



DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL
**DRAFT CLIMATE CHANGE
ACTION PLAN**

2019-2024

This *Draft Climate Change Action Plan* has been prepared by the Dublin energy agency Codema, in partnership with the Climate Change and Energy Strategic Policy Committee and the Elected Members of Dún Laoghaire-Rathdown County Council. 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.

CONTENTS

EXECUTIVE SUMMARY	4
INTRODUCTION	8
CLIMATE ACTION – ADAPTATION & MITIGATION	12
GLOBAL, NATIONAL AND LOCAL CONTEXTS	13
THE ACTION PLAN PROCESS	16
MILESTONE 1: INITIATE	18
MILESTONE 2: RESEARCH	19
PUBLIC AWARENESS	20
ADAPTATION BASELINE	22
MITIGATION BASELINE	44
MILESTONE 3: PLAN	49
GATHERING ACTIONS & DEVELOPING INDICATORS	49
ACTION AREAS	51
ENERGY & BUILDINGS	52
TRANSPORT	60
FLOOD RESILIENCE	68
NATURE-BASED SOLUTIONS	74
RESOURCE MANAGEMENT	82
MILESTONE 4: IMPLEMENTATION	88
MILESTONE 5: MONITORING & ITERATION	89
APPENDICES	90





FOREWORD



MESSAGE FROM AN CATHAOIRLEACH OSSIAN SMYTH

The Dún Laoghaire-Rathdown 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 (DLAs) - Dún Laoghaire-Rathdown County Council, Fingal County Council, Dublin City Council, and South Dublin County Council - are developing their Climate Change Action Plans collaboratively through Codema, Dublin's Energy Agency and through the work of the SPCs.

The Dún Laoghaire-Rathdown Climate Change Action Plan sets specific actions and targets. The targets we set cover our own direct emissions as a local authority; we will, however, aim to influence the emissions in the wider County through leading by example and working with communities, businesses and national government.

My local authority will lead by example; introducing ambitious emissions reduction measures in our own operations, such as electrifying our vehicle fleet and re-insulating our social housing stock.

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 THE CHIEF EXECUTIVE PHILOMENA POOLE

Climate change is one of the biggest global challenges of this century. The imperative and responsibility of public bodies to provide leadership to combat the impacts of climate change has never been greater. This is the moment when we must take action and show our ambition through real action to preserve the world as we know it for the generations that will come after us – our own children, grandchildren and great grandchildren. We will only achieve this by working together and making sure we all make our own contributions to reducing our carbon footprint. Dún Laoghaire-Rathdown County Council has put climate change to the forefront of our agenda. Our Climate Change Action Plan sets out how this Council aims to significantly reduce carbon emissions by 2030. DLR is already on track to meet its target of reducing energy consumption by 33% by 2020. Initiatives in the Council's programme of work such as our housing programme where we deliver exemplar projects like the houses at Georges Place and Rochestown House to promote nearly Zero Energy Build, the roll out of electric charging points, replacement of our public lighting with LED lights, commencing the replacing of our fleet with electric vehicles, targeting the elimination of single use cups in our own facilities, and ongoing environmental awareness programmes are all evidence of this Council's commitment to this challenge. We have committed a further €150,000 in the 2019 budget to further support this action plan. This action plan has been organised into five key areas:

- Energy and Buildings
- Transport
- Flood Resilience
- Nature-Based Solutions
- Resource Management

I look forward to us achieving on all five pillars in conjunction with the other Dublin Authorities. This plan is a joint initiative across all four Dublin Councils as together we look to lead the way at local level.

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 Dún Laoghaire-Rathdown County Council to achieve these targets, this Climate Change Action Plan sets out the current 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 Dún Laoghaire-Rathdown 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 capital has risen in the last 10 years. Dún Laoghaire-Rathdown 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.

The mitigation baseline calculates the greenhouse gas emissions for the Council's own activities and also for the entire Dún Laoghaire-Rathdown area (including a breakdown of the residential, transport and commercial sectors). It found that Dún Laoghaire-Rathdown County Council produced 11,280 tonnes of CO₂ in 2017 and has reduced its emissions by 24% in the last 10 years. In addition, the Council has improved its energy efficiency by 28.2% 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 just over 2% of the total emissions in Dún Laoghaire-Rathdown, it highlights the need to tackle the remaining 98% of emissions produced county-wide. In recognising this challenge, Dún Laoghaire-Rathdown County Council will work with key stakeholders to influence and support carbon reduction initiatives across the County's transport, commercial and residential sectors.

