2Sa36U	2.07	10.53	2.29	17.47	2.56	22.72
2Saaz1030	4.13	0.40	4.32	0.71	4.47	1.06
2Saaz341	3.39	0.69	3.69	1.40	3.90	1.93
2Saa687	2.96		3.38		3.61	
2Saa181	2.33	1.19	3.11	2.16	3.22	3.16
073	2.77		3.20		3.43	

Figure 10 Areas Subject to Tidal Flooding in Portmarnock, Fingal (Source: Adapted from OPW/ RPS)

FLOODING

The effects of urbanisation and climate change both impact and increase the risk of flooding. This is the case for Fingal, which has had an increase in urban areas and is also a coastal County that has a complex system of rivers, canals, surface-water sewers, foul sewers and urban watercourses.

Flooding can have multiple causes, including sea level rise, run-off water, heavy rainfall, extreme events, storms and tidal surges. Fingal experiences several types of flooding, including:

- **Coastal and tidal flooding** resulting from storm surges, wave action causing flooding by overtopping flood defences or other extreme weather events that cause sea levels to rise above the norm and force sea water onto land
- **Fluvial flooding** is caused by rainfall (extended or extreme), resulting in rivers exceeding their capacity
- **Network flooding** resulting from urban drainage systems being inundated with water and exceeding their capacity
- **Pluvial flooding** from intense and sudden rainfall running over-ground and exceeding capacity of local drainage systems is a key risk across the whole County
- **Flooding from dam** discharges or breaches

BASELINE ASSESSMENT

As outlined earlier in Table 1, there are very few records of significant flooding events between the years 1986 and 2000. More extreme weather events have been noted between the years 2000 and 2002, and from 2008 onwards, their frequency increased at a significant rate. This can be seen in the Timeline of Major Climatic Events (Figure 4).

It is important to note that flood risks may not be attributed to just one cause and could be due to multiple factors that result in major flooding.

Figure 11 Historic Flooding Risks in Fingal (Source: Fingal Development Plan)

FLOOD RISKS

There are tidal flooding risks along Fingal's coasts, whilst inland there are fluvial risks mainly along the Ward River, Broadmeadow River, Tolka River, Santry River and the River Liffey. These rivers may be seen in Figure 11 on the previous page (circles in blue represent historical flooding locations).

Figure 12 below depicts the likely flooding along the Broadmeadow River.

Flooding risks are further complicated by riparian rights. Some property or land-owners who own land that is adjacent to a watercourse, or has a watercourse running through it, are riparian owners and have certain legal responsibilities to maintain the watercourse.

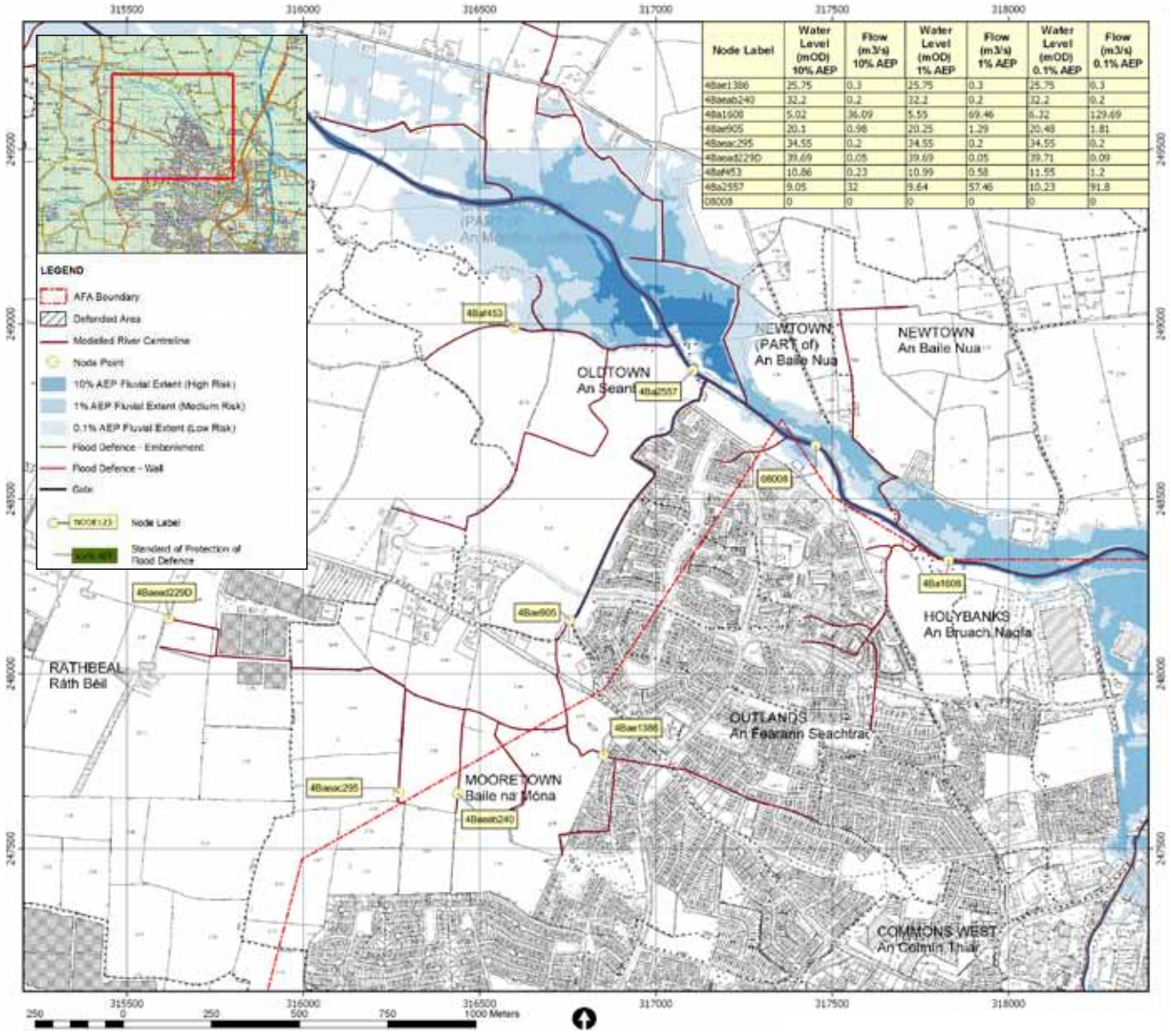


Figure 12 Areas at Risk of Fluvial Flooding - Broadmeadow River (Source: Adapted from OPW)

FUTURE RISKS

With climate change, it is predicted that the probability of flood events occurring will increase. The number of heavy rainfall days per year is also projected to rise, resulting in a greater risk of both fluvial and pluvial flooding.

Figure 13 below depicts a flood risk assessment carried out in Fingal and the Annual Event/Exceedance Probability (AEP) is used; this is the chance of an event occurring in a year, i.e. there is a 1-in-100 chance that a flood will occur.

Future flood risks may be mitigated by urban settlement patterns, land use and the quality of flood forecasting, warning and response systems in place. Fingal is especially vulnerable to future risks, due to the projected population growth over the coming years. This increased risk of flooding will affect Fingal's already vulnerable systems, in terms of increased pressure on water and sanitation systems, and damage to critical infrastructure and property.

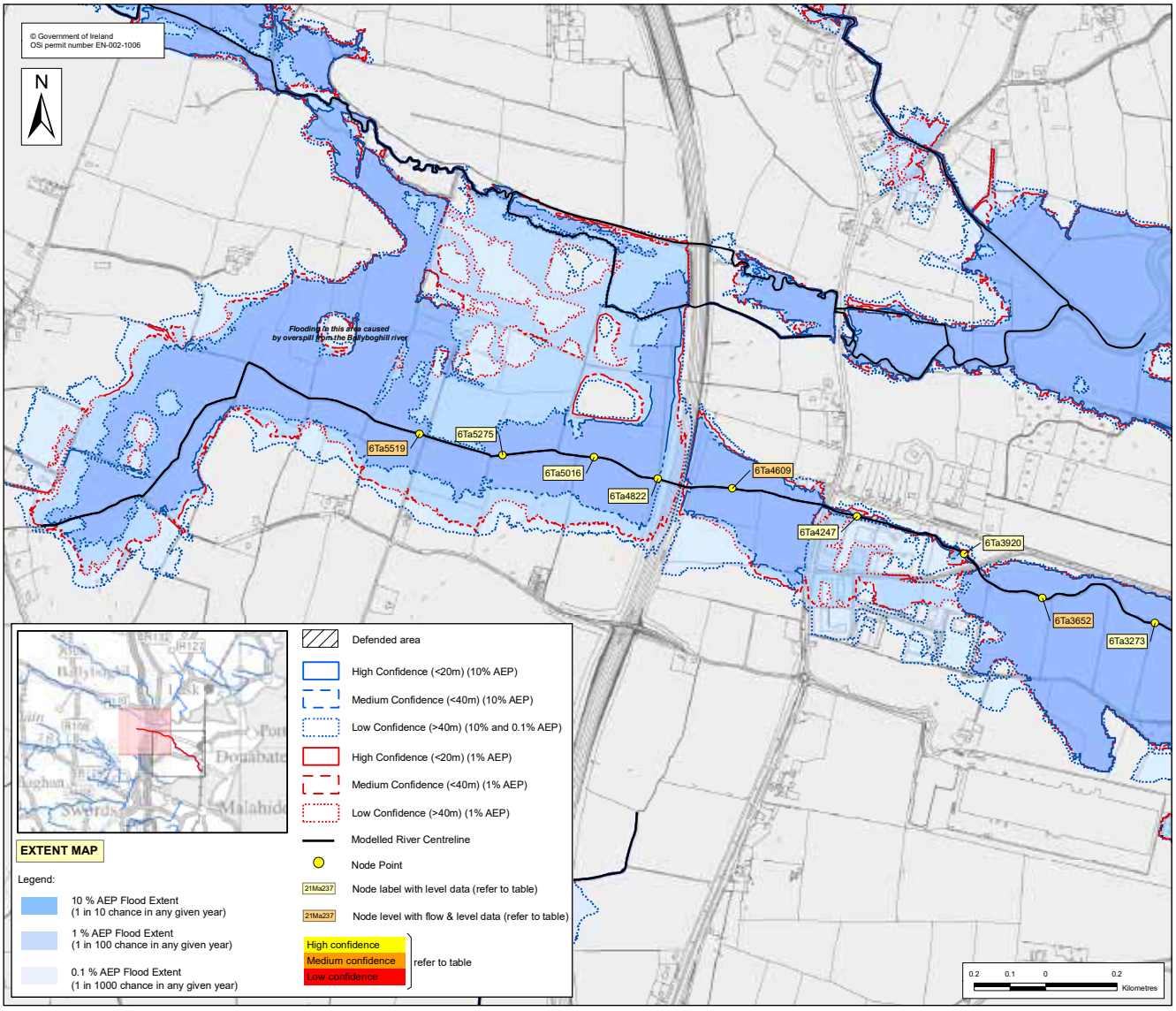


Figure 13 Flooding Extents in Donabate (Source: Adapted from OPW/Harlow Barry)

RISK MATRIX

Table 5 Flooding Risk Matrix

IMPACT AREAS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Critical Infrastructure & the Built Environment	Coastal, fluvial and pluvial flooding will put additional stress and risk on the built environment. This additional risk will cause all areas in the built environment to suffer (businesses, residential, critical infrastructure, etc.)	Coastal & Tidal	5	5	**25**
		Fluvial	5	5	**25**
		Pluvial	4	4	**16**
Transport	Increases in coastal, fluvial and pluvial flooding will cause road damage, which can lead to disruptions to all transport services	Coastal & Tidal	5	5	**25**
		Fluvial	5	5	**25**
		Pluvial	4	4	**16**
Biodiversity	Increasing extreme flood events can cause loss of habitats and damage to ecosystems	Coastal & Tidal	4	5	**20**
		Fluvial	3	5	**15**
		Pluvial	2	4	**8**
Waste Management	Flooding of landfill sites increases the risk of surface and groundwater contamination	Coastal & Tidal	4	5	**20**
		Fluvial	3	5	**15**
		Pluvial	4	4	**16**
Water Resources	Increases in flooding incidents put more pressure on water systems, which are typically located at the lowest elevation possible and are therefore at a greater risk of flooding	Coastal & Tidal	5	5	**25**
		Fluvial	4	5	**20**
		Pluvial	4	4	**16**

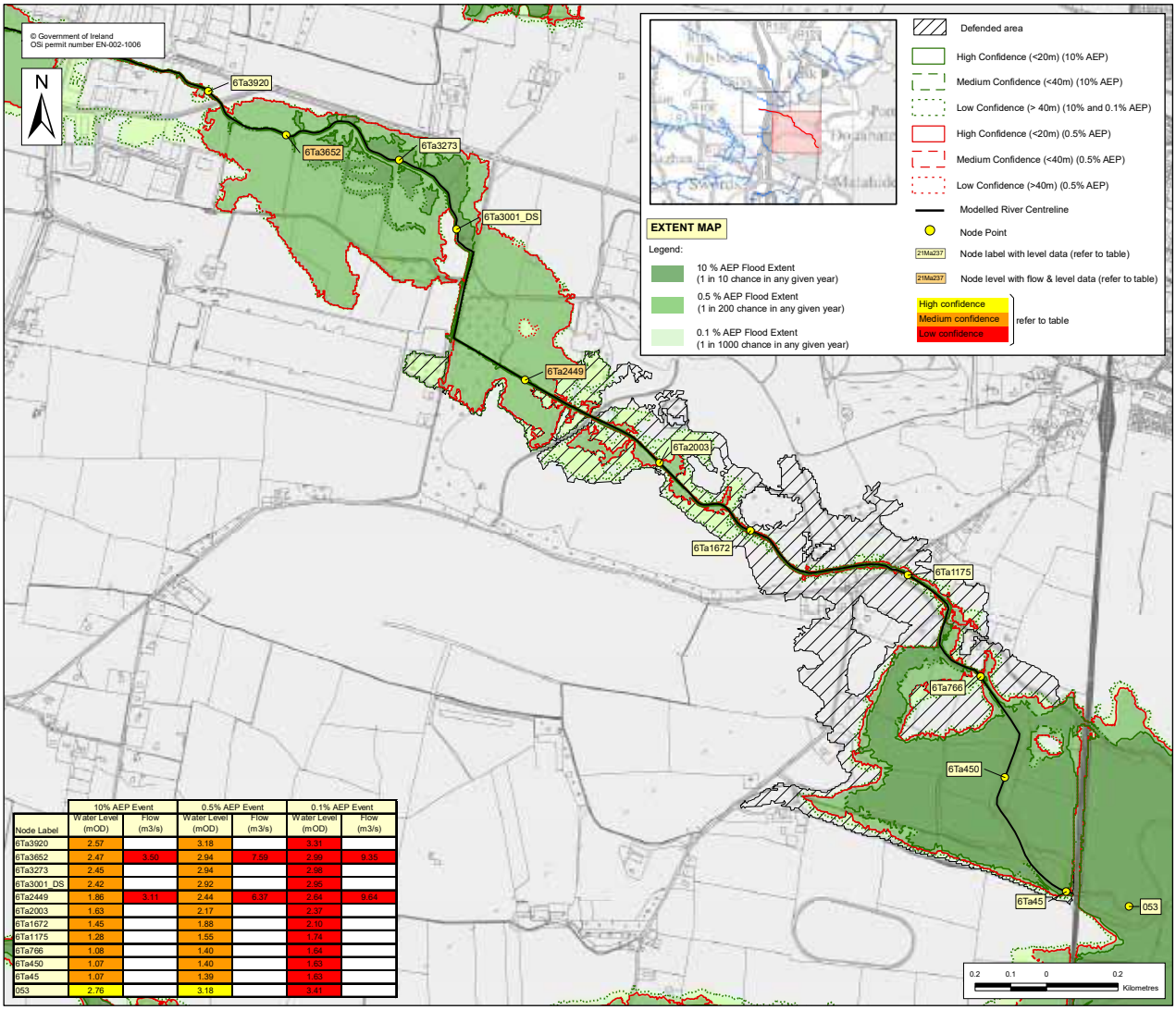
FLOODING ADAPTATION ACTIONS

The purpose of flooding adaptation actions is to reduce the effect of flooding events, and they should tackle both current and future risks from flooding. The objectives of flood adaptation actions are:

1. **Economic** – ensure that expenditure for flood risk management is based on cost benefit analysis
2. **Social** – reduce risk to life and health, while protecting key infrastructure and ensuring that there is no increased risk to other areas
3. **Environmental and heritage** – protect, and enhance if possible, biodiversity and cultural heritage

Fingal has maintained flood resilience through the use of spatial planning and infrastructure projects with a preference given to nature-based solutions. Some of these adaptive measures include:

- **Community and business flood resilience measures** – such as flood forecasting and monitoring systems to forecast coastal surges
- **Site-specific measures** – this may involve using existing natural landscapes or existing infrastructure to reduce flooding. Examples of this are raised property floor levels and limited development in the area
- **Generic measures** – such as Sustainable urban Drainage Systems (SuDS), which is mandatory for all new developments. If SuDS cannot be provided for at the site, then there must be alternative means of reducing run-off. To reduce flood risks in new developments, the *Greater Dublin Strategic Drainage Study* states that no new development is permitted within 10-15 metres on either side of watercourses, planning applications must include a surcharge risk assessment and drainage systems must be isolated from basements
- **Flood management** - the use of *The Planning System and Flood Risk Management Guidelines* from the Office of Public Works (OPW), as a measure for flood management and adaptation. These guidelines are to be properly implemented and included in any development, planning and flood mitigation/adaptation measures



Node Label	10% AEP Event		0.5% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
6Ta3920	2.57		3.18		3.31	
6Ta3652	2.47	3.50	2.94	7.59	2.99	9.35
6Ta3273	2.45		2.94		2.98	
6Ta3001_DS	2.42		2.92		2.95	
6Ta2449	1.86	3.11	2.44	6.37	2.64	9.64
6Ta2003	1.63		2.17		2.37	
6Ta1672	1.45		1.88		2.10	
6Ta1175	1.28		1.55		1.74	
6Ta766	1.08		1.40		1.64	
6Ta450	1.07		1.40		1.63	
6Ta45	1.07		1.39		1.63	
053	2.76		3.18		3.41	

Figure 14 Location of the Defended Areas in Donabate (Source: Adapted from OPW/Harlow Barry)

AIR POLLUTION AND AIR QUALITY

Air quality is a measurement of the concentration of specific pollutants harmful to human health. Changes in climate, especially increases in temperature, will impact the concentration of pollutants in the air; as temperatures increase, so too will the concentration of pollutants[24]. This is also the case with the changing strength and frequency of high wind speeds due to climate change, which may cause pollutant dispersion and could potentially affect a larger area and population.