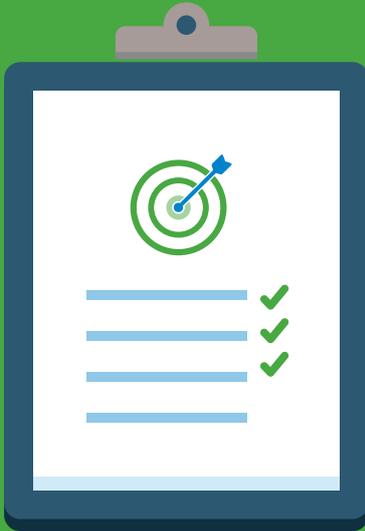
In addition, as public awareness is key to tackling both climate adaptation and mitigation, Dún Laoghaire-Rathdown County Council commits through this plan to address the current knowledge-gap and will encourage citizens to act on climate change through a range of awareness and behavioural change actions.

This Climate Change Action Plan has been developed by the Dublin energy agency Codema on behalf of Dún Laoghaire-Rathdown 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 will be continually monitored and updated by a dedicated climate action team working across 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 national and international best practice.



ABOUT THE PLAN



Dún Laoghaire-Rathdown 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 Dún Laoghaire-Rathdown 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

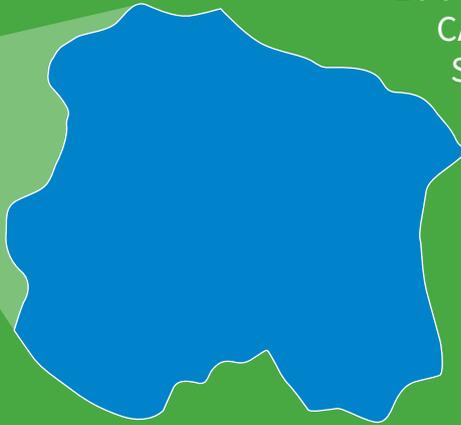
40%

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



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

OVERVIEW OF DÚN LAOGHAIRE-RATHDOWN



MAIN RIVERS
LOUGHLINSTOWN
CARRICKMINES
SHANGANAGH
DODDER



MAIN RISK AREAS:

FLOODING

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

SEA LEVEL RISE



POPULATION
218,018



78,601
HOUSEHOLDS

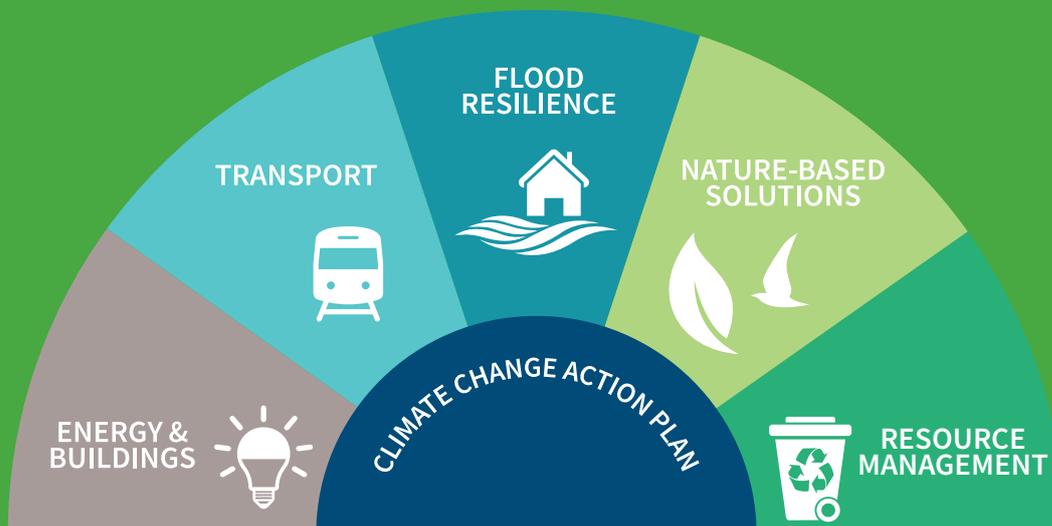


17 km
OF COASTLINE



ACTION AREAS

The actions in this plan have been organised under the action areas shown below, reflecting Dún Laoghaire-Rathdown County Council's remit.