Air quality policy focuses on the reduction of pollutants, both greenhouse gases (GHGs) and the more immediate, harmful particulates and dioxins. Reducing the concentration of GHGs (i.e. mitigation) means lessening or eliminating the use of carbon-based fuels and moving to renewable sources of energy and carbon absorption by vegetation[22,23,24].

BASELINE ASSESSMENT

Presently, the air quality in the Dublin Region is good, with levels of nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM_{10} and $PM_{2.5}$) all within acceptable levels, according to European Union (EU) guidance. New guidance from the World Health Organisation (WHO) concentrates on the health implications of air quality (even air quality that is within the acceptable levels) and how to mitigate against this. In order to ensure robust, localised mitigation for health issues, accurate data is needed on the air quality of a region. There are currently 13 active air quality monitoring stations located across Dublin; however, they do not monitor all GHGs and particulate matter at each station. In recognition of the need for more robust data, Dublin City Council is currently working with the EPA to collect data on air quality for the entire Dublin Region under the new national Ambient Air Quality Monitoring Programme (AAMP). The use of sensors to collect localised, accessible, real-time data will assist in the development of policy to address air quality and pollutants, such as the *National Clean Air Strategy*, which is to be released in 2019.

AIR POLLUTION AND AIR QUALITY RISKS

Air pollutants depend greatly on the climate and characteristics of the area. Dublin's emissions from the transport sector, construction industry and the burning of waste and emissions from industrial activities, all make the County vulnerable to pollutants.

Air pollution and air quality risks mainly relate to health and risks to ecosystems. Vulnerable citizens (children, pregnant women, the elderly and those of ill health) are the most likely to be at risk. The risk to health may include worsening respiratory issues and a reduction in lifespan. Meanwhile, ground level poor air quality may put food production (e.g. crops) at risk. Excessive pollutants may result in acid rain from air pollution and eutrophication, which is caused by pollutants being distributed to plants and rivers from run-off water.

This is also exacerbated by prolonged increases in air temperatures. Air quality monitors on the national ambient air quality monitoring network detected elevated ozone concentrations during the summer 2018 heat wave, with increased levels of ground level air pollution.

FUTURE RISKS

Existing risks may be further exacerbated in the future, especially with a projected population growth. As the County's population grows, so does the need for transportation and transport networks, energy, waste disposal and housing. Any new technologies (biomass, etc.) introduced to tackle climate change will need to be assessed for impacts on air quality.

Emissions of air pollutants, particularly PM_{10} and NO_X (nitrogen oxide), from road traffic, remain the biggest threat to air quality in urban areas[25]. Even though the new standards for car emissions have resulted in cleaner fuels and reduced emissions, Ireland has still seen an increase in both the number of cars and their engine sizes. Also, there has been a shift to diesel engines in recent years, which are lower in CO_2 but are higher in particulate matter.

The Dublin Region has had an increase in construction and development over recent years, and construction is projected to grow with the increased demand for housing from a growing population. As construction and demolition in Fingal increases, so do airborne emissions and dust particles, which further aggravate health issues in the population.

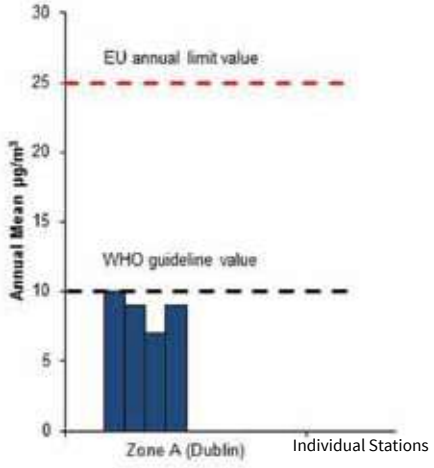


Figure 15 Annual Mean $PM_{2.5}$ (Fine Particulate Matter) Concentrations at Individual Stations in 2016 (Source: EPA)

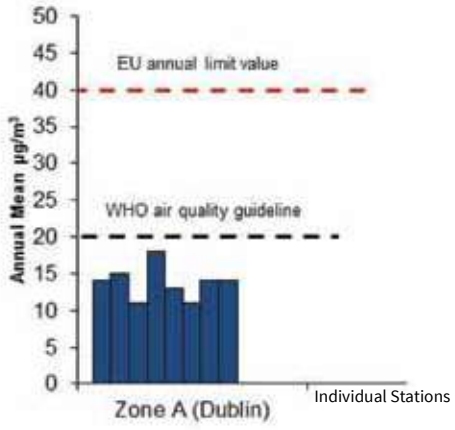


Figure 16 Annual Mean PM_{10} (Particulate Matter) Concentrations at Individual Stations in 2016 (Source: EPA)

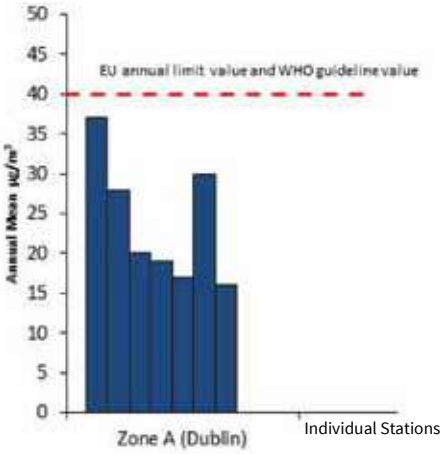


Figure 17 Annual mean NO_2 (Nitrogen Dioxide) Concentrations at Individual Monitoring Stations in 2016 (Source: EPA)

AIR POLLUTION AND AIR QUALITY ADAPTATION ACTIONS

Air pollution and air quality adaptation actions aim to reduce and monitor the effects from air pollution. This is done through policy and legislation to regulate pollutants generated from different energy sectors in Fingal. The two sectors that impact most on air quality are home heating and transport. A shift from the burning of solid fuel to cleaner, more energy efficient methods of home heating and a move away from the use of private diesel and petrol powered motor cars to alternative modes of transport such as walking, cycling and electric vehicles will result in cleaner air and a healthier environment for citizens. This is especially important in our at-risk urban environments. To incentivise and complement these behavioural changes in the public, it is imperative that Ireland adopts policy solutions that can marry the twin issues of ambient air quality and climate change mitigation. The government's National Clean Air Strategy, which is due for publication, should point the way forward in terms of policy solutions for Ireland in this regard.

Actions adopted by Fingal County Council include:

- Effective enforcement controls - *The Air Pollution Act 1987* to regulate and monitor illegal burning, excessive emissions from industry and dust emissions from the construction industry
- Transport policies to reduce pollutants. This includes the provision of cycle routes, a restriction on heavy goods vehicles and the expansion of Quality Bus Corridors (QBCs)
- Control of development whilst giving preference to high density occupancy developments that are close to public transport routes and amenities
- Environmental Impact Assessment (EIA) and Statements required for large developments that apply for planning permission. EIAs should provide details of impacts that the development will have on air quality
- Reviewing and updating of emission inventories, urban air quality modelling and ambient air quality monitoring

EMERGENCY RESPONSE PLANNING

The adaptation baseline has shown that extreme weather events due to a changing climate are increasing in both frequency and intensity, and can pose a risk to citizens and infrastructure. This highlights the need for emergency planning, with plans that are continually updated in line with these extreme weather events. The Major Emergency Management (MEM) Framework sets out the working relationship between the various agencies that make up the front line emergency response. The MEM Framework defines a major emergency as:

"Any event which, usually with little or no warning, causes or threatens death or injury, serious disruption of essential services or damage to property, the environment or infrastructure beyond the normal capabilities of the principal emergency services in the area in which the event occurs, and requires the activation of specific additional procedures and the mobilisation of additional resources to ensure an effective, co-ordinated response"[26].

The MEM Framework enables Principal Response Agencies (PRAs), which are made up of An Garda Síochána, the Health Service Executive and local authorities, to prepare and make a coordinated response to major emergencies. Small-scale events are dealt with by Principal Emergency Services (PES), which include An Garda Síochána, the Ambulance Service, the Fire Service and the Irish Coast Guard. Defence Forces, voluntary emergency services, transport companies and affected communities can support PRAs by managing major emergencies.

Figure 18 below shows the national, regional and local structures that have been set up to support the development of the Framework.

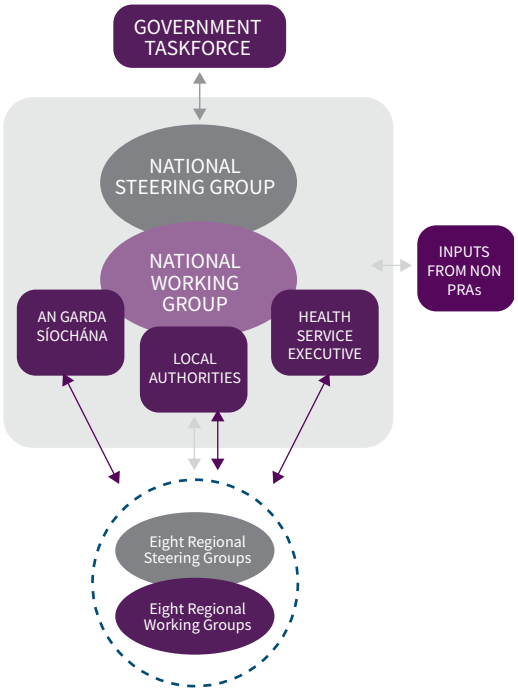


Figure 18 Structures for Implementation (Source: Major Emergency Management Framework)

EMERGENCY RESPONSE AT A LOCAL AND REGIONAL LEVEL

Fingal County Council is part of the Major Emergency East Region, and is a Principal Response Agency (PRA). The Dublin Fire Brigade is its Principal Emergency Service (PES) and Dublin City Council administers the Dublin Fire Brigade on behalf of Dún Laoghaire-Rathdown County Council, Fingal County Council and South Dublin County Council.

The *Major Emergency Plan of Fingal County Council 2011*[27] includes an ongoing emergency programme that involves hazard analysis and risk assessment, response planning, recovery planning and involvement in inter-agency training, exercises and regional forums.

Each Council department undertakes an appraisal of their current procedures and operational plans, to ensure compatibility with the major emergency planning documents.

When a major emergency is declared, senior management within the local authority, An Garda Síochána and the Health Service Executive establish a local coordinating group. Key roles in this group include a controller of operations, an on-site coordinator and FCC's Crisis Management Team (CMT).

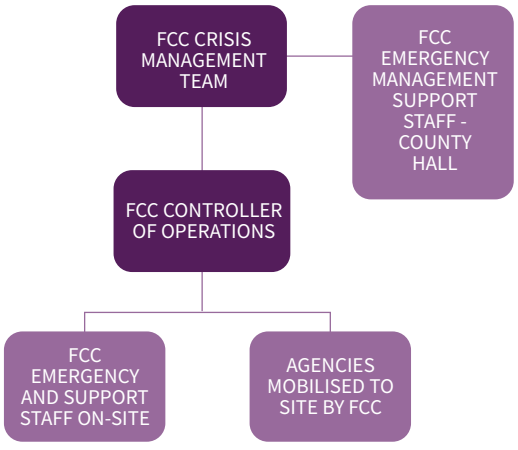


Figure 19 Local Authority Control of Resources (Source: Major Emergency Plan of Fingal County Council 2011)

The CMT is a strategic level management team within FCC and reports directly to the Chief Executive. The CMT is assembled during a major emergency, and is responsible for the following:

- Manage, control and coordinate FCC's overall response to the major emergency
- Provide support to FCC's Controller of Operations on site and gain resources from FCC or externally
- Liaise with relevant government departments on strategic issues
- Ensure participation of FCC in the inter-agency coordination structures

EMERGENCY RESPONSE SERVICES & RESOURCES

The Dublin Fire Brigade provides the primary response to emergencies in the County. FCC supports this response by providing, amongst others, the following functions:

- Coordinating the delivery of services from all Council departments
- Making buildings such as leisure and community centres available to people displaced by the emergency
- Providing a volunteer Civil Defence organisation
- Providing advice and assistance with clean up after major flooding or pollution
- Assessing structural damage to buildings
- Coordinating and leading multi-agency meetings to plan community recovery

The Dublin Fire Brigade coordinates meetings, activities, training and support for the FCC Crisis Management Team, including carrying out a review of the Major Emergency Plan and Severe Weather Plans.

SUB-PLANS FOR RESPONDING TO SEVERE WEATHER & FLOOD EMERGENCIES

Severe Weather Plans are a sub-plan of the Emergency Plan, and can be activated in preparation, response to or recovery of a major emergency. Severe weather emergencies may pose significant threats to the areas within the local authorities' boundary, so therefore they are the lead agency for coordinating the response to severe weather events in their area. Met Éireann issues public service severe weather warnings to FCC, with the target time for issuing a warning being 24 hours before the start of the event, or up to 48 hours in advance when confidence is high.

FCC has set measures to receive and respond promptly to public service severe weather warnings issued by Met Éireann. FCC's response to flood events is led by the Operations Department and Water Services Department (on behalf of Irish Water).

MITIGATION BASELINE

FINGAL COUNTY COUNCIL'S ENERGY USE & EMISSIONS

Fingal County Council (FCC) is responsible for the energy use and emissions from its buildings and facilities, its public lighting, and also from its vehicle fleet. The information from the Sustainable Energy Authority of Ireland's (SEAI's) Monitoring and Reporting (M&R) database shows that FCC consumed a total of 56.5 gigawatt hours (GWh) of primary energy in 2017. The energy database also shows that FCC improved its energy performance by 30.3% between the baseline year (which is an average of between 2006 - 2008) and 2017, which represented a cumulative absolute saving of 12 GWh of primary energy during the same period. This highlights a gap-to-target of 2.7%, meaning that FCC must improve its energy performance by a further 2.7% between now and 2020, in order to meet its 33% energy reduction target.

The Council's public lighting was the highest energy consumer, accounting for 51% of the Council's overall primary energy consumption. Buildings and facilities were the second highest energy consumer, accounting for 38% of the total energy consumption, while the municipal fleet accounted for 11% of the total energy use.

As a signatory to the Covenant of Mayors for Climate and Energy, FCC is committed to reducing its own emissions by 40% by 2030, compared to the baseline year.

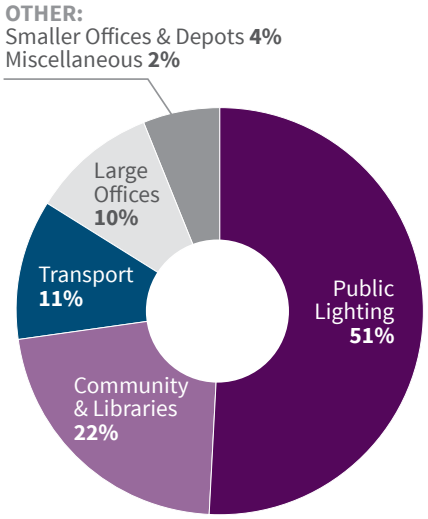


Figure 20 Significant Energy Users

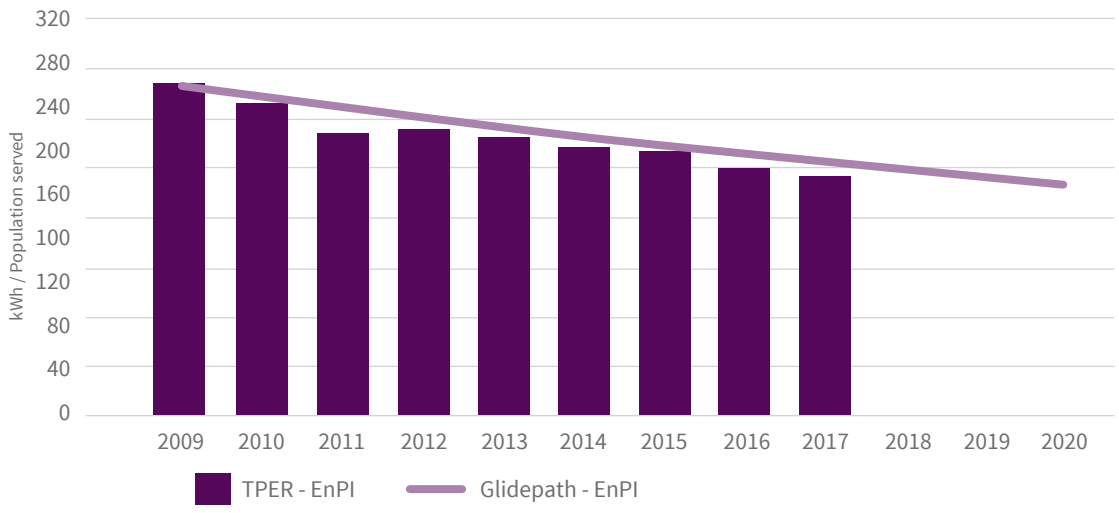


Figure 21 FCC's Annual Energy Performance Compared to the 33% Glidepath

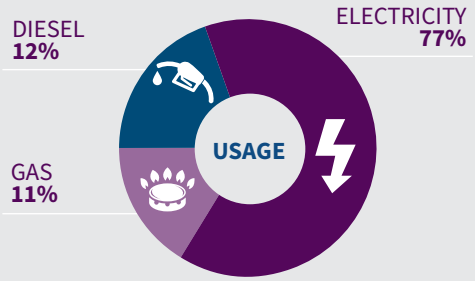
FCC EMISSIONS OVERVIEW

TOTAL EMISSIONS PRODUCED BY FCC IN 2017

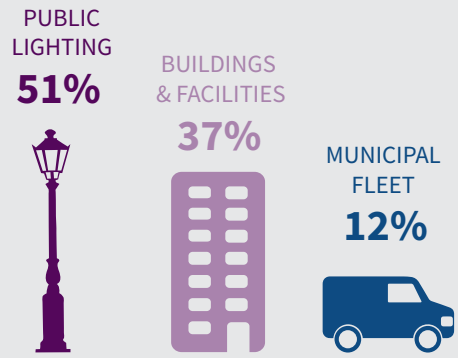
12,620

TONNES OF CO_2

FCC'S EMISSIONS PER FUEL TYPE



FCC'S EMISSIONS PER CATEGORY



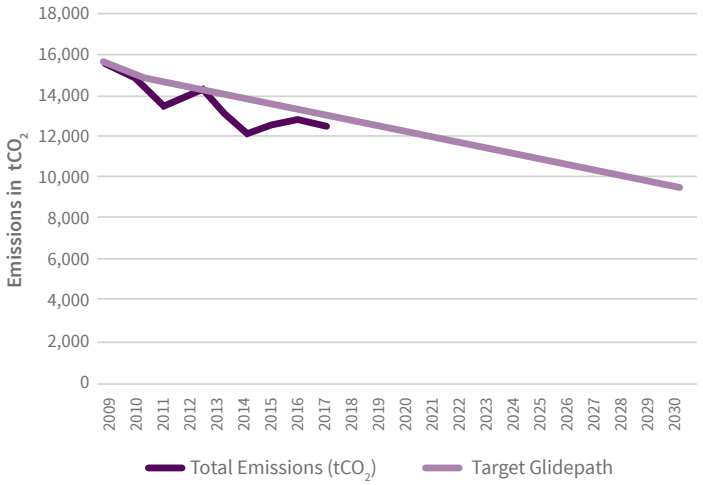


Figure 22 FCC's Emissions 2009-2017, with Projected Glide Path to the 40% Reduction Target by 2030

Figure 22 above shows FCC's emissions between 2009 to 2017, with a projected glide path to the 40% reduction target by 2030. This shows that FCC's emissions decreased from 15,570 tonnes of CO_2 in 2009 to 12,620 tonnes of CO_2 in 2017. This means that FCC is now 3,280 tonnes of CO_2 (21%) away from the 40% emission reduction target by 2030.

Public lighting was the highest contributor, accounting for 51% of the total emissions. This was followed by buildings and facilities, and the municipal fleet, each contributing 37% and 12% to the Council's emissions, respectively.

In 2017, 77% of the Council's emissions came from electricity; this was mainly due to the large amount of electricity used in public lighting and in the Council's buildings and facilities. Natural gas contributed 11% to emissions, the majority of which was used for space heating in Council buildings and facilities. Diesel, which made up the majority of the energy used for the vehicle fleet, contributed 12% to the total emissions.

FINGAL COUNTY COUNCIL'S SOCIAL HOUSING

Fingal County Council is responsible for the allocation, maintenance and refurbishment of its social housing stock, but not for the day-to-day energy use of its tenants. However, the Council can take steps to reduce these emissions, through energy efficiency upgrades.

The most recently-available information for FCC's social housing is based on the Council's social housing data for 2016 and SEAI's Building Energy Rating (BER) Research Tool. A BER is a certificate of energy efficiency of a property. Properties that achieve an 'A1' rating are the most energy efficient, while properties with a 'G' rating are the least efficient.

Figure 23 below shows the estimated BERs for all the total social housing stock in Fingal. It can be seen that the most common rating was C2, which made up 28% of the total social housing stock in the County. 75% of the housing stock was rated C3 or better, which reflects the retrofitting work already carried out by FCC to upgrade the less efficient social housing stock. The majority of the higher A and B ratings were made up of newer built housing.

The social housing stock in Fingal is an ageing housing stock, and as a result, newly built or refurbished dwellings would generally perform better. In 2016, there were no A1 or A2 ratings in the social housing sector in Fingal. Similarly, data gathered from SEAI's BER Research Tool did not contain any A1 or A2 dwellings for 2016, so these are not reflected in the charts. Very few buildings (less than 1%) were found to be F and G-rated.

SOCIAL HOUSING EMISSIONS OVERVIEW

TOTAL EMISSIONS FROM SOCIAL HOUSING SECTOR IN 2016

15,070 tCO_2

75%
RATED C3 OR BETTER

75% OF SOCIAL HOUSING STOCK IN FINGAL WAS RATED **C3 OR BETTER**, WITH 'C2' BEING THE MOST COMMON BER TYPE

73%
OF EMISSIONS CAME FROM NATURAL GAS

FOLLOWED BY ELECTRICITY AT 24%, WHICH SHOWS THE MAJORITY OF EMISSIONS CAME FROM THE NEED TO **MEET HEATING REQUIREMENTS**

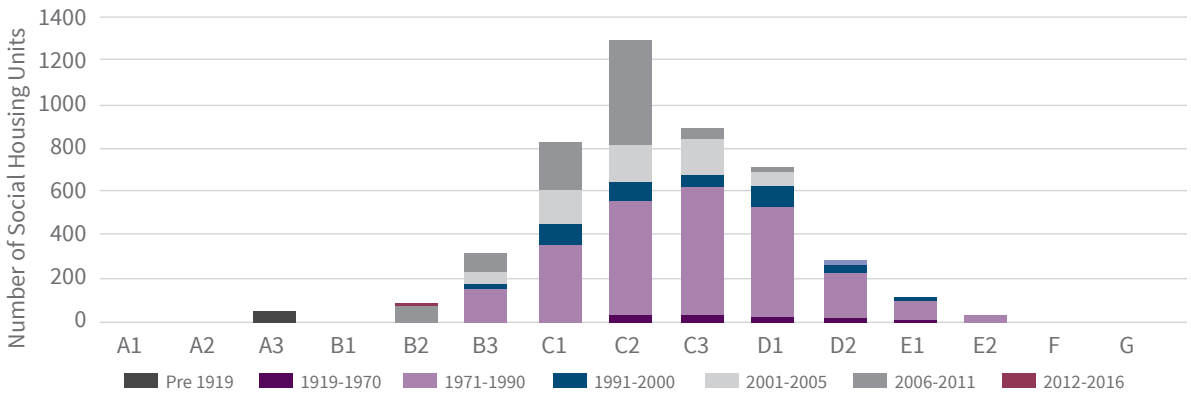


Figure 23 FCC's Social Housing Units by Construction Period and BER Rating, as in 2016

TOTAL FINGAL COUNTY EMISSIONS

The most recently-available information for total emissions in the entire Fingal area is based on Census 2016 data. Therefore, using this data, Codema was able to calculate that the total emissions for the Fingal area amounted to 1,976,230 tonnes of CO_2 equivalent in 2016. The sectors that produced the most emissions were the transport, residential and commercial sectors, accounting for 44.6%, 26% and 24.5% of the total emissions, respectively. Fingal County Council's emissions amounted to only 0.6% of the total County emissions, with social housing contributing another 0.8%. This highlights the need for collaboration and action from all stakeholders to tackle the remaining 98.6% of emissions from public and private sector sources in the County.

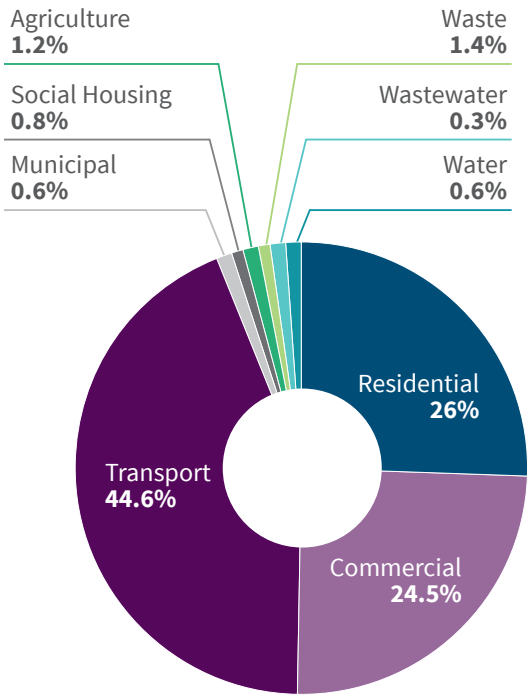


Figure 24 Total GHG Emissions for Fingal County per Sector

Further information

For further information and a more detailed analysis of the GHG emissions of Fingal County Council and the region, please refer to Appendix I of this document, or read Codema's *Fingal Baseline Emissions Report 2016* at www.codema.ie/publications

Photo Source: Wikimedia Commons / Bjørn Christian Tørrissen

MILESTONE 3 – PLAN

Having established the current situation of Fingal's emissions, vulnerabilities to climate change related risk and possible future impacts, the next stage was to formulate actions to reduce these risks. The knowledge gathered through one-to-one interviews, research and the first workshop was continued through a second workshop to refine actions and follow up input from staff. This was also an opportunity for the four Dublin Local Authorities to swap knowledge and establish regional groups in the various action areas. This section lays out the actions that FCC will undertake to achieve this plan's objectives.

GATHERING ACTIONS & DEVELOPING INDICATORS

The actions have been organised into the following areas - Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions, and Resource Management - reflecting FCC's remit and with the aim of fostering greater collaboration across departments within the Council.

FCC understands that it has a role to play in reducing emissions and creating climate resilience outside its remit, both as a signatory to the Covenant of Mayors for Climate and Energy and contributing to national targets. It will take a role as a climate leader, pursuing new solutions or work practices that can be replicated by citizens, businesses or other public bodies. In order to increase awareness and acceptance of the climate change risks, FCC will inform citizens through actions with which the Council are raising awareness of climate issues and solutions or facilitating projects undertaken by citizens and businesses towards climate resilience.

Figure 25 Visualising the Action Plan

ACTION AREAS:

ENERGY & BUILDINGS

TRANSPORT

FLOOD RESILIENCE

NATURE-BASED SOLUTIONS

RESOURCE MANAGEMENT

ENERGY & BUILDINGS

Photo Source: Fingal County Council

OVERVIEW

50.1 GWh
consumed in 2017

=

11,095
tonnes CO_2

TARGET

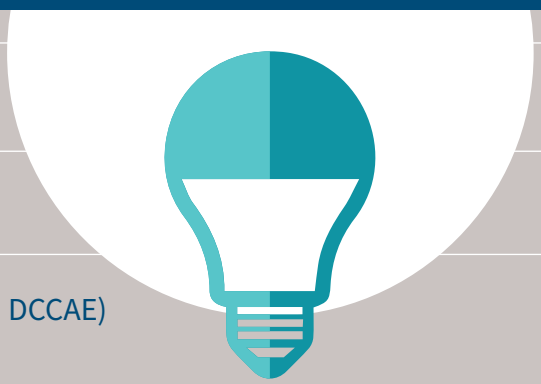
33%
IMPROVEMENT IN ENERGY EFFICIENCY BY 2020

40%
REDUCTION IN COUNCIL'S GHG EMISSIONS BY 2030

EXAMPLES OF MAIN ACTION TYPES

- Energy Master Plan for the Dublin Region
- Converting all public lighting to LEDs by 2021
- Display Energy Certificates for public buildings
- All new Council buildings built to nZEB standard
- Home Energy Saving Kits in all FCC libraries
- Upgrades in buildings using Energy Performance Contracts

STAKEHOLDERS TO WORK WITH AND INFLUENCE



- PRIVATE BUSINESSES
- PRIVATE CITIZENS
- GOVERNMENT DEPARTMENTS (e.g. DCCAE)
- SEAI
- ENERGY SUPPLIERS
- DEVELOPERS

Despite a reduction in energy consumption in recent times, Ireland still spends a significant amount of money on energy imports. International, EU and national policies all work for a rapid transition to a much more energy-efficient society relying on sustainable renewable energy sources. This transition also leads to increased use of and demand for indigenous resources and increased security of supply. Therefore, consideration and commitment to policies, which create energy efficiencies and further the development of indigenous resources, is crucial over the lifetime of the [County Development] Plan. - Fingal Development Plan 2017-2023

In 2017, Fingal County Council consumed 50.1 GWh of primary energy across its buildings and operations (excluding transport), which amounted to 11,095 tonnes of CO_2. The actions outlined in this section show how, through better energy master-planning, improvements in building energy efficiency, and the use of renewables and innovation, FCC will reduce the emissions from its operations and service delivery. As FCC is not responsible for the upgrading of private buildings in the Fingal area, it will provide information on how the Council has retrofitted social housing and Council-owned buildings, and how it has deployed renewable energy systems. FCC is also helping citizens reduce their energy use by making Home Energy Saving Kits available in all of its public libraries.

ENERGY PLANNING

Currently, analyses of energy use and related emissions are carried out at a national level and are used to develop strategic national level energy policies. However, local level energy planning allows for the identification of low-carbon solutions that are specifically designed to the distinct energy characteristics of the region examined.

Codema produced the *Fingal Spatial Energy Demand Analysis* (SEDA) in 2016 to better understand the current and future energy demand and local energy resources of the area, within a spatial context. Its methodology allowed for 'energy character areas' to be defined, i.e. areas with distinct types of energy needs, consumption patterns and fuel types used. These needs were then matched to the best available technical solution incorporating renewable resources and energy-efficient solutions. This will now be built-upon with the creation of an energy master plan for the whole of Dublin (see case study below).

CASE STUDY

Photo Source: Fáilte Ireland / Brian Morrison

The Dublin Region Energy Master Plan

Building on the Spatial Energy Demand Analyses (SEDAs) that were developed for the four Dublin Local Authorities, the Dublin Region Energy Master Plan will create evidence-based, realistic, and costed pathways for the Dublin Region to achieve its carbon emissions reduction targets to 2030 and 2050. The scenario analyses will include all areas of energy use in the Dublin Region, and will be evaluated based on the socio, economic and environmental impacts. The resulting scenarios will give local authority and regional level planners, architects, engineers and other policy-makers the tools to create effective low carbon policies and make strategic decisions to influence the use of energy in Dublin. This master plan will be created by Codema and will be funded for over two years through SEAI's Research, Development and Demonstration (RD&D) programme. It will focus on the energy areas where actions can be taken to introduce energy efficiency measures and reduce CO_2 emissions, such as district energy systems and renewable energy technologies.

The key objectives of advancing evidence-based climate change policy at the local level are:

- To develop a closer link between European and national climate change policy and spatial planning policy for both climate change mitigation and adaptation
- To base climate change policies and objectives on a robust spatial understanding of the existing and future energy profiles across sectors at a local authority scale
- To promote the generation and supply of low-carbon and renewable energy alternatives, having regard to the opportunities offered by the settlement hierarchy of local authority areas, the variety of land uses present, and the built environment
- To stimulate the development of a more evidence-based regional methodology for spatial mapping of future climate risks and vulnerabilities and climate change adaptation policy development
- To educate local authorities, public and private sector organisations and climate stakeholders on measures and responses that are most relevant at the local level
- To encourage greater local authority involvement and leadership in the roll-out of climate change projects in partnership with other stakeholders
- To inform and support the EU Covenant of Mayors for Climate and Energy initiative, a key aim of which is to act 'together towards sustainable, climate-resilient and vibrant cities'

ENERGY EFFICIENCY AND RENEWABLES

FCC will lead in renewable energy uptake and energy efficiency through retrofits of its buildings and social housing stock. Presently, FCC has several ongoing programmes to replace boilers, update lighting, improve insulation, upgrade windows and doors, and install solar photovoltaic (PV) panels in FCC owned buildings.

Annual Energy Reviews

Codema has produced Energy Reviews for FCC for 2016 and 2017. The aim of these Energy Reviews is to help the Council in its energy planning programmes, in order to meet the public sector 2020 energy targets. The Energy Reviews show a breakdown of FCC's energy use for these years, highlighting where energy was used, what drove its consumption, and where the greatest energy savings can be achieved. This data allows Codema to develop a specific list of energy-saving recommendations, which will guide FCC on how best to tackle their Significant Energy Users (SEUs) and meet public sector energy targets.

Codema will continue to produce these annual Energy Reviews, in order to guide the Council on the best action to take to meet the 2020 target.

Photo Source: Fáilte Ireland / Rob Durston

CASE STUDY

Community Centres and Libraries
In 2017, the Community Department commissioned conditioning reports of 16 older community centres ranging in size from converted, small domestic buildings to larger sport centres. The reports focused on a review of the mechanical and electrical services within these facilities and highlighted issues such as old heating systems and boilers and inefficient lighting systems across many of these buildings.

The Community Department has prioritised many of these issues and has asked the Architects Department to look at how the works may be undertaken. A current budget of €1.5 million has been allocated to begin addressing these issues in the community centres from 2018 onwards. From analysis of the energy consumption within these buildings, 0.6 GWh of primary energy and 289 tonnes of CO_2 could be saved by upgrading these facilities, and will reduce the energy consumption within this area by a further 12%.

Display Energy Certificates (DECs)

The information from Codema's energy database and energy surveys is used to prepare Display Energy Certificates for FCC's public buildings with a floor area greater than 250m^2, as required under the Regulation S.I. 243 of 2012. Codema assisted FCC with the annual inspection and certification of 15 public buildings in 2018.

This information was entered into the SEAI system and Codema issued certificates to the managers of all of these FCC buildings, along with information on how much energy would need to be saved in the following year to improve their energy rating. Each building manager also received a copy of Codema's *Guide to Display Energy Certificates in Local Authority Buildings* to accompany these certificates and encourage direct action.