INTRODUCTION

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

THE FOUR MAIN TARGETS OF THIS PLAN ARE:

<p>33% improvement in the Council's energy efficiency by 2020</p> 	 <p>Make Dublin a climate-resilient region by reducing the impacts of future climate change-related events</p>
<p>40% reduction in the Council's greenhouse gas emissions by 2030</p> 	 <p>Actively engage and inform our citizens on climate change</p>

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 (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 (DCCA) 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 - have developed 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).

Dún Laoghaire-Rathdown County Council (DLRCC) 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 Change Action Plans and reduce their regions' greenhouse gases (GHGs) by 40% by 2030. DLRCC will apply this target to its own operations but will also influence a reduction in GHGs in Dún Laoghaire-Rathdown by leading by example and working with key stakeholders and decision-makers.

DLRCC will also help to make Dún Laoghaire-Rathdown climate-resilient and protect its critical infrastructure by reducing the impacts of current and future climate change-related events, 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, DLRCC 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 DÚN LAOGHAIRE-RATHDOWN 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 fuels

ENVIRONMENTAL



- 1 By using nature-based solutions to combat climate risks, we can increase the green infrastructure of the County
- 2 By improving our public transport and cycling networks, we reduce congestion 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 County 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 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.

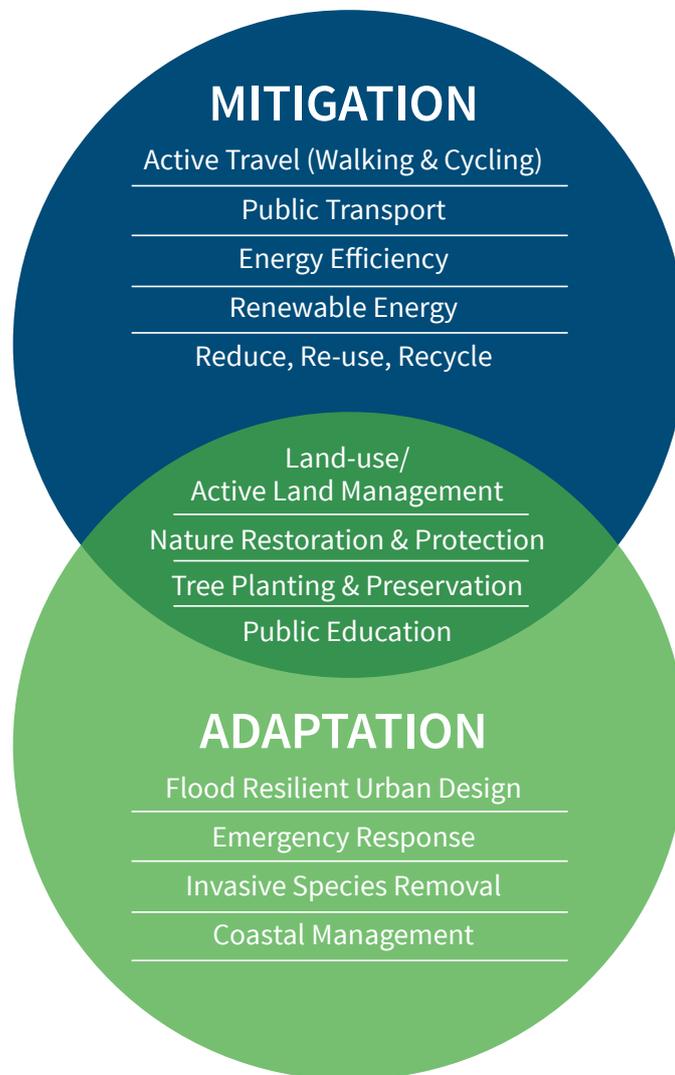


Figure 1 Examples of some Mitigation and Adaptation Solutions and their Crossovers



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]

“ 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.

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.

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 (ETS) 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.