Energy Efficiency Programme of Works

Fingal County Council is continually upgrading its social housing units. These deep retrofits include measures such as insulation, lighting, water conservation, window and door replacement, and solar PV installations, in estates across Fingal County, such as Cappaghfinn, Moyne Park and Racecourse Common.

Through FCC's upgrade programme, many units have been refurbished, resulting in significant energy and cost savings and improved comfort levels for residents. The programme is set to continue over the next few years.

Public Lighting

As it accounts for 51% of Fingal County Council's overall energy use, public lighting is key to the Council achieving its 2020 energy efficiency target.

Within the Council's stock of public lighting, there is currently 9,366 SOX lamps. The manufacture of these SOX lamps is in the process of being phased out, so these will have to be replaced, and LED lights, with their very high energy efficiency, are the obvious replacement.

By replacing 1,000 SOX lamps and 1,000 SON lamps by 2020, FCC can achieve savings of 1.8 GWh of primary energy and 850 tonnes of CO_2 per year. This would have a significant impact on the Council's 2020 targets. In addition, an ongoing programme to replace the remaining street lighting with LEDs by 2021 is also planned.

CASE STUDY

Energy Performance Contracting
FCC, in partnership with Codema, is currently developing an Energy Performance Contract (EPC) as an innovative way of improving the energy use and efficiency of its buildings.

An EPC is a contractual agreement by an Energy Service Company (ESCo) to guarantee energy savings over an agreed period of time.

Following a detailed assessment, a project involving FCC's headquarters at County Hall in Swords and the Civic Offices, Draíocht Arts Centre and public library in Blanchardstown has been deemed suitable for an EPC and can now advance to the procurement stage.

Photo Source: Fingal County Council

RESEARCH AND INNOVATION

To maximise the benefits of advances in technology, FCC is part of the Smart Dublin programme to engage with academia, the private sector and citizens to co-create solutions to the challenges facing the Dublin Region.

The Smart Dublin programme was established in 2016 to enable the four Dublin Local Authorities to collaboratively take advantage of some of the big tech trends that are transforming how we live and work. In partnership with Enterprise Ireland, Smart Dublin runs Small Business Innovation Research (SBIR) competitions, which challenge smart technology providers, researchers and citizens to come up with solutions that will improve the operation and resilience of the Dublin Region. To date, €750,000 in funding has been awarded to small businesses to develop solutions in areas such as cycling, wayfinding, illegal dumping and flooding.

Phase 2 of the SBIR competition was launched in April 2018, and has a further €800,000 in funding to develop solutions for areas such as bathing water quality, staff workplace mobility and last mile delivery in urban centres.

ENERGY AWARENESS

A key aspect of reducing energy use is public awareness, as retrofits, technology and innovation can only achieve a portion of FCC's goals. FCC, in partnership with Codema, is actively engaging with staff and citizens about energy, from the benefits of renewables to providing tips on small steps that can be taken to reduce energy use and save money on their bills.

Through Engineer's Week and the Green Schools Programme, FCC engineers are also actively engaging with students about energy projects and the work being undertaken to transition Dublin to a low carbon society. FCC hopes to build on these programmes and expand its engagement with the public, for example through the Public Participation Networks (PPNs).

CASE STUDY

Home Energy Saving Kits

FCC, in partnership with Codema, is actively encouraging citizens to become more energy-aware by making Home Energy Saving Kits available for the public to borrow from all of its public libraries. The kits contain six tools for householders to assess how energy-efficient their homes are, and to identify areas for improvement. The scheme is the first of its kind in Ireland, and has had great success, garnering awards and recognition both nationally and at an EU level.

Codema has also made a kit available for staff in Fingal's County Hall to trial. FCC and Codema will continue to work together to build on this initiative over the coming years, and energy-saving information will continue to be made available by the Council through its public libraries.

ENERGY & BUILDINGS

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
ENERGY PLANNING					
1	Create Energy Master Plan for the Dublin Region	2018 onwards	Codema	Website with e-Map	GHG
2	Prepare Fingal Sustainable Energy and Climate Action Plan	2019	Codema	SECAP complete	GHG
3	Prepare Local Authority Renewable Energy Strategy	2019	Planning & Strategic Infrastructure	Strategy prepared	GHG
4	Outputs and recommendations from the *Fingal Spatial Energy Demand Analysis (SEDA) 2016* to inform the review of the *Fingal Development Plan 2017-2023*	2020	Planning & Strategic Infrastructure	Content in Development Plan review	GHG
ENERGY EFFICIENCY & RENEWABLES					
5	Complete the roll out of LED public lighting by 2021 (27,000 units remaining)	2018-2021	Operations	100% of lighting converted to LED by 2021	GHG
6	Fingal Energy Management Team established	2018 onwards	Operations	Team established	GHG
7	Develop ISO 50001 compliant energy management system	Ongoing	Facilities Management, Codema	System developed and ISO 50001 compliant	GHG
8	Comply with S.I. 426 under the EU (Energy Efficiency) Regulations 2014	Ongoing	Facilities Management, Codema	Compliant	
9	Procure upgrades through an Energy Performance Contract for County Hall (Swords) and Civic Offices, Draíocht Arts Centre and public library in Blanchardstown	2019	Facilities Management	EPC awarded, measurement and verification of energy savings	GHG
10	Participate in the SEAI Energy Public Partnership Programme	2018 onwards	Facilities Management	Signed up to programme	
11	Annual Monitoring & Reporting to SEAI	Ongoing	Codema	FCC's energy use monitored and reported	GHG
12	Publish Fingal County Council's Energy Review annually	Ongoing	Codema	Review published, # of recommendations implemented	GHG
13	Display Energy Certificates for public buildings	Ongoing	Codema	# of DECs generated for public buildings	GHG

ENERGY & BUILDINGS

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
14	All new Council buildings built to nZEB standard	Ongoing	Housing, Facilities	All new builds nZEB standard	GHG
15	Refurbishment programme for Fingal Corporate buildings to include energy reviews and retrofits as standard	2018 onwards	All departments / Architects	# of buildings upgraded	GHG
16	Boiler replacement programme in social housing stock underway	2018 onwards	Housing	150 boilers upgraded annually	GHG
17	Insulation of all Council owned social housing stock; extended to include acquisitions and long term leasing where feasible	2019	Housing	All Council owned social housing insulated by 2019	GHG
18	LED lighting changeover of social housing voids and tenant changeover	Ongoing	Housing	100% of all voids and re-lets upgraded	GHG
19	Complete single glazing replacement programme in social housing stock and extend to include long term leases and acquisitions	2019	Housing	All single glazing replaced by 2019	GHG
20	Conduct a pilot to deep retrofit social housing voids to inform potential for roll out for all stock	2019	Housing	Pilot underway	GHG
21	Automatic shutdown of computers and lighting in all of Fingal's offices and depots	Ongoing	I.T., Facilities	# of systems installed	GHG
RESEARCH & INNOVATION					
22	Study potential for viable district heating projects within Fingal	2019-2021	Codema / Climate Action	Study complete	GHG
23	Study potential for viable renewable energy projects on a temporary/permanent basis, on Council controlled lands	2019-2021	Climate Action/ Economics & Tourism	Study complete	GHG
24	Work with SMEs in partnership with SEAI to promote energy efficient adaptations	Ongoing	LEO / EETD	# of SMEs availing of funding from SEAI	GHG
25	Engage with SEAI to help develop education programme for SME sector	Ongoing	LEO / SEAI	# of programmes developed/delivered	GHG
26	Support Small Business Innovation & Research (SBIR) programme	Ongoing	Smart Dublin / Enterprise Ireland	Energy and climate change challenges identified for SBIR programme	GHG
27	Work with CARO / Codema on research and project proposals for grant funding	2019 onwards	Climate Action / CARO / Codema	# of research projects initiated	GHG

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ENERGY AWARENESS					
28	Monitor and develop the Home Energy Saving Kits scheme in Fingal Libraries	Ongoing	Fingal Libraries, Codema	Borrowing rates from libraries	
29	Annual energy awareness event	2019	Climate Action / Codema	Annual event held	
30	Promote and support SEAI's Better Energy Communities and Sustainable Energy Communities	2019 onwards	Climate Action / All Depts	# of communities supported	
31	Develop and encourage CPD training in energy awareness amongst Fingal staff	Ongoing	All Depts / Architects	Ongoing programme	
32	Expand tenant induction programme to include tenant energy awareness	2019	Housing / Architects	100% of tenants provided with energy saving tips	
ACTIONS AWAITING BUDGET					
33	*Install high visibility PV panels on suitable Council roofs such as libraries and community buildings*	*2020*	*Facilities Management*	*Panels installed*	

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Technical Guidance Document L – Conservation of Fuel and Energy – Dwellings 2017
- Technical Guidance Document L – Conservation of Fuel and Energy - Buildings other than Dwellings 2017
- Climate Action and Low Carbon Development Act 2015
- Energy Act 2016
- Energy Efficiency Directive (Article 14)
- Fingal Development Plan 2017-2023 (Objectives EN06; LP01; PM02; PM12; PM28; PM30)
- Fingal Local Economic and Community Plan (LECP) 2016-2021 (Actions A85; A91; A 92; A102)
- Fingal Sustainable Energy Demand Analysis (SEDA)
- Ireland's National Renewable Energy Action Plan (NREAP) - Energy White Paper
- National Energy Efficiency Action Plan (NEEAP)
- Support Scheme for Renewable Heat
- S.I. No. 243/2012 - European Union (Energy Performance of Buildings)
- S.I. No. 426/2014 - European Union (Energy Efficiency) Regulations

TRANSPORT

Photo Source: William Murphy / Flickr

OVERVIEW

6.4 GWh

CONSUMED IN 2017 = **1,530** TONNES OF CO_2

230

VEHICLES IN COUNCIL FLEET

TARGET

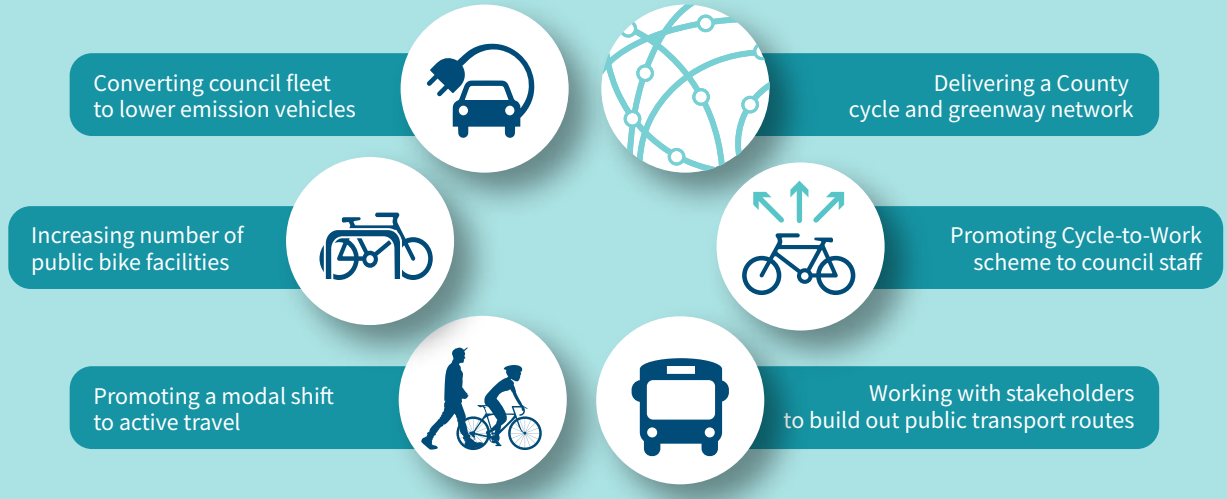
33%

IMPROVEMENT IN ENERGY EFFICIENCY BY 2020

40%

REDUCTION IN COUNCIL'S GHG EMISSIONS BY 2030

EXAMPLES OF MAIN ACTION TYPES



STAKEHOLDERS TO WORK WITH AND INFLUENCE

GENERAL PUBLIC

COMMUNITY GROUPS

GOVERNMENT DEPARTMENTS

ENVIRONMENTAL GROUPS

DUBLIN BUS, IRISH RAIL BUS ÉIREANN

NATIONAL TRANSPORT AUTHORITY, TRANSPORT INFRASTRUCTURE IRELAND

The integration of land-use and transport … ensures that places where people live are either close to, or are connected by public transport, to their places of work or education, thereby allowing people to use the most sustainable modes of transport, namely walking, cycling and public transport.
- Fingal Development Plan 2017-2023

Transport contributes to a significant amount of GHG emissions within the Fingal area. Walking, cycling and public transport currently accounts for just 38.6% of all journeys, and the target is to increase this figure to 50%. Therefore, through its own development plan strategy and policies, FCC promotes the integration of land use and transportation, and works with a range of stakeholders to improve transportation in Fingal and encourage modal shift away from private cars to more sustainable alternatives, in order to achieve this target.

Towards this, Fingal County Council worked with the National Transport Authority (NTA) and neighbouring local authorities to produce the *Greater Dublin Area Transport Strategy 2016-2035*, which sets out a strategic vision for transport in Dublin, and builds on the government's *Smarter Travel – A Sustainable Transport Future 2009 – 2020* plan. Both of these plans aim to improve how people get to their destination. In addition, along with promoting sustainable transport, FCC has reduced speed limits in certain residential areas and introduced traffic calming measures to improve the safety of the streets.


Photo Source: Fingal County Council

OPERATIONS

Fingal County Council's transport fleet is made up of 230 vehicles, which consumed 6.4 GWh of energy in 2017 and accounted for 12% of the Council's total emissions, due to its reliance on petrol and diesel. Converting the fleet to electric vehicles is essential to reducing these carbon emissions, and the Council is implementing a replacement programme that aims to electrify FCC's fleet, where possible, by 2030.

To begin this process, Fingal County Council has recently added five new electric vehicles to its fleet, in an effort to promote sustainability and tackle climate change. The fully-electric Citroen Berlingo vans mark the beginning of Fingal's transition to the electrification of its fleet.

Twelve charging points were also recently installed across Fingal, where electric vehicles are expected to take just 30 minutes to completely re-charge at these points.

CASE STUDY

Photo Source: Wikimedia Commons / Peter Gerken

Swords – Green City

Planning for the MetroLink and its significant economic stimulus, Fingal County Council has developed the Strategic Vision 2035 for Swords. By encouraging a process of mutual partnership between all stakeholders, it is intended to facilitate the achievement of environmental targets. The Strategic Vision 2035 aims to develop Swords as a sustainable town by incorporating the following elements:

- A Green City in terms of the physical landscape and sustainable environmental objectives
- A town with well-defined boundaries and a strong landscape setting
- A high-quality landscape setting with a network of public open spaces and parks
- Energy efficient buildings and green technology
- An integrated transport strategy comprising significant public transport services (including BusConnects and Metrolink) and strategic pedestrian, cycling and road infrastructure
- A vibrant economy with flagship retailers and a unique and attractive town centre
- An improved employment base, in terms of the number and quality of jobs available within Swords
- Improved quality of life for residents, businesses and visitors

PLANNING & PUBLIC REALM

Central to placemaking is the development of sustainable communities, where communities are able to evolve and the needs of today can be facilitated without compromising the ability of future generations to meet their own needs… Access to public transport, education, community facilities, leisure, retail, health services and jobs are as important as the aesthetic of a place.

- Fingal Development Plan 2017-2023

Key to encouraging people to walk and cycle is the design of streets and the public realm. FCC is working to implement street design guidelines that make the streets more inviting and improve the public realm. This includes incorporating green infrastructure into the streetscape, which also reduces risk of urban heat islands and provides sustainable urban drainage. Improved, low-energy lighting will create a safer night-time environment for pedestrians and cyclists. FCC is also in the process of developing a public lighting master plan that will improve the ambiance and safety of streets for pedestrians and cyclists.

ACTIVE TRAVEL & BEHAVIOUR CHANGE

To promote the development of cycling in the County, a comprehensive network of cycle routes will be established throughout the County with the emphasis on promoting direct, comfortable, convenient, and safe routes.

- Fingal Development Plan 2017-2023

Encouraging people to walk or cycle will help FCC to respond to climate change. Moreover, promotion of active travel will improve the health of citizens. Of the transportation modes that FCC can influence and shape, cycling has been the predominant focus.

To encourage the uptake of cycling and walking, FCC is actively working to improve pedestrian and cycling infrastructure, and is prioritising the safety of cyclists through the development of segregated cycle paths where possible. Proposed projects include cycleways at Broadmeadow Estuary, Snugborough Interchange, the Hole in the Wall and Kilshane Cross. The Council is actively advancing a number of specific cycle facilities across the county including the Fingal Coastal Way, the Broadmeadow Way, the Harry Reynolds Road Cycle Route and the Royal Canal Urban Greenway. Alongside this, a number of road schemes are being developed that will include high quality cycle facilities such as the Donabate Distributor Road, Rathbeale Road Upgrade and Snugborough Interchange.

FCC will also work with relevant transport bodies and businesses to expand the availability of bicycle parking to enable people to cycle to and from key public transport nodes. FCC has been developing and implementing successful behavioural change programmes to encourage more sustainable forms of transport, by providing opportunities for road safety education. For example, in partnership with An Taisce's Green Schools, the Council is encouraging thousands of children and their parents to walk, cycle or scoot to school and over 2,500 students have participated in cycle safety training.

PUBLIC TRANSPORT

FCC will continue to work with the relevant transportation bodies (National Transport Authority, Transport for Ireland, Dublin Bus, Irish Rail, Bus Éireann, Road Safety Authority) to introduce measures to achieve modal shift, and promote interchange between modes. Fingal is in ongoing dialogue with the NTA and TII regarding the provision of high quality passenger facilities to accommodate the increased numbers expected to use public transport as a result of proposed schemes such as MetroLink and BusConnects.

TRANSPORT

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
STAFF TRAVEL					
1	Install quality teleconferencing facilities between Blanchardstown and Swords	2019	I.T.	Facilities installed	GHG
2	Modernise the workplace to facilitate flexible working arrangements to reduce staff travel (e.g. Skype)	2019	Human Resources / I.T.	Modernisation programme underway	GHG
3	Implement carbon offset programme for official flights	2019	Corporate, Climate Action	Programme implemented	GHG, Public Awareness
4	Promotion of Cycle-to-Work Scheme for Council staff	Ongoing	Human Resources	# of staff availing of scheme	GHG, Public Awareness
5	Provide an electric vehicle in County Hall courtyard and Blanchardstown for use by staff travelling to site visits and meetings	2019	HR / Operations	EVs provided	GHG
OPERATIONS					
6	Continued electrification of the Council's vehicle fleet as market technology develops	2018 onwards	Operations	% of total fleet converted to EVs	GHG
7	Expand availability of EV charging points for Council staff and operational vehicles	2019	Operations	# of charging points	GHG
8	Electric vehicle charge points to be provided in car parking for new Fingal Corporate buildings and social housing where technically feasible	Ongoing	All departments / Architects	# of EV charge points provided	Energy Efficiency, GHG
9	Provide eco driving training to Council drivers	2019	Human Resources	# of staff trained	GHG, Public Awareness
INTEGRATION OF SPATIAL PLANNING & TRANSPORT					
10	To plan spatial development patterns which reduce transport demand and encourage low carbon transport modes. E.g. consolidation of the existing communities already served by public transport and close to established social and community infrastructure and the creation of new communities serviced by high quality transport links	Ongoing	Planning & Strategic Infrastructure / Operations	Kms of cycle routes, # of schemes completed	GHG

TRANSPORT

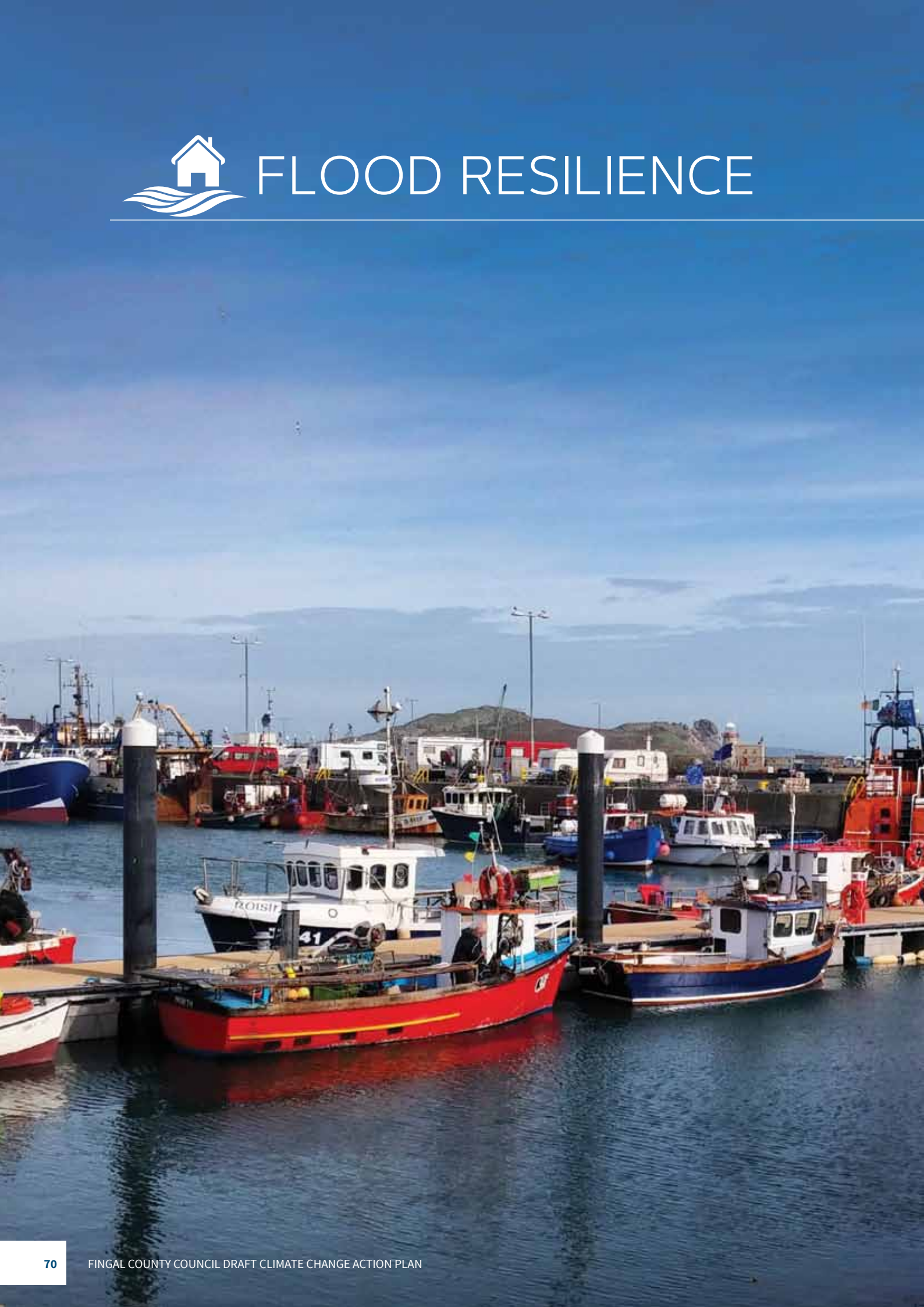
NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
11	Promote the installation of EV charge points in curtilage, for all new house constructions in Fingal	2019	Planning & Strategic Infrastructure	Policy adopted	
ACTIVE TRAVEL & BEHAVIOUR CHANGE					
12	Build out Fingal's cycle network offering direct routes to local destinations and public transportation hubs. Develop linked cycling trails, greenways and green belts for recreation and biodiversity protection	Ongoing	Planning & Strategic Infrastructure, Operations	Kms of cycle routes, # of schemes completed	GHG
13	Advance the provision of new cycle networks across the County such as the Fingal Coastal Way, the Sutton to Malahide Cycleway, the Broadmeadow Way, the Harry Reynolds Road Cycle Route and the Royal Canal Urban Greenway, etc.	Ongoing	Planning and Strategic Infrastructure, Operations	Kms of cycle routes, # of schemes completed	GHG
14	Advance the construction of the following road schemes which will include a high quality cycle network - Donabate Distributor Road, Rathbeale Road Upgrade and Snugborough Interchange and Ongar - Barnhill Link Road, etc.	Ongoing	Planning and Strategic Infrastructure, Operations	Kms of cycle routes, # of schemes completed, map produced	GHG
15	Implement traffic calming programme including provision of new signalised pedestrian crossings	Ongoing	Operations	# of traffic calming measures	GHG
16	Regular maintenance of regional and local roads to encourage modal shift to cycling	Ongoing	Operations	Km of roads maintained that facilitates modal shift	GHG
17	Improve conditions and uptake of cycling through public realm / local area plans	Ongoing	Planning & Strategic Infrastructure, Operations	# of projects implemented, # of and kms of planned cycle paths	GHG
18	Re-organisation of allocation of space to pedestrians in the public realm	Ongoing	Planning & Strategic Infrastructure, Operations	Pre and post surveys of pedestrian numbers	GHG
19	Increase the quantity of bicycle stands in the public domain	Ongoing	Operations	Projects implemented, # of bike stands	GHG
20	Expand Bike Sharing Schemes in urban areas	2019-2020	Operations	# of bikes provided	GHG
21	Promote and facilitate additional car sharing schemes	2019	Operations	# of cars provided	GHG

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
PUBLIC TRANSPORT					
22	Develop a policy with NTA for the provision of Park & Ride facilities across the County	2019	Operations, Planning & Strategic Infrastructure	Policy developed and sites identified	GHG
23	Support the development and expansion of existing public transport services including MetroLink, BusConnects and DART expansion to Balbriggan	Ongoing	Planning & Strategic Infrastructure	Public transport supported	GHG
ACTIONS AWAITING BUDGET					
24	*Expand the availability of EV charge points in towns and villages in line with national policy as it develops*	*Ongoing*	*Operations*	*# of charging points*	GHG
25	*Identify and put in place the resources necessary to develop and implement a cycling strategy*	*2019-2020*	*Operations*	*Resources assigned*	GHG

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Climate Action and Low Carbon Development Act 2015
- Design Manual for Urban Roads and Streets (DMURS)
- Electric Vehicle Grant Scheme and VRT Relief
- Fingal Development Plan 2017-2023 (Objectives ED64; GI30; MT01; MT31; MT33, MT34; PM26; SS01)
- Greater Dublin Area Transport Strategy 2016-2035
- National Cycle Policy Framework 2009-2020
- National Transport Authority's Permeability Best Practice Guide
- Public Transport Act 2016
- Smarter Travel: A New Transport Policy for Ireland 2009-2020

FLOOD RESILIENCE



OVERVIEW

10 MAIN RIVERS:
WARD, DELVIN, TOLKA, SLUICE, MAYNE, SANTRY, BROADMEADOW, BALLYBOUGHIL, CORDUFF & LIFFEY

88 km
OF COASTLINE IN FINGAL

TARGET

A CLIMATE-RESILIENT REGION

REDUCTION/MITIGATION OF FLOOD RISKS IN REGION

EXAMPLES OF MAIN ACTION TYPES

- Protect and conserve wetlands, floodplains and coastal areas
- Increase flood capacity of rivers and estuaries
- Prepare a maintenance register for the entire surface water system
- Update Council Emergency Response Plans to include flood event response
- Finalise a SuDS policy
- Develop a coastal monitoring programme to measure coastal erosion

STAKEHOLDERS TO WORK WITH AND INFLUENCE

- OFFICE OF PUBLIC WORKS
- GOVERNMENT DEPARTMENTS
- GENERAL PUBLIC
- COMMUNITY GROUPS
- ENVIRONMENTAL GROUPS
- DEVELOPERS

Control and manage surface water, mitigate against flooding and to protect and improve water quality in the County while allowing for sustainable development and improve water quality in line with the Water Framework Directive and Eastern River Basin Management Plan.
- Fingal Development Plan 2017-2023

Flooding is an ongoing challenge for the Dublin Region. Climate change increases the frequency and duration of heavy rainfall events and storm surges, which increase the risk of flooding in vulnerable areas of the County. Together with the Office of Public Works and neighbouring local authorities, FCC is actively working to implement projects and programmes that align with the *EU Floods Directive* and *Water Framework Directive*, which call for member states to undertake strategic flood risk assessments and to employ Sustainable urban Drainage Systems (SuDS), with an emphasis on nature-based solutions to be used in adaptation and mitigation responses to achieve resilience.

FLOOD RISK MANAGEMENT

In response to the Floods Directive, Fingal County Council, along with Meath County Council and the Office of Public Works (OPW) completed a catchment based flood risk assessment and management study of 19 rivers and streams in the Fingal East Meath area, the Fingal East Meath Flood Risk Assessment and Management Study (FEM-FRAMS). The core objectives of the Study include:
a) The development of maps for the existing and potential flood hazard and risk areas within the study catchment.
b) The development of an economically, socially and environmentally appropriate long-term strategy (a Flood Risk Management Plan) for the Fingal and East Meath study area and associated SEA
- Fingal Development Plan 2017-2023

In partnership with the Office of Public Works (OPW) and neighbouring local authorities, FCC is working to adapt areas that are vulnerable to flooding by using comprehensive flood-risk mapping. FCC is looking at measures that include nature and have multiple benefits beyond flood defence, such as providing new spaces for recreation and habitats for wildlife. Based on flood maps developed by the OPW and FCC, the Council has identified areas such as Portrane, the Broadmeadow River, the Tolka River and the Santry River that will benefit from solutions involving green infrastructure, integrated wetlands and tree planting.

CASE STUDY

Fingal Coastal Liaison Group
The Fingal Coastal Liaison Group was established in October 2016. It is comprised of councillors, Council staff and community members from Rush, Portrane and Sutton. These areas are at risk of coastal erosion and flooding and members of the group work to:

- Discuss and address concerns of communities living in the areas
- Make recommendations to management to address coastal flooding and erosion
- Facilitate community participation in coastal and natural resource management
- Support the development of joint projects that are related to coastal management
- Provide best practice advice based on current scientific knowledge
- Incorporate latest knowledge of climate change into coastal planning

FLOOD DEFENCE

While flood alleviation using nature-based solutions is FCC's preferred response, there are certain areas of the County that are not suited to soft solutions. Therefore, FCC is building physical flood defences that take into consideration current and future risks; Fingal is reviewing with the OPW where physical flood defences are required, and a priority list for their development. Additionally, FCC is actively researching alternatives to the physical flood defences, namely policy tools such as zoning to restrict further development in areas at risk.

Protecting Fingal's 88 kilometres of coastline, which is home to villages, valuable natural heritage and beaches that provide recreation for residents, is a high priority for the Council. The Irish Coastal Protection Study (ICPS) Phase 3 – North East Coast and the Dublin Coastal Flooding Protection Project (DCFPP) investigated the impacts of storm surges and sea level rise on the coast, and this resulted in the production of maps showing coastal flood risk, which are now being used to inform policy and planning along the coast, with a focus on the deployment of nature-based solutions.

CASE STUDY

Rogerstown Estuary – Climate Smart Conservation

As a special area of conservation under the EU Habitats Directive, the Rogerstown Estuary is rich in biodiversity and is a key recreation area. However, it is prone to flooding and in recent years, the barriers built originally to reclaim the land for agricultural purposes have failed, resulting in the lower areas of the estuary flooding at high tide. Rather than repairing the barriers, FCC decided to follow a 'Let it Flood' approach. By removing the barriers, the estuary is now able to flood naturally with the tide and during storms. The results of this approach have been positive; sites upstream from the estuary are protected from flooding and biodiversity has improved in the area, with some new species arriving and protected species thriving.

CASE STUDY

Photo Source: Fáilte Ireland / Brendan Lyon

Portrane Coastal Defence

Coastal erosion is a key climate risk facing many coastal communities in Ireland. Most of the Fingal coast comprises of soft sediment such as dunes, beaches and soft cliffs, which are very vulnerable to damage by storms and rising sea levels. FCC has been actively working to address coastal erosion risk through coastal defence projects along the Fingal coast. Dealing with the erosion of the dunes and beaches at Portrane and Rush is a priority for FCC as many homes are at risk. At present, FCC is considering several options to defend the coast at Portrane and Rush, such as:

- Beach supplementation and groynes
- Seawalls
- Coastal retreat

FLOOD RESILIENCE

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
FLOOD RISK MANAGEMENT					
1	Implement *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (2009)	Ongoing	Planning & Strategic Infrastructure	# of projects following guidelines	
2	Undertake Strategic Flood Risk and SuDS Assessments for all LAPS, SDZs and development plans	Ongoing	Planning & Strategic Infrastructure	Assessments completed	
3	Finalise a SuDS policy in collaboration with all Fingal departments	Ongoing	Planning & Strategic Infrastructure	SuDS policy finalised	
4	Mid-term review of the Strategic Flood Risk Assessment (SFRA) for the County Development Plan	2019	Planning & Strategic Infrastructure	Review completed	
5	Protect and conserve floodplains, wetlands and coastal areas subject to flooding through available policy instruments	Ongoing	Planning & Strategic Infrastructure	Map of areas to be protected, # of hectares protected	
6	Assess the feasibility of green roofs on all new Fingal public, operational and social buildings and provide where viable and appropriate	Ongoing	All Depts / Architects	Assessments completed and provided	
7	Update Council Emergency Response Plans to include flood event response	Ongoing	Corporate / Operations	Plans completed and updated yearly	
8	Develop template for extreme weather events to capture details, response and costs	2019-2020	Corporate / Finance	Template developed and issued	
9	To engage with the Fingal Coastal Liaison Group with the integration of adaptation strategies into planning policies, etc.	Ongoing	Planning & Strategic Infrastructure	# of meetings held each year	
10	Develop a climate change impact GIS risk map with scenarios for the Dublin Region	2020	Climate Ireland, Environment and Transportation, multi-departmental	GIS map developed	
FLOOD DEFENCE					
11	Develop and implement Coastal Protection Plan for Portrane	2019-2020	OPW / Planning & Strategic Infrastructure	Plan produced and actions implemented	
12	Progress OPW flood protection scheme at Mill Stream Skerries	Ongoing	OPW / Climate Action	Project completed	
13	Progress OPW flood protection scheme at Bissett Strand and The Green Malahide Village	Ongoing	OPW / Climate Action	Project completed	
14	Progress OPW flood protection scheme at Portmarnock Bridge	Ongoing	OPW / Climate Action	Project completed	
15	Continued engagement with the OPW to progress further studies of areas within Fingal at risk of flooding, and development of suitable schemes such as Strand Road Sutton and Santry	Ongoing	OPW / Climate Action	Schemes identified	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS AWAITING BUDGET					
16	*Develop a coastal monitoring programme to measure coastal erosion along the Fingal coast*	*2020*	*Coastal Liaison Group, Planning & Strategic Infrastructure*	*Monitoring programme set up*	
17	*Identify sites where flood defence features can be removed or relocated to increase flood capacity of rivers and estuaries*	*2019*	*Planning & Strategic Infrastructure*	*# of sites identified*	
18	*Restore St Ita's wetlands to maximise water attenuation capacity and nature conservation benefits*	*2020*	*Planning & Strategic Infrastructure*	*% of wetland restored*	
19	*Record on a GIS layer the Council surface water system and make it available to all relevant staff from Operations & Planning. This must include all SuDS systems and flood embankments*	*Ongoing*	*Water Services, Operations, Planning & Strategic Infrastructure*	*Surface water system recorded on GIS layer*	
20	*Prepare a maintenance register for the entire surface water system within the county, including SuDS, pipes and culverts to aid proactive maintenance, alleviate flooding and maintain water quality*	*Ongoing*	*Water Services, Operations, Planning & Strategic Infrastructure*	*Maintenance register created*	
21	*Identify and put in place the resources to develop and promote SuDS, including: Promote and encourage community involvement in the retrofit of SuDS in existing developments, maintaining community rain gardens, discourage hard paving in gardens and retrofit raingardens / water butt installations*		*Planning & Strategic Infrastructure*	*Resources and programme in place*	
22	*Create a case study of SuDS at Local Area Plan level*		*Planning & Strategic Infrastructure*	*Case study complete*	

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Arterial Drainage Acts
- Catchment-Based Flood Risk Management Plans (CFRMP)
- Dublin Bay Biosphere Biodiversity Conservation and Research Strategy 2016-2020
- Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study 2011-2016
- EU Floods Directive 2007/60/EC
- Fingal Development Plan 2017-2023 (Objectives DW03; GIM25; NH53; NH54; NH56; NH57; NH58; NH67; NH68; SW01; SW04; SW07; WQ02)
- Fingal Biodiversity Action Plan 2010-2015
- Fingal Local Economic and Community Plan (LECP) 2016-2021 (Actions A85; A91; A 92; A102)
- Greater Dublin Strategic Drainage Study
- National Landscape Strategy for Ireland 2015-2025
- Planning System and Flood Risk Management Guidelines
- Water Framework Directive 2000/60/EC
- Water Services Strategic Plan (2015)

NATURE-BASED SOLUTIONS

Photo Source: Fáilte Ireland / Rob Durston

OVERVIEW

10 PUBLIC PARKS MAINTAINED BY FINGAL COUNTY COUNCIL

RESPONSIBLE FOR PROTECTING **2,000** HECTARES OF OPEN SPACE

13 BEACHES AT RISK OF COASTAL EROSION

TARGET

A CLIMATE-RESILIENT REGION

PREVENTING HABITAT LOSS

PROTECTING NATIVE SPECIES, PARKS AND TREE COVER

EXAMPLES OF MAIN ACTION TYPES

STAKEHOLDERS TO WORK WITH AND INFLUENCE

GOVERNMENT DEPARTMENTS

COMMUNITY GROUPS

PRIVATE CITIZENS

ENVIRONMENTAL GROUPS

DUBLIN BAY BIOSPHERE PARTNERSHIP

SCHOOLS AND THIRD LEVEL INSTITUTIONS

Recognising that as a society and economy we depend on nature and natural systems and that we need to sustain this 'natural capital' because it provides us with a multitude of benefits (including food, clean water, clean air and raw materials) and functions (such as temperature regulation and flood control).
- Fingal Development Plan 2017-2023

Nature-based solutions are defined by the International Union for Conservation of Nature as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"[28].