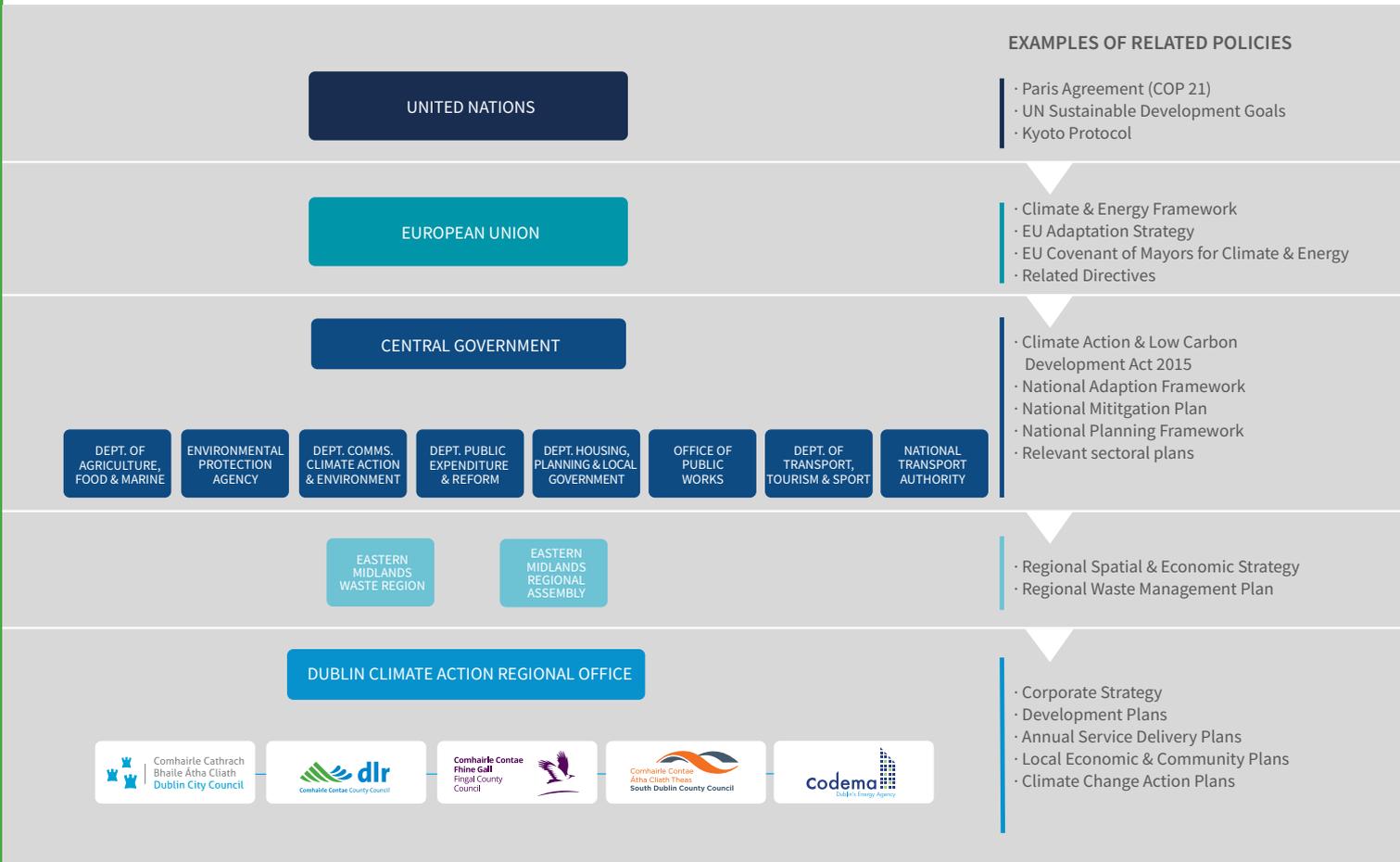


Figure 2 Institutional and Policy Context



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 (DCCA) 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 DÚN LAOGHAIRE-RATHDOWN 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 many 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. DLRCC's focus is on climate-proofing the areas for which it has direct responsibility. In areas outside its remit, DLRCC 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 (DCCA), thereby supporting the whole of government approach to climate action. Recognising its role as a climate leader, DLRCC 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 to develop 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 developing 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 Dún Laoghaire-Rathdown 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 which sectors in Dún Laoghaire-Rathdown are the 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 DLRCC 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 DLRCC, which identifies and assesses the current climate change risks facing Dún Laoghaire-Rathdown. 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 DLRCC's own operations and emissions for the whole of Dún Laoghaire-Rathdown. 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 Dún Laoghaire-Rathdown 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 the Dún Laoghaire-Rathdown area. 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^[4]. 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, which is explained further on in the document.