Nature-based solutions are critical in climate change adaptation; they can play an important role not only for biodiversity and ecosystems, in flood prevention and carbon sequestration, but also in temperature regulation, water quality erosion prevention, and filtering pollutants from the air and water. Nature-based solutions are used in a smart, 'engineered' way to provide sustainable, cost-effective, and adaptable measures that support climate resilience. Trees and plants reduce water run-off in extreme rain events, taking pressure off the urban drainage system. They also prevent soil erosion. Natural environments, such as wetlands, river banks and beaches form buffers to reduce the impact of climate change events.

All of these solutions have the added value of providing recreation opportunities, while building resilience to climate change.

Of the four local authority areas in Dublin, Fingal is the largest in terms of geographical size. The County is diverse, with several large urban centres, rural villages, agricultural land, river valleys, estuaries, and extensive dunes and beaches. Fingal County Council will work to protect these natural features so that both current and future generations can enjoy their many benefits.

GREEN INFRASTRUCTURE

Develop the green infrastructure network to ensure the conservation and enhancement of biodiversity, including the protection of European Sites, the provision of accessible parks, open spaces and recreational facilities (including allotments and community gardens), the sustainable management of water, the maintenance of landscape character including historic landscape character and the protection and enhancement of the architectural and archaeological heritage
- Fingal Development Plan 2017-2023

The European Commission broadly defines green infrastructure as "a strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings"[29].

Fingal's *Keeping It Green Open Space Strategy* emphasises the importance of nature and green infrastructure in the health and well-being of people who live in the County. It is FCC's goal through this Climate Change Action Plan to plan for a public realm that promotes walkability by creating streets and spaces that are beautiful and inviting with trees and plants, which simultaneously help with flood management and promote biodiversity. Green infrastructure plays a vital role in this and helps in climate change mitigation and adaptation, by reducing CO_2 in the air and absorbing water, and cooling the urban environment.

Fingal County Council is responsible for 2,000 hectares of open space that are managed in a sustainable manner to ensure that future generations can enjoy the benefits of these amenities in terms of recreation, health and well-being. These parks and open spaces are vital in adapting to climate change and mitigating future impacts.

CASE STUDY

Wildflower Meadows

Fingal is responsible for over 2,000 hectares of open space. Much of the open space comprised of short grass that would have been cut every two to three weeks throughout the growing season. About 10 years ago, the Council switched to wildflower meadows in bigger open spaces and regional parks. Local farmers harvest the hay once a year. This has reduced the management input into the meadows, thereby reducing petrol consumption and emissions. The wildflower meadows also have a great wildlife benefit and provide a lot of colour in the parks for the visiting public to enjoy.

AGRICULTURE

Agricultural activity in Fingal includes tillage of cereals and other crops, pasture and dairy and is an important part of the economic life of rural Fingal helping to sustain, enhance and maintain the rural economy. Agriculture will continue to be an important component of Fingal's rural economy. The agricultural sector must adapt to the challenges posed by modernisation, restructuring, market development and the increasing importance of environmental issues

- Fingal Development Plan 2017-2023

Fingal is both an urban and a rural County and as such, agriculture plays a key role in the County's economic, environmental and social activities. North County Dublin produces more than half of all the fruit and vegetables in the country.

In 2016, agriculture accounted for 37 GWh of final energy and 23,100 tonnes of CO_2 within the Fingal region. This is equivalent to 1.2% of total emissions in the County. Emissions from agriculture mainly came from livestock, which accounted for 62% of total agricultural emissions, followed by emissions from crops (22%) and horticulture (16%). It should be noted that emissions from agriculture in the Dublin Region are not as high as in other counties in Ireland. This is mainly due to the amount of built-up areas in Dublin, compared to other counties that have more farmland available for agricultural practices.

The agricultural sector is supported to climate-proof activities through encouraging crop diversification and implementing land-use policies that protect the rural environment. Farmers are supported to diversify crops and potentially lease land for renewable energy projects through the Green Low Carbon Agriculture Environment Scheme (GLAS). FCC is also supporting the efforts of communities and schools to undertake urban farming projects and has provided 885 allotments to date.

TREE MANAGEMENT

Existing tree belts should be retained and managed and older stands of trees restocked. Roadside hedging should be retained and managed. Proposals necessitating the removal of extensive field and roadside hedgerows or trees should not be permitted. Strong planting schemes using native species, to integrate development into these open landscapes, will be required.

- Fingal Development Plan 2017-2023

The Tree Canopy Study, carried out by UCD's School of Geography, estimates that in Fingal, trees cover only 6.5% of the total area[30], and this figure can be as low as 3% in urban areas. However, this is due to different land-uses in Fingal (i.e. when shrubs and grassland are accounted for, the County has 56.8% green cover). Recognising the value of trees, FCC is actively working to protect existing tree belts and plant more trees by implementing the County's Tree Strategy. This will guide the maintenance and care of the 70,000 trees and 400 hectares of woodland that are currently in the County to ensure that their benefits are guaranteed for years to come.

CONSERVATION AND PRESERVATION

> **Sustainable Drainage Systems (SuDS) can best be summarised as offering a "total" solution to rainwater management and is applicable in both urban and rural situations…SuDS can also provide amenity benefits to local communities and benefits for biodiversity simultaneously. In this way SuDS features are not just part of the County's drainage infrastructure but a vital part of the County's Green Infrastructure.**
> - Fingal Development Plan 2017-2023

SuDS and Water-Based Solutions

Wetlands, floodplains, lakes and reservoir ecosystems play an important role in the regulation of floods in inland systems and provide protection from the adverse consequences of natural hazards to humans. They also play a role in temperature regulation.

FCC has developed a range of plans and strategies (*Fingal Development Plan 2017-2023*, *Fingal Biodiversity Action Plan*, *The Forest of Fingal – A Tree Strategy for Fingal*) to protect its biodiversity. As Dublin's natural ecosystems have a critical role in the international migration of various bird species, it is important to protect and conserve these habitats. The expansion of the Dublin Bay Biosphere to areas between Howth Head and Dalkey is ensuring that the mosaic of ecological systems that make up the biosphere are protected. Furthermore, managing the Dublin Bay Biosphere is a collaborative effort with Dublin City Council and Dún Laoghaire-Rathdown County Council, demonstrating the importance of the area to the environmental, economic and social vitality of the Dublin Region.

Eighty-eight kilometres of Dublin's coastline are found in Fingal; this coastline is diverse and is characterised by three large estuaries (Rogerstown, Malahide, and Baldoyle), which are the most important nature conservation areas in the Fingal area. Critically, these estuaries are at risk of flooding, coastal erosion and sea level rise. Conserving and preserving these estuaries, along with the sand dunes that act as a natural barrier to coastal flood risk, are a priority for FCC, demonstrated by the creation of the Fingal Coastal Liaison Group to develop and recommend solutions.

CASE STUDY

Dublin Bay Biosphere - UNESCO Site

In 1981, UNESCO recognised the importance of Dublin Bay by designating North Bull Island as a biosphere because of its rare and internationally important habitats and species of wildlife. UNESCO's concept of a biosphere has evolved to include not just areas of ecological value, but also the areas around them and the communities that live and work within these areas. There have since been additional international and national designations, covering much of Dublin Bay, to ensure the protection of its water quality and biodiversity.

The biosphere was expanded in 2015, and now covers all of Dublin Bay and extends to over 300 km^2. Over 300,000 people live within the newly enlarged biosphere. The Dublin Bay biosphere contains three different zones, which are managed in different ways:

- The core zone of the Dublin Bay biosphere comprises of 50 km^2 of areas of high natural value. Key areas include the Tolka and Baldoyle Estuaries, Booterstown Marsh, Howth Head, North Bull Island, Dalkey Island and Ireland's Eye.
- The buffer zone comprises 82 km^2 of public and private green spaces, such as parks, greenbelts and golf courses, which surround and adjoin the core zones.
- The transition zone comprises 173 km^2 and forms the outer part of the biosphere. It includes residential areas, harbours, ports and industrial and commercial areas.

NATURE-BASED SOLUTIONS

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
OPERATIONS					
1	Engage with sectoral adaptation plan on biodiversity to identify key habitats and species at risk from climate change impacts	2019	Planning & Strategic Infrastructure	Workshop carried out, risks and responses identified	
2	Engage with regional working group on nature-based solutions once set up	2019	Planning & Strategic Infrastructure	Working group established	
GREEN INFRASTRUCTURE					
3	Develop Green Infrastructure Strategy that incorporates climate change mitigation and adaptation to increase climate resilience	2021	Planning & Strategic Infrastructure	Strategy completed	
4	Map access to green space in County to identify areas of need	2020	Planning & Strategic Infrastructure	Map showing green space and projects	
AGRICULTURE					
5	Engage with the agri-food sector to gain an understanding of how Fingal might better support more sustainable farming practices	Ongoing	Planning & Strategic Infrastructure	Sector engaged	
6	Develop climate change initiatives in partnership with local farmers and other stakeholders	2019 onwards	Planning & Strategic Infrastructure	Initiatives developed	
TREE MANAGEMENT					
7	Review and implement the Tree Strategy to protect existing trees, increase tree cover, establish guidelines on tree maintenance and investigate feasibility of urban orchards	Ongoing	Planning & Strategic Infrastructure / Operations	Tree Strategy implemented, online map of trees and plants across the County	GHG
8	Identify sites for woodland planting	Ongoing	Planning & Strategic Infrastructure	# of sites and acreage of potential woodland identified	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
9	Map and protect strategic agricultural land for national food security purposes	2022	Planning & Strategic Infrastructure / Teagasc	Resource mapped	
10	Incorporate SuDS into Constructed Tree Pits provided by the Council and in requirements for Constructed Tree Pits conditioned by the Council in Planning Permissions	Ongoing	Planning & Strategic Infrastructure	SuDS incorporated	
CONSERVATION AND PRESERVATION					
11	Develop a map of habitats and species at risk of climate change	2019	Planning & Strategic Infrastructure	Map completed	
12	Develop a monitoring programme of the habitats and species considered at risk of climate change	2019	Planning & Strategic Infrastructure	# of monitoring programmes set up for habitats and species	
13	Prepare a climate proof biodiversity plan	2019	Planning & Strategic Infrastructure	Complete review for climate relevant actions and amend accordingly	
14	Support and promote National Biodiversity Data Centre All-Ireland Pollinator Plan Actions for Councils	Ongoing	Planning & Strategic Infrastructure / Operations	Actions implemented	
15	Increase pollinator areas in public parks and open spaces	2019	Operations	Increased pollinator area	
16	Support the use of allotments as a way communities can grow their own food, and lower food miles and food waste	Ongoing	Operations	Increased awareness	
ACTIONS AWAITING BUDGET					
17	*Prepare a heathland management plan for Howth*	*2020*	*Planning & Strategic Infrastructure*	*Plan produced*	
18	*Pilot tree planting projects in areas with hard landscaping*	*2020-2021*	*Planning & Strategic Infrastructure*	*Plan produced*	
19	*Create multi-functional master plans for Rogerstown and Baldoyle Estuaries and their surroundings*	*2020*	*Planning & Strategic Infrastructure*	*Master plans produced*	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED

RELEVANT LEGISLATION/POLICIES/GUIDANCE

- All-Ireland Pollinator Plan 2015-2020
- Dublin Bay Biosphere Biodiversity Conservation and Research Strategy 2016-2020
- Dublin Tree Canopy Study (2017)
- EU Biodiversity Strategy
- EU Birds Directive 2009/147/EC
- European Communities (Birds and Natural Habitats) Regulations 2011 S.I. 477 of 2011
- EU Environmental Impact Assessment Directive 2014/52/EU
- EU Habitats Directive 92/43/EEC
- EU (Planning and Development) (Environmental Impact Assessment) Regulations 2018 S.I. 296 of 2018
- EU (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018
- EU Regulation on Invasive Alien Species - EU Regulation 1143/2014
- EU Strategy on Green Infrastructure 2013
- Fingal Development Plan 2017-2023 (Objectives GI02; GI03; GI10, Gl11; Gl12; Gl13; Gl14; Gl15; Gl16; Gl17; NH21; NH49; PM51; PM64; RF100; SS08; SS10; SS11)
- Fingal Local Economic and Community Plan (LECP) 2016-2021 (Actions A85; A91; A92; A102)
- Green Low Carbon Agriculture Environment Scheme (GLAS)
- National Biodiversity Action Plan 2017-2021
- National Landscape Strategy for Ireland 2015-2025
- The Forest of Fingal – A Tree Strategy for Fingal
- Water Framework Directive 2000/60/EC
- Wildlife (and Amendment) Acts 1976-2012

RESOURCE MANAGEMENT

OVERVIEW

WASTE AND WASTE-WATER ACCOUNTED FOR **1.7%** OF FINGAL'S TOTAL EMISSIONS IN 2016

TARGETS

50% RECYCLING RATE OF MANAGED WASTE BY 2020

REDUCE TO 0% THE DIRECT DISPOSAL OF UNPROCESSED RESIDUAL MUNICIPAL WASTE TO LANDFILL

10% REDUCTION IN WASTE GENERATED BY LOCAL AUTHORITIES

EXAMPLES OF MAIN ACTION TYPES

- Implement Climate Awareness Programme for staff
- Remove all single use items from Council canteens
- Promote 'Reuse Month' annually
- Establish a network of public drinking water fountains to help reduce plastic waste
- Support marine litter clean up initiatives
- Trial recycling bins in regional parks

STAKEHOLDERS TO WORK WITH AND influence

- GENERAL PUBLIC
- GOVERNMENT DEPARTMENTS
- IRISH WATER
- PRIVATE BUSINESSES
- EASTERN MIDLANDS WASTE REGION
- COMMUNITY GROUPS, TIDY TOWNS, IBAL

The Waste Management Plan for the Eastern-Midlands Region is the framework for the prevention and management of wastes in a safe and sustainable manner. The scope of the waste plan is broad and ultimately it provides policy direction, setting out what we want to achieve and a roadmap of actions to get us there. The waste management plan is a statutory document prepared by the local authorities of the region and it covers the period from 2015 to 2021, after which time it will be revised or replaced.

- Eastern Midlands Regional Waste Management Plan (2015-2021)

The Eastern Midlands Waste Regional Office (EMWRO) is responsible for the implementation of the region's Waste Management Plan. The EMWRO is managed by Dublin City Council, as the lead authority for the waste region. Its role includes the following:

- Providing education and advice to households and communities to empower them to reduce, reuse and recycle
- Working hand-in-hand with local authorities to achieve waste prevention and resource efficiency targets
- Working with businesses to rethink their approach to waste management, by viewing our waste as valuable material resources
- Providing education and advice to households and communities to empower them to reduce, reuse and recycle
- Partnering with a range of stakeholders including local authorities, government bodies, waste industry operators, environmental organisations, reuse organisations, research institutions and so on, to research and devise sustainable solutions for specific waste streams

FCC is working to reduce the production of waste and protect the environment from contamination by hazardous waste materials and general litter.

WASTE MANAGEMENT

Plan Target - Reduce to 0% the direct disposal of unprocessed residual Municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

- Eastern Midlands Regional Waste Management Plan (2015-2021)

FCC will introduce a comprehensive waste prevention and recycling programme within the Council, and will strive to reduce consumption and the waste produced in FCC's buildings and operations. Central to preventing the production of waste is changing the procurement of products used in Council buildings and operations. A priority for FCC is to review procurement procedures and identify opportunities to source locally-sourced, environmentally-friendly products for use in its operations. This will be further strengthened by the recent announcement by the government that all public bodies will not purchase single-use plastic beverage cups, cutlery and drinking straws after the 31st of March 2019 and will be required to report to its respective Minister by the end of November 2019 on the measures it is taking to minimise waste generation and maximise recycling.