The Dún Laoghaire-Rathdown region is 125 km², and comprises of 17 km of coastline, which includes beaches, marshes and cliffs, and four main rivers (the River Dodder,

Carrickmines River, Loughlinstown River and Shanganagh River) and several streams (Deansgrange Stream, Crinken Stream, Carysfort-Maretimo Stream, the Little Dargle, and the Slang, which are tributaries of the River Dodder).

Approximately two thirds of the County comprises of built-up areas, such as small towns and villages, which makes up an urban environment^[5]. According to the most recent Census (2016)^[4], the Dún Laoghaire-Rathdown area has a population of 218,018, with 78,601 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. 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.

These geographic and demographic characteristics make Dún Laoghaire-Rathdown sensitive to a set of climate change risks, which differ from rural, landlocked or sparsely-populated regions.

As explained in the previous section, this plan follows the ICLEI Five Milestone Approach. As part of this approach, the second milestone (Research) collected information 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 Dún Laoghaire-Rathdown 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 below 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 the Dublin Region, 90.8 mm of rain fell.
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.
Extreme Temperatures	Summer 2006	Warmest summer on record since 1995.
Pluvial	August - September 2008	42.9 mm of rain fell in 2 hours which was a 1-in-100 year event. After just two hours of rainfall, numerous calls were made to the Dublin Fire Brigade, the Dublin Traffic Control Centre and the Drainage Division. The DART line was severely disrupted.
Extreme Cold	December 2010	It was the coldest of any month at Dublin Airport, Casement Aerodrome and Mullingar, in 50 years. Casement Aerodrome's temperature plummeted to -15.7°C on Christmas Day, the lowest temperature ever recorded in Dublin.
Pluvial/Fluvial	October 2011	This was between a 1-in-50 and a 1-in-100 year event across the majority of Dublin.
Coastal	January 2014	The highest tide ever recorded, at 3.014 metres ODM recorded at Alexandra Basin.
Storm Darwin	February 2014	A 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 County, 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

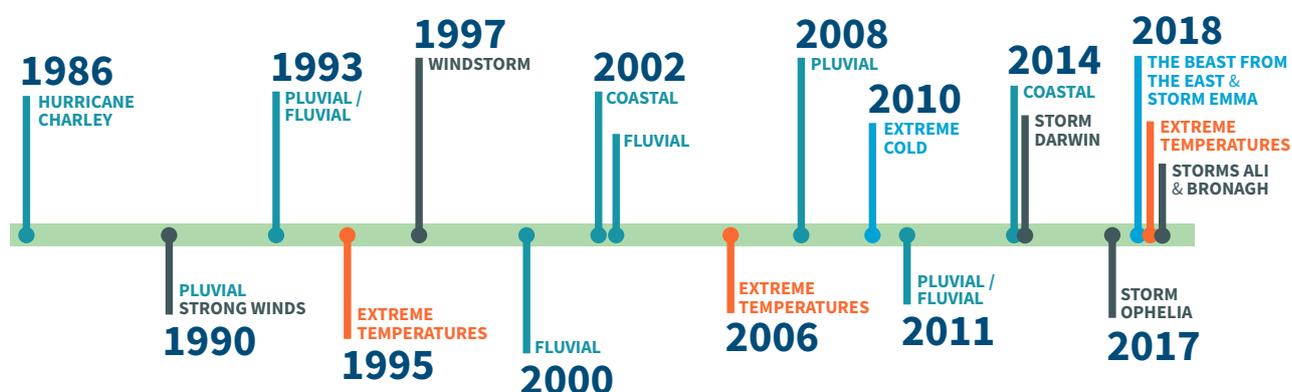


Figure 4 Timeline of Major Climatic Events in Dún Laoghaire-Rathdown

CLIMATIC EVENTS, TRENDS & RISKS

The Dublin Region’s geographic and demographic characteristics make it vulnerable to certain risks. As an urban environment, Dún Laoghaire-Rathdown 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 Dún Laoghaire-Rathdown area, waste heat generated from urban activities and a lack of tree cover, which can reduce temperatures in the area through shading. Flood risks are also higher in urban environments, 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 and semi-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 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 Dún Laoghaire-Rathdown is facing are:

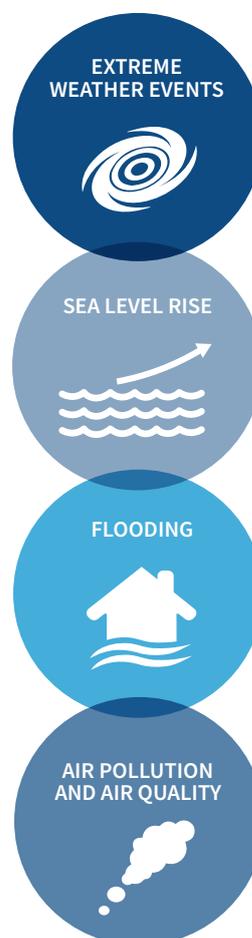
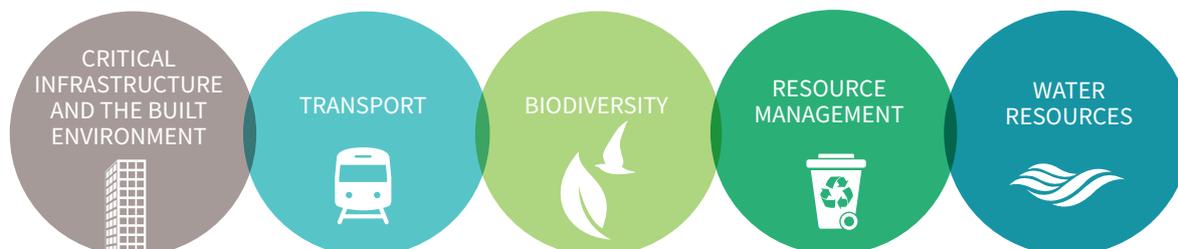


Table 2 Climate Variables Projection: 30 Year Overview

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 Dún Laoghaire-Rathdown, 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, Flood Resilience, Nature-Based Solutions and Resource Management), which reflect DLRCC’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 Dún Laoghaire-Rathdown. The projected changes (Table 2) give an overview of the future risk that Dún Laoghaire-Rathdown 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:

Consequence	
Critical	5
Major	4
Moderate	3
Minor	2
Negligible	1

x

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

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

=

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:

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. A more in-depth analysis about risk matrices and the method by which they are calculated may be found in Appendix I. An additional 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



Dún Laoghaire-Rathdown has experienced an increase in extreme weather events, and this is evident from the Timeline of Major Climatic Events (Figure 4) illustrated earlier in this chapter. 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 the summer months, with extreme cold spells during winter. 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, the Dún Laoghaire-Rathdown region experienced its greatest snowfall since the winter of 1982, with depths of up to 55 cm, as a result of 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 snowdrifts resulted in the closure of all schools across the country. This was followed by extreme cold and blizzard-like conditions, as a result of Storm Emma coming from the Atlantic. Many businesses in Dún Laoghaire-Rathdown were forced to close, and many homes and businesses also experienced power outages. High demands were placed on the country’s water network and many households and businesses in the area were affected by water outages or curtailments in the days after Storm Emma^[1.6].

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^[1.7,18].