CASE STUDY

Conscious Cup Campaign - Citizen Led Initiatives

The Conscious Cup Campaign (CCC) aims to reduce the use of disposable cups in organisations around the country, and is a partnership between VOICE and the Eastern Midlands Waste Regional Office. By signing up to the movement, organisations agree to offer incentives to customers for bringing their own cups, such as a monetary reduction, or other rewards such as an extra loyalty stamp or a free treat. Fingal County Council has been actively promoting this initiative by working with the other Dublin Local Authorities to carry out an advertising campaign (e.g. radio campaign, cinema ads) to encourage reusable cups among the public.

Photo Source: Goran Ivas / Unsplash

CASE STUDY

Illegal Dumping SBIR Challenge
Fingal County Council is part of the Smart Dublin programme, which, in partnership with Enterprise Ireland, launched the Small Business Innovation Research (SBIR) Illegal Dumping Challenge in April 2017 to find low-cost, innovative solutions to tackle this ongoing problem in urban and rural areas. Six companies received €12,500 in Phase 1, and four of these companies were then awarded additional funding of €130,000 to trial their solutions, which include:

- Integrating existing data to provide better insights and allow Councils to make data-driven decisions
- Using drone technology and a network of licenced pilots to identify and geo-tag litter in rural areas of Dublin
- Using low-cost, low-powered camera and monitoring systems to capture, report and deter illegal dumping in both urban and rural areas

WATER CONSERVATION

While the Dublin Region has an abundance of water, this however, does not equate to treated water suitable for drinking. As demonstrated with extreme weather events in 2018, there are challenges with water supply and delivery in Ireland. While FCC is no longer responsible for water delivery, FCC will work with Irish Water to ensure that people have security of supply. As such, actions in this plan are also focused on public education around conservation and protection of this valuable resource.

FCC will also lead the way with measures to reduce water consumption in Council buildings; for example, the installation of sensors on all taps and researching the feasibility of using grey water for toilets.

LITTER & RECYCLING IN THE PUBLIC REALM

Plan Target – Achieve a Recycling Rate of 50% of Managed Municipal Waste by 2020.
- Eastern-Midlands Regional Waste Management Plan (2015-2021)

Part of reducing waste is encouraging people to recycle. FCC is planning to expand the availability of recycling infrastructure, such as Bring Centres across the County, to reduce the amount of recyclable materials that go to landfill. FCC is also actively working with the Eastern Midlands Regional Waste (EMRW) team to inform people about what they can and cannot recycle.

CASE STUDY

Recycling Ambassador Programme
Fingal County Council supported the Recycling Ambassador Programme, which was a VOICE initiative funded by the Department of Communications, Climate Action and Environment (DCCAE) and REPAK. The programme also partnered with the Regional Waste Management Offices with the aim to improve Ireland's recycling rates and reduce levels of contamination in household recycling bins. Many people have become confused about what can and cannot be recycled. VOICE Ireland's Recycling Ambassador Programme showed what can be recycled in the household bin based on the new nationally agreed recycling list.

Highlights:

- 650 workshops throughout the country led by trained Recycling Ambassadors, who educated, supported and encouraged the public to recycle more effectively
- 30 ambassadors across the country

RESOURCE MANAGEMENT

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
PROCUREMENT					
1	Implement green procurement where feasible, starting with office consumables	2019	Corporate	Green procurement implemented	GHG
2	Implement green procurement at Council supported events where feasible, including reduction of single use plastics	2019	Economic & Tourism	Green procurement implemented at events	GHG
WASTE MANAGEMENT					
3	Implement Environmental Management System for Council buildings including reduction in waste and water usage, and increased recycling	2019	Facilities Management / Environment	EMS implemented	GHG
4	Remove all single use items from Council canteens	2018 onwards	Facilities Management	100% removal	GHG
5	Apply for Local Authority Waste Prevention Network grants	Ongoing	Water Services and Environment	# of grants for waste-related projects	GHG
6	Promote Conscious Cup Campaign	Ongoing	Water Services and Environment, Communications	# of activities, # of people reached	GHG
7	Promote 'Reuse Month' annually	Ongoing	Water Services and Environment, Communications	# of Council events	GHG
8	Promote recycling centres and expand the range of materials accepted where possible	Ongoing	Operations / Environment	Tonnage of materials accepted	GHG
LITTER & RECYCLING IN THE PUBLIC REALM					
9	Trial recycling bins in regional parks	2019	Operations	# of bins	GHG
10	Implement a programme for the installation of big belly bins across the County to reduce collection frequencies and emissions	2019	Operations	# of bins	GHG
11	Support and promote the inclusion of climate change initiatives in tidy town, green schools and cleaner communities	Ongoing	Water Services and Environment	# of initiatives supported by the Council each year	GHG
12	Support marine litter clean-up initiatives	Ongoing	Environment / Operations	# of initiatives supported by the Council each year	
13	Explore collaboration with Refill. ie to reduce single use drinking water bottles	2019	Water Services and Environment	Feasibility assessed	
LANDFILL MANAGEMENT					
14	Maintain landfill gas collection and reuse system at Dunsink and Balleally Landfill	Ongoing	Water Services and Environment	Zero GHG emissions by 2030	GHG

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
15	Look at feasibility of planting trees on Dunsink Landfill	2019	Water Services and Environment	Systems maintained	GHG
WATER CONSERVATION					
16	Provide a water butt retrofit programme for Council owned housing on a cost benefit basis, starting with voids and tenant changeovers	2019	Housing	# of water butts installed	Resilience
17	Assess the feasibility of including rainwater harvesting on all new Fingal public, operational and social buildings and provide where viable and appropriate	Ongoing	All Departments / Architects	# assessed and provided	Resilience
18	Incorporate low flush toilets into Council buildings, depots and housing, in line with refurbishment programmes	2019-2020	Facilities Management	# of low flush toilets incorporated in Council buildings, depots and housing	Resilience
AWARENESS					
19	Develop and implement an ongoing public Climate Awareness Programme	2019 onwards	Climate Action / Comms / CARO	Programme implemented	Resilience, Public Awareness
20	Implement a Climate Awareness Programme for staff	Ongoing	HR / Comms / Climate Action	Programme implemented	Resilience, Public Awareness
21	Develop and implement a Climate Change Awareness Grant Programme for schools and communities	2019 onwards	Climate Action	Programme implemented	Resilience, Public Awareness
22	As part of an emerging 'Green City' concept to produce *A Guide to Sustainable Business in Swords*	2020	Economics & Tourism	Guide produced	Resilience, Public Awareness
23	Expand tenant induction programme to include tenant energy, water, waste and environmental awareness	Ongoing	Housing, Water Services and Environment, Architects	# of tenants reached	GHG, Public Awareness

ACTIONS AWAITING BUDGET

24	*Establish a network of public drinking water fountains to help reduce plastic waste*	*2019-2024*	*Operations*	*# of points installed*	GHG, Public Awareness
25	*Examine the feasibility of retrofitting rainwater harvesting measures in existing Council buildings, particularly for vehicle washing, toilet flushing and landscaping*	*2019-2020*	*Facilities Management / Architects*	*Feasibility study complete*	Resilience

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Climate Action and Low Carbon Development Act 2015
- Directive 2008/98/EC on Waste (Waste Framework Directive)
- Fingal Development Plan 2017-2023 (Objectives WM05
- Eastern-Midlands Regional Waste Plan (Policies B.4.3; C.1.1; C.1.3)
- Water Services Strategic Plan (2015)

MILESTONE 4: IMPLEMENTATION

Ownership and implementation of this Climate Change Action Plan (CCAP) clearly resides with Fingal County Council (FCC). This plan demands a whole-of-council approach, as the climate actions listed cut across multiple departments and sections within the Council. There is no single solution; instead, success in combating climate change will be achieved through numerous individual actions.

FCC has established a Climate Action Team that aims to gather and coordinate individual actions to address the interconnected challenges of climate mitigation, climate adaptation and carbon-free sustainable energy. The Climate Action Team will work with an Interdepartmental Steering Group, representative of all Council Departments. Regular reports will be brought to the Water and Environmental Services Strategic Policy Committee (SPC). An Annual Report will be brought to the full Council with an updated action list.

The mandate of Fingal County Council's Climate Action Team will be to:

- Climate-proof existing and future corporate strategies, development plans, and local economic development plans
- Incorporate climate change into its procurement policies where it is feasible to do so
- Set up a monitoring and reporting structure, including quarterly schedule of meetings to evaluate progress
- Gather new actions and develop targets
- Coordinate work on actions
- Follow up with respective departments on progress
- Develop a new action plan every five years
- Be a point of contact for the public to learn about climate action in the Dublin Region

Codema, Dublin's Energy Agency, is continuing to provide support to many individual actions in the areas of research, planning, technical assessment, cost-benefit analyses, procurement, project management and communications.

It is also clear that climate change is a transboundary challenge; it does not stop at political and geographical borders, and therefore a Dublin regional approach has been agreed by the four Dublin Local Authorities, whereby they collaborate closely in the implementation of their action plans. Ultimately, the CCAPs for the four Dublin Local Authorities are the starting point to building climate resilience, through present and future action on climate change throughout the region.

The newly-established Dublin Metropolitan Climate Action Regional Office (CARO) will oversee the implementation of the CCAPs. It is one of four regional climate change offices that have been set up in response to Action 8 of the *National Adaptation Framework* (NAF). Under the NAF, sectoral adaptation plans are to be developed and implemented that will affect the work of the DLAs. As such, the CARO will liaise with respective central government departments to align actions undertaken by the DLAs with sectoral adaptation plans.

The role of the Dublin Metropolitan CARO is to:

- Assist the local authorities within the region in preparing their own Climate Change Action Plan
- Develop education and awareness initiatives for the public, schools, NGOs and other agencies engaged in driving the climate change agenda and contributing to the National Dialogue on Climate Action on a local and regional basis
- Link with third-level institutions in developing a centre of excellence for specific risks – in the case of the Metropolitan Region, this will be for urban climate effects
- Liaise and interact with the Dublin energy agency Codema

Internationally, FCC will liaise closely with the Covenant of Mayors for Climate and Energy and other established networks of European cities and associations. In association with Codema, FCC will seek technical and financial supports from EU programmes. Private commercial opportunities will be encouraged where possible to deliver solutions. Existing and new third-level research partnerships and new areas of research will be incorporated into relevant actions.

MILESTONE 5: MONITORING AND ITERATION

Monitoring and verifying progress on the implementation of actions to reduce or avoid greenhouse gas emissions is an ongoing process. Monitoring begins once actions are implemented and continues for their lifetime, providing important feedback that can be useful to improve roll out over time.

In order to guarantee the success of this Climate Change Action Plan, the Climate Action Team within Fingal County Council (working in close association with the CARO) will report directly to the Water and Environmental Services Strategic Policy Committee (SPC), and to the Chief Executive's Office, through the Director of the Water Services and Environment Department. This will help to track regular progress and updating of this Climate Change Action Plan. This reflects best practice of cities globally, which have acknowledged that progress on climate change adaptation and mitigation calls for cross-departmental action and coordination with all stakeholders.

A critical challenge in the implementation and monitoring of this plan is data. While staff are able to identify and discuss the vulnerabilities stemming from climate change and the actions to address them, the need for localised, reliable and valid data was emphasised for developing action indicators. Presently, the DLAs are reliant on various central government departments (not just the Central Statistics Office) for data on air quality (EPA), transportation (NTA), energy (SEAI) and flood risk (OPW). This challenge of accessibility and availability of localised data impacts on policy decisions, and the ability of the DLAs to monitor their progress on climate change actions.

Overall, this Climate Change Action Plan will be monitored on an ongoing basis and actions will be reviewed and updated annually. A full review and revision of the plan will take place every five years. This draft of the Climate Change Action Plan was developed through FCC's Water and Environmental Services SPC who report to the full County Council. The Director of the Water Services and Environment Department will report on progress to the SPC annually and the SPC will monitor progress towards the set targets. Every five years there will be a full review and revision of the plan taking into account demographic, technical and other changes that have occurred and any new targets that have been introduced.

KEY PERFORMANCE INDICATORS

The Dublin Metropolitan CARO agrees relevant Key Performance Indicators (KPIs) with the national Local Authority Climate Change Steering Group which, in turn, monitors the performance of the CARO against those agreed KPIs.

This Steering Group additionally links in with the Department of Communications, Climate Action and Environment (DCCAE), the Environmental Protection Agency (EPA), the Office of Public Works (OPW), Met Éireann and the national Climate Change Advisory Council. This facilitates engagement with the different government departments and helps to align the local authority KPIs with the national and EU climate policy objectives.

Covenant of Mayors for Climate & Energy

COVENANT OF MAYORS FOR CLIMATE AND ENERGY

FCC, along with over 7,000 cities and regions in 57 countries, is a signatory to the Covenant of Mayors for Climate and Energy, which is the world's largest movement for local climate and energy actions. The signatory cities pledge action to support implementation of the EU 40% greenhouse gas reduction target by 2030 and the adoption of a joint approach to tackling mitigation and adaptation to climate change.

Accordingly, FCC commits to submitting a Sustainable Energy and Climate Action Plan (SECAP) outlining the key actions it plans to undertake, and this must be submitted within two years of signing up to the initiative. The plan will feature a Baseline Emission Inventory to track mitigation actions and a Climate Risks and Vulnerability Assessment. This commitment marks the beginning of a long-term process, with cities committed to reporting every two years on the implementation progress of their plans.

APPENDIX I: CLIMATE CHANGE RISK ASSESSMENT

A climate change risk assessment is needed to determine which sectors in Fingal are the most vulnerable to future risks from a changing climate. Codema carried out a medium-term risk assessment up to the year 2050. The risk assessment was carried out once a baseline of climatic events and trends affecting Fingal had been established.

METHODOLOGY

The first step in conducting a climate change risk assessment is to determine a projection of different climate variables (such as wind speeds, heat waves, sea level rise, flooding, etc.). Codema used various sources to project climate parameters up to 30 years. This climate variables projection can be found in the Adaptation Baseline section.

To determine the effects of a changing climate on Fingal, Codema identified five action areas that include the different sectors in the County:

1. Critical infrastructure and the built environment
2. Transport
3. Biodiversity
4. Waste management
5. Water resources

The action areas chosen reflect the action areas used throughout this Climate Change Action Plan (Energy and Buildings, Transport, Nature-Based Solutions, Resource Management and Flood Resilience), which reflect FCC's remit. Once the action areas had been identified, the next step was to calculate the risk of these areas to a changing climate. This was done using the risk equation below to quantify future risks:

Future Risk = Consequence x Likelihood

Consequence is the level of damage caused by an event and likelihood is the probability of that same event occurring.

Both the likelihood and consequences are given a range of ratings from one to five and the result of their product is the future risk. The consequences are an estimation of future disruptions caused by the climate variables. Table 6 on the following page (adapted from the European Commission Non-paper Guidelines[31]) shows the consequence scoring matrix, with ratings that range from critical to negligible.

The likelihood rating is based on the level of confidence attributable to the projections of change in the climate variable projections. The likelihood ratings can be either almost certain, likely, possible, unlikely or rare.

Once the ratings for both the consequence and likelihood have been determined, then a climate risk matrix for each of the climate variables affecting the action areas is set up to determine the potential future risks. The future risks range from high risk to low risk; this is depicted in Table 7 on the next page, with the high risks, (the most urgent and should be addressed first) shown in red and dark orange, and the low risks shown as green (least urgent).