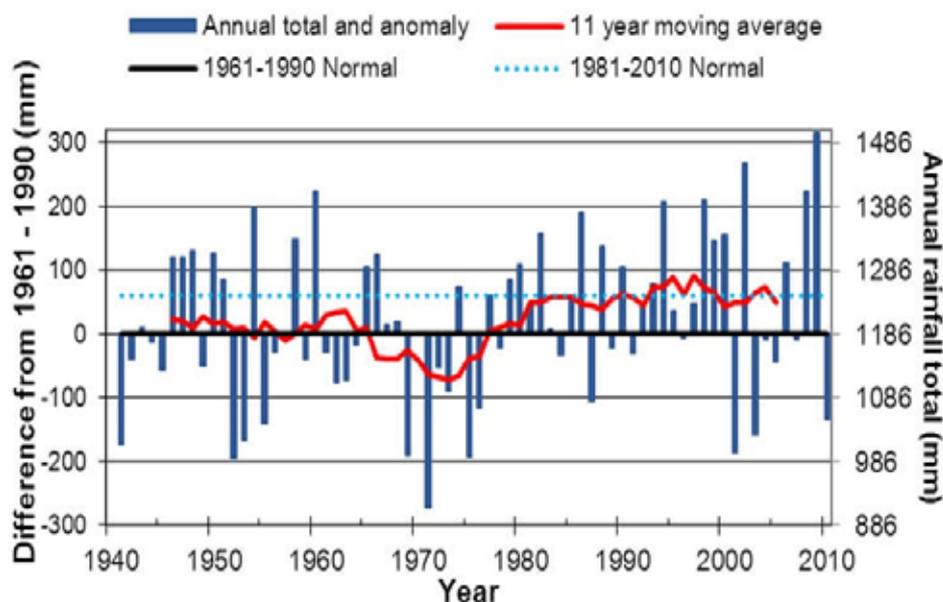


Figure 5 Annual Rainfall (1941-2010) (Source: Met Éireann / Dwyer)

Figure 6 below shows that 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."^[19] This will see new challenges for Dún Laoghaire-Rathdown 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^[20].

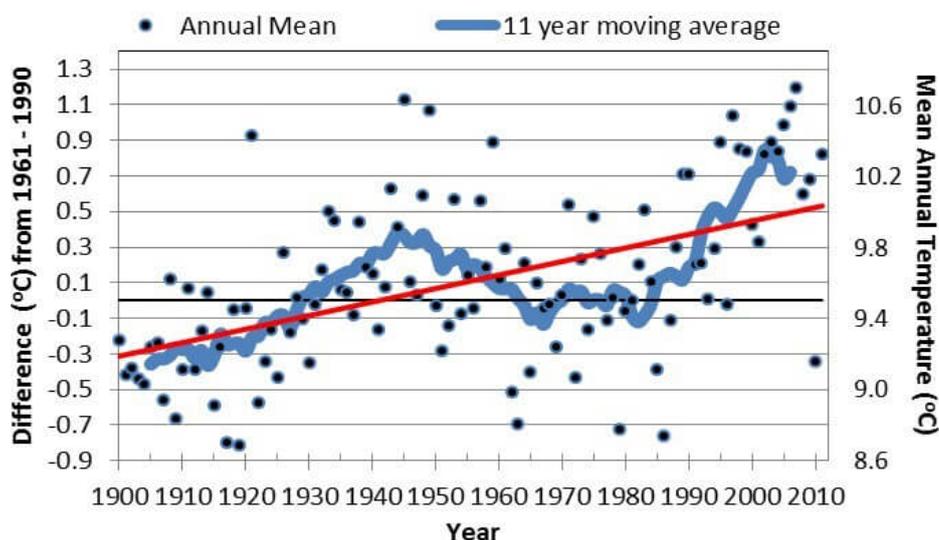


Figure 6 Mean Surface Air Temperature (1900-2011) (Source: Met Éireann / Dwyer)

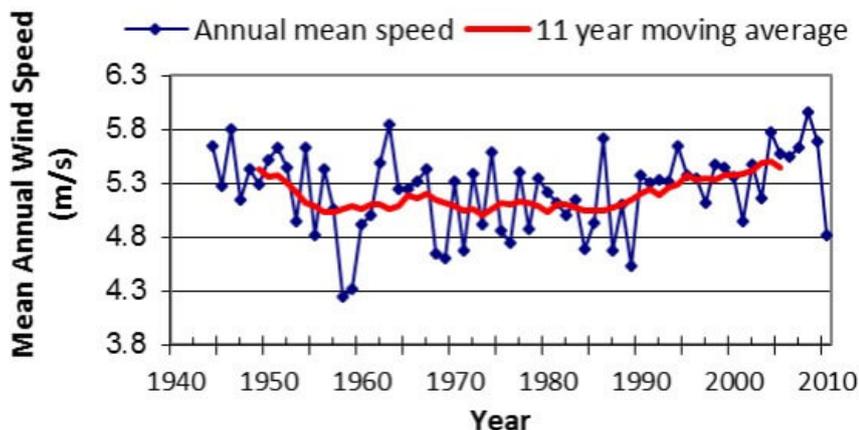


Figure 7 Dublin Airport Wind Trends (1944-2010) (Source: Met Éireann / Dwyer)