Consequence	
Critical	5
Major	4
Moderate	3
Minor	2
Negligible	1

Likelihood	
Almost Certain	5
Likely	4
Possible	3
Unlikely	2
Rare	1

Future Risk	
High Risk	[15-25]
Medium Risk	[7-14]
Low Risk	[1-6]

Table 6 Consequence Scoring Matrix

CONSEQUENCE					
	ASSET DAMAGE/ ENGINEERING	HEALTH & SAFETY	ENVIRONMENT	SERVICE PRIORITY	REPUTATION
Critical [5]	Disaster with potential to lead to shut down or collapse of the asset/network	Single or multiple fatalities and permanent injuries	Significant harm with widespread effect. Recovery longer than one year. Limited prospect of full recovery	Complete failure to deliver on a service priority	National, long term impact with potential to affect stability of government
Major [4]	A critical event that requires extraordinary/ emergency business continuity actions	Major injury leading to long term incapacity/ disability, multiple significant injuries	Significant harm with local effect. Recovery longer than one year. Failure to comply with environmental regulations	Major impact on a service priority	National, short term impact on public opinion, negative national media coverage
Moderate [3]	A serious event that requires additional emergency business continuity actions	Moderate injury requiring professional intervention or multiple minor injuries	Moderate harm with possible wider effect. Recovery in one year	Moderate impact (positive or negative) on a service priority	Local, long term impact on public opinion with adverse local media coverage
Minor [2]	An adverse event that can be absorbed through business continuity actions	Minor injury requiring minimal intervention or treatment	Localised within site boundaries. Recovery measurable within one month of impact	Minor impact (positive or negative) on a service priority	Localised, short term impact on public opinion
Negligible [1]	Impact can be absorbed through normal activity	Minimal injury only requiring first aid	No impact on baseline environment. Localised to point source. No recovery needed	Positive impact on a service or priority	Localised temporary impact on public opinion

Table 7 Climate Risk Matrix to Identify Potential Future Risks

CONSEQUENCE	LIKELIHOOD				
	RARE [1]	UNLIKELY [2]	POSSIBLE [3]	LIKELY [4]	ALMOST CERTAIN [5]
Critical [5]	5	10	15	20	25
Major [4]	4	8	12	16	20
Moderate [3]	3	6	9	12	15
Minor [2]	2	4	6	8	10
Negligible [1]	1	2	3	4	5

Table 8 Fingal's Climate Change Risk Matrix

IMPACT AREAS	CLIMATE RISKS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Critical Infrastructure & the Built Environment	Extreme Weather Events	Projected increases in temperature, wind speeds, cold snaps and rainfall will put a stress on the built environment, particularly on critical infrastructure (such as electricity and communication networks) and residential developments (with the most vulnerable populations being particularly at risk)	Cold Snaps	4	3	**12**
			Heat Waves	2	4	**8**
			Dry Spells	3	5	**15**
			Extreme Rainfall	4	3	**12**
			Wind Speeds	5	2	**10**
	Sea Level Rise	Increases in sea levels and wave overtopping, along with increased occurrence of coastal storms, will put the built environment at risk. This will include housing and critical infrastructure, which are typically built along the coast	Sea Level Rise	5	5	**25**
			Wave Height	4	3	**12**
			Tides	4	4	**16**
			Coastal Erosion	3	3	**9**
			Storm Surges	4	2	**8**
	Flooding	Coastal, fluvial and pluvial flooding will put additional stress and risk on the built environment. This additional risk will cause all areas in the built environment to suffer (businesses, residential, critical infrastructure, etc.)	Coastal & Tidal	5	5	**25**
			Fluvial	5	5	**25**
			Pluvial	4	4	**16**
Transport	Extreme Weather Events	Increases in wind speeds, cold snaps and rainfall will put a stress on transport networks, which may lead to disruptions of transport services during extreme events	Cold Snaps	5	3	**15**
			Heat Waves	2	4	**8**
			Dry Spells	2	5	**10**
			Extreme Rainfall	3	3	**9**
			Wind Speeds	4	2	**8**
	Sea Level Rise	Projected rises in sea level, wave heights and occurrence of coastal storms will put transport services (such as roads and the DART) that are along the coast and close to tidal rivers at increased risk	Sea Level Rise	4	5	**20**
			Wave Height	4	3	**12**
			Tides	3	4	**12**
			Coastal Erosion	3	3	**9**
			Storm Surges	4	2	**8**
	Flooding	Increases in coastal, fluvial and pluvial flooding will cause road damage, which can lead to disruption of transport services	Coastal & Tidal	5	5	**25**
			Fluvial	5	5	**25**
			Pluvial	4	4	**16**
Biodiversity	Extreme Weather Events	Projected increases in temperature, wind speeds, cold snaps and rainfall will put an increased stress on biodiversity, by causing damage, habitat loss and increasing the prevalence of invasive species	Cold Snaps	5	3	**15**
			Heat Waves	4	4	**16**
			Dry Spells	4	5	**20**
			Extreme Rainfall	3	3	**9**
			Wind Speeds	3	2	**6**

IMPACT AREAS	CLIMATE RISKS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Biodiversity	Sea Level Rise	Rising sea levels, wave heights and coastal erosion will greatly affect coastal habitats, with estuaries and wetlands being particularly at risk	Sea Level Rise	4	5	**20**
			Wave Height	4	3	**12**
			Tides	3	4	**12**
			Coastal Erosion	4	3	**12**
			Storm Surges	4	2	**8**
	Flooding	Increasing extreme flood events can cause loss of habitats and damage to ecosystems	Coastal & Tidal	4	5	**20**
			Fluvial	3	5	**15**
			Pluvial	2	4	**8**
Waste Management	Extreme Weather Events	Projected increases in temperature, heat waves and droughts may increase the risk of fires in landfill sites and can also increase the prevalence of vermin and odour	Cold Snaps	2	3	**6**
			Heat Waves	4	4	**16**
			Dry Spells	4	5	**20**
			Extreme Rainfall	5	3	**15**
			Wind Speeds	1	2	**2**
	Sea Level Rise	Increases in sea levels and tides will put pressure on sanitation systems (these are typically situated at low levels) located close to the coast	Sea Level Rise	4	5	**20**
			Wave Height	4	3	**12**
			Tides	4	4	**16**
			Coastal Erosion	2	3	**6**
			Storm Surges	2	2	**4**
	Flooding	Flooding of landfill sites increases the risk of surface and groundwater contamination	Coastal & Tidal	4	5	**20**
			Fluvial	3	5	**15**
			Pluvial	4	4	**16**
Water Resources	Extreme Weather Events	Projected increases in temperature, cold snaps and rainfall will affect flows and quality of water resources. Temperature increases and dry spells will result in a reduction of water resource availability, whilst cold snaps can cause disruption of water services	Cold Snaps	5	3	**15**
			Heat Waves	4	4	**16**
			Dry Spells	5	5	**25**
			Extreme Rainfall	5	3	**15**
			Wind Speeds	1	2	**2**
	Sea Level Rise	Rising sea levels, wave heights and tides put water supply and aquifers at risk. Therefore, sea level rise will need to be constantly managed to avoid flooding	Sea Level Rise	4	5	**20**
			Wave Height	3	3	**9**
			Tides	4	4	**16**
			Coastal Erosion	2	3	**6**
			Storm Surges	3	2	**6**
	Flooding	Increases in flooding incidents put more pressure on water systems, which are typically located at the lowest elevation possible and therefore are at a greater risk of flooding	Coastal & Tidal	5	5	**25**
			Fluvial	4	5	**20**
			Pluvial	4	4	**16**

APPENDIX II: TOTAL EMISSIONS IN FINGAL

This section examines the resulting total emissions from the different sectors in Fingal. The total emissions from the various sectors in Fingal amount to 1,976,230 tonnes of CO_2eq. The sectors that produced the most emissions were the transport, residential and commercial sectors, producing 44.6%, 26.0% and 24.5% respectively, of total emissions in Fingal. From this analysis, these three sectors should be the main targets of energy and emission reduction initiatives.

Figure 27 illustrates the total CO_2 equivalent emissions in tonnes of CO_2 equivalent by sector and fuel type. Waste and wastewater are all expressed as CO_2 equivalent, and are not broken down by fuel type, as the data provided was in terms of different GHG emissions.

From this analysis, Codema found that the commercial sector used the most electricity in Fingal, and had the highest emissions from electricity (58%). This may be due to the number of retail and industrial uses in Fingal, which both make use of a large amount of electricity as their main energy source. The residential sector had the highest CO_2 emissions for natural gas, accounting for 69% of the total gas emissions in Fingal. Meanwhile, the transport sector accounted for 99% of all diesel emissions in Fingal. It should be noted that the transport, residential and commercial sectors had the highest emissions and consumed more fossil fuels than the other sectors.

A more in-depth review of Fingal's energy use, emissions and methodologies for this baseline may be found in Codema's publication *Fingal Baseline Emissions Report 2016*.

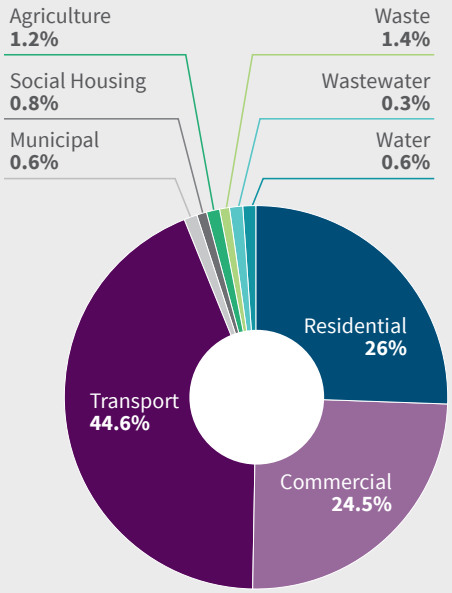


Figure 26 Share of Total Emissions in County Fingal

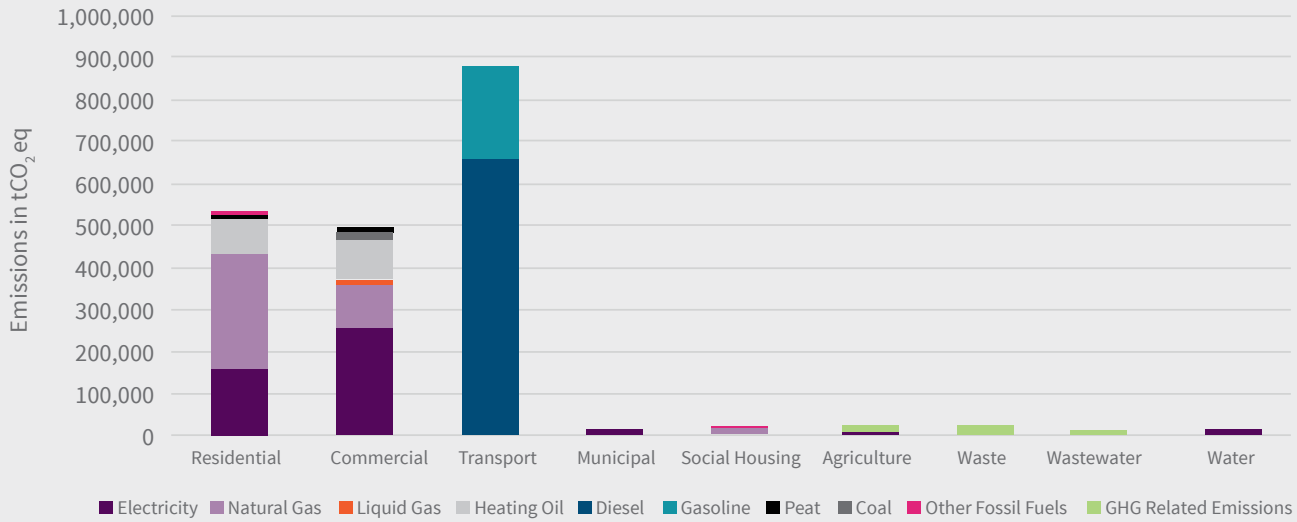


Figure 27 Total tCO_2eq Emissions in Different Sectors

Table 9 Fingal's 2016 Energy and Emissions Inventory in the Covenant of Mayors for Climate & Energy

SECTOR		FINAL ENERGY CONSUMPTION (MWh)															
				FOSSIL FUELS								RENEWABLE ENERGIES					
		ELECTRICITY	HEAT/COLD	NATURAL GAS	LIQUID GAS	HEATING OIL	DIESEL/GAS OIL	GASOLINE	LIGNITE	COAL	OTHER FOSSIL FUELS	PLANT OIL	BIOFUEL	OTHER BIOMASS	SOLAR THERMAL	GEO-THERMAL	TOTAL
BUILDINGS, EQUIPMENT, FACILITIES AND INDUSTRIES																	
Municipal buildings, equipment/facilities		6,392	-	6,873	-	-	-	-	-	-	-	-	-	-	-	-	13,265
Tertiary (non municipal) buildings, equipment/facilities		353,641	-	346,949	9,913	297,384	-	-	-	-	-	-	-	33,704	-	27,756	1,069,346
Residential Buildings		351,228	-	1,376,683	5,768	306,421	-	-	151	1,613	10,444	-	3	1,591	-	-	2,053,901
Public Lighting		13,985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13,985
Industry	Non-ETS	227,429	-	181,905	25,139	55,496	-	-	237	54,548	-	-	711	49,330	-	-	594,795
	ETS (not recommended)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SUBTOTAL		**952,673**	**-**	**1,912,409**	**40,821**	**659,301**	**-**	**-**	**388**	**56,160**	**10,444**	**-**	**714**	**84,625**	**-**	**27,756**	**3,745,291**
TRANSPORT																	
Municipal fleet		-	-	-	-	-	5,927	206	-	-	-	-	-	-	-	-	6,134
Public Transport		1,355	-	-	842	-	944,659	320,921	-	-	-	-	-	-	-	-	1,267,776
Private and commercial transport		2,241	-	-	1,393	-	1,562,851	530,934	-	-	-	-	-	-	-	-	2,097,419
SUBTOTAL		**3,596**	**-**	**-**	**2,234**	**-**	**2,513,437**	**852,061**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3,371,328**
OTHER																	
Agriculture, Forestry, Fisheries		5,864	-	-	-	2,236	28,698	-	-	-	-	-	-	-	-	-	36,798
TOTAL		**962,133**	**-**	**1,912,409**	**43,055**	**661,538**	**2,542,135**	**852,061**	**388**	**56,160**	**10,444**	**-**	**714**	**84,625**	**-**	**27,756**	**7,153,418**

SECTOR		CO_2 EMISSIONS															
				FOSSIL FUELS								RENEWABLE ENERGIES					
		ELECTRICITY	HEAT/COLD	NATURAL GAS	LIQUID GAS	HEATING OIL	DIESEL/GAS OIL	GASOLINE	LIGNITE	COAL	OTHER FOSSIL FUELS	PLANT OIL	BIOFUEL	OTHER BIOMASS	SOLAR THERMAL	GEO-THERMAL	TOTAL
BUILDINGS, EQUIPMENT, FACILITIES AND INDUSTRIES																	
Municipal buildings, equipment/facilities		2,988	-	1,407	-	-	-	-	-	-	-	-	-	-	-	-	4,395
Tertiary (non municipal) buildings, equipment/facilities		165,327	-	71,020	2,273	76,428	-	-	-	-	-	-	-	-	-	-	315,048
Residential Buildings		164,199	-	281,807	1,323	78,750	-	-	54	549	2,756	-	-	-	-	-	529,438
Public Lighting		6,538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,538
Industry	Non-ETS	106,336	-	37,236	5,764	14,263	-	-	84	18,579	-	-	-	-	-	-	182,262
	ETS (not recommended)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SUBTOTAL		**445,388**	**-**	**391,470**	**9,360**	**169,440**	**-**	**-**	**138**	**19,128**	**2,756**	**-**	**-**	**-**	**-**	**-**	**1,037,681**
TRANSPORT																	
Municipal fleet		-	-	-	-	-	1,565	52	-	-	-	-	-	-	-	-	1,617
Public Transport		633	-	-	193	-	249,390	80,872	-	-	-	-	-	-	-	-	331,088
Private and commercial transport		1,048	-	-	319	-	412,593	133,795	-	-	-	-	-	-	-	-	547,755
SUBTOTAL		**1,681**	**-**	**-**	**512**	**575**	**663,547**	**214,719**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**880,459**
OTHER																	
Agriculture, Forestry, Fisheries		2,741	-	-	-	-	7,576	-	-	-	-	-	-	-	-	-	10,892
OTHER NON-ENERGY RELATED																	
Waste Management																	28,192
Waste water management																	6,813
Other non-energy related (Agriculture GHG emissions)																	12,192
TOTAL		**449,810**	**-**	**391,470**	**9,872**	**170,015**	**671,124**	**214,719**	**138**	**19,128**	**2,756**	**-**	**-**	**-**	**-**	**-**	**1,976,229**

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ABBREVIATIONS

AAMP	Ambient Air Quality Monitoring Programme
AASL	Annual Average Sea Level
AEP	Annual Event/Exceedance Probability
BER	Building Energy Rating
CARO	Climate Action Regional Office
CCAP	Climate Change Action Plan
CCC	Conscious Cup Campaign
CFRAM	Catchment Flood Risk Assessment and Management
CMT	Crisis Management Team
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2 eq	Carbon Dioxide Equivalent
CoP	Conference of the Parties
DAFM	Department of Agriculture, Food and the Marine
DCCAE	Department of Communications, Climate Action and Environment
DCFPP	Dublin Coastal Flooding Protection Project
DEC	Display Energy Certificate
DMURS	Design Manual for Urban Roads and Streets
DHPLG	Department of Housing, Planning and Local Government
DLAs	Dublin Local Authorities
DTTAS	Department of Transport, Tourism and Sport
EIA	Environmental Impact Assessment
EMRW	Eastern Midlands Regional Waste
EPA	Environmental Protection Agency
EPC	Energy Performance Contract
ESCo	Energy Service Company
ETS	Emissions Trading Scheme
EU	European Union
FCC	Fingal County Council
FEM-FRAMS	Fingal East Meath Flood Risk Assessment and Management Study
GDA	Greater Dublin Area
GLAS	Green Low Carbon Agriculture Environment Scheme
GHG	Greenhouse gas
GWh	Gigawatt hour
ICLEI	Intergovernmental Council for Local Environmental Initiatives
ICPS	Irish Coastal Protection Study
IPCC	Intergovernmental Panel on Climate Change
km	Kilometre
KPI	Key Performance Indicator
LAP	Local Area Plan
LECP	Local Economic and Community Plan
M&R	Monitoring and Reporting
MEM	Major Emergency Management
MSL	Mean Sea Level
NAF	National Adaptation Framework
NEEAP	National Energy Efficiency Action Plan
NMP	National Mitigation Plan
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxide
NPF	National Planning Framework
NREAP	National Renewable Energy Action Plan
NTA	National Transport Authority
nZEB	nearly Zero Energy Building
ODM	Observed Difference in Mean
OPW	Office of Public Works
PES	Principal Emergency Service
PM_{10}	Particulate Matter
$PM_{2.5}$	Fine Particulate Matter
PPN	Public Participation Network
PRA	Principal Response Agency
PV	Photovoltaic
QBC	Quality Bus Corridor
RD&D	Research, Development and Demonstration
SAFER	Strategies and Actions for Flood Emergency Risk
SBIR	Small Business Innovation Research
SDZ	Strategic Development Zone
SEAI	Sustainable Energy Authority of Ireland
SECAP	Sustainable Energy and Climate Action Plan
SEDA	Spatial Energy Demand Analysis
SEU	Significant Energy User
SFRA	Strategic Flood Risk Assessment
SO_2	Sulphur Dioxide
SPC	Strategic Policy Committee
SuDS	Sustainable urban Drainage Systems
tCO_2	Tonnes of carbon dioxide
TII	Transport Infrastructure Ireland
UCD	University College Dublin
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VOICE	Voice of Irish Concern for the Environment
WHO	World Health Organisation
WMO	World Meteorological Organisation

Comhairle Contae
Fhine Gall
Fingal County
Council

Codema
Dublin's Energy Agency