EXTREME WEATHER RISKS

Dún Laoghaire-Rathdown's extreme weather risks are very much linked to the characteristics of urban areas. The Dublin Region's temperatures are already increasing, as it experiences 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 increases. Recently, in 2018, Ireland experienced extreme temperatures, which caused heat wave and drought conditions, and resulted in a hose pipe 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. During Storm Emma, prolonged periods of cold resulted in water pipes freezing and then bursting as the temperatures started to rise, which left homes in the County 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 the County at risk of coastal flooding, due to sea surges caused by both sea level rise and extreme weather. Due to the characteristics of the Dublin Region, 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^[17,18]. "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. This can also affect water quality and may cause pollutant contamination to surface water that may be attributed to a decrease in water flows during the warming summer and autumn months. Areas to the east are expected to see the strongest increase over the coming decades."^[18] Meanwhile, precipitation projections indicate an increase of up to 20% in heavy rainfalls during the autumn and winter seasons^[18].

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^[18]. 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 adaptation actions for extreme weather events 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 Dún Laoghaire-Rathdown 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, surveillance, evaluating and monitoring
- The use of nature-based solutions (such as green roofs and SuDs) to reduce the increased risk from heat waves and flooding
- Energy-efficient buildings to ensure preparedness to extreme temperatures. DL RCC is continually upgrading its social housing stock to make it more efficient by retrofitting to nearly Zero Energy Building (nZEB) standard. Furthermore, all new developments in Ireland have to be energy efficient, and must comply with nearly Zero Energy Building (nZEB) standards after 31st 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 and species 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
Resource 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^[21]. 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 Dublin is a coastal County, rises in sea level and coastal tides would significantly impact the region 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 increases their intensity.

Approximately 20% of Ireland's coastline is eroding^[21]. 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).

BASELINE ASSESSMENT

As a coastal area, Dún Laoghaire-Rathdown 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.

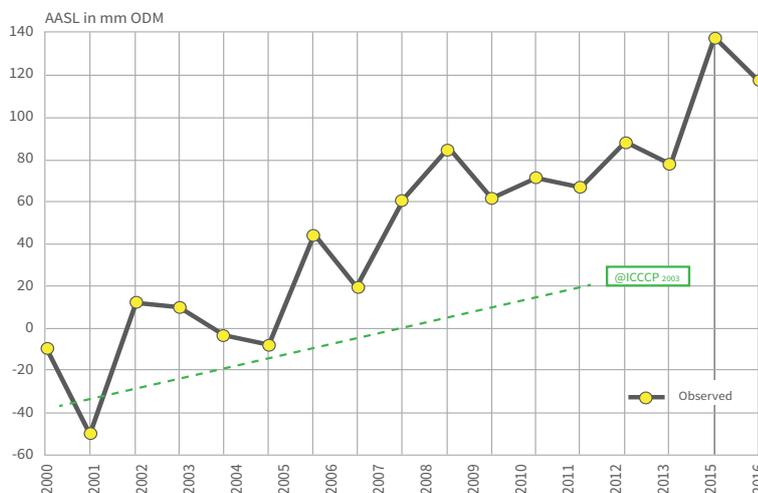


Figure 8 Dublin Annual Average Sea Level 2000-2016 (Source: DCC)



To reduce vulnerability to sea level rise, a minimum safety of four metres above present sea level in the east coast of Ireland is recommended; this accounts for a rise in sea level of 0.5 metres, a storm surge of 2.95 metres and a safety margin^[22].

It is important to note that sea level rise, while an important phenomenon to understand for Dún Laoghaire-Rathdown, is only one element that contributes to flooding issues in the area.

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

Sea level rise risks may be categorised as economic, social and environmental risks. The risks associated with sea level rise in Dún Laoghaire-Rathdown 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
- **Increased pressure on sanitation systems** - 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 Dún Laoghaire-Rathdown, especially since some housing and major infrastructure (roads, DART lines) are along the coast
- **Increased wave heights and high tides** producing damage further inland and upstream
- **Destruction** and alterations of coastal and marine ecosystems, habitats and species

FUTURE RISKS

Future projections indicate continued sea level rise will be 3-4 mm per year globally^[21], 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.

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^[18]. This will make Dún Laoghaire-Rathdown 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 will put an increased stress on water supply systems.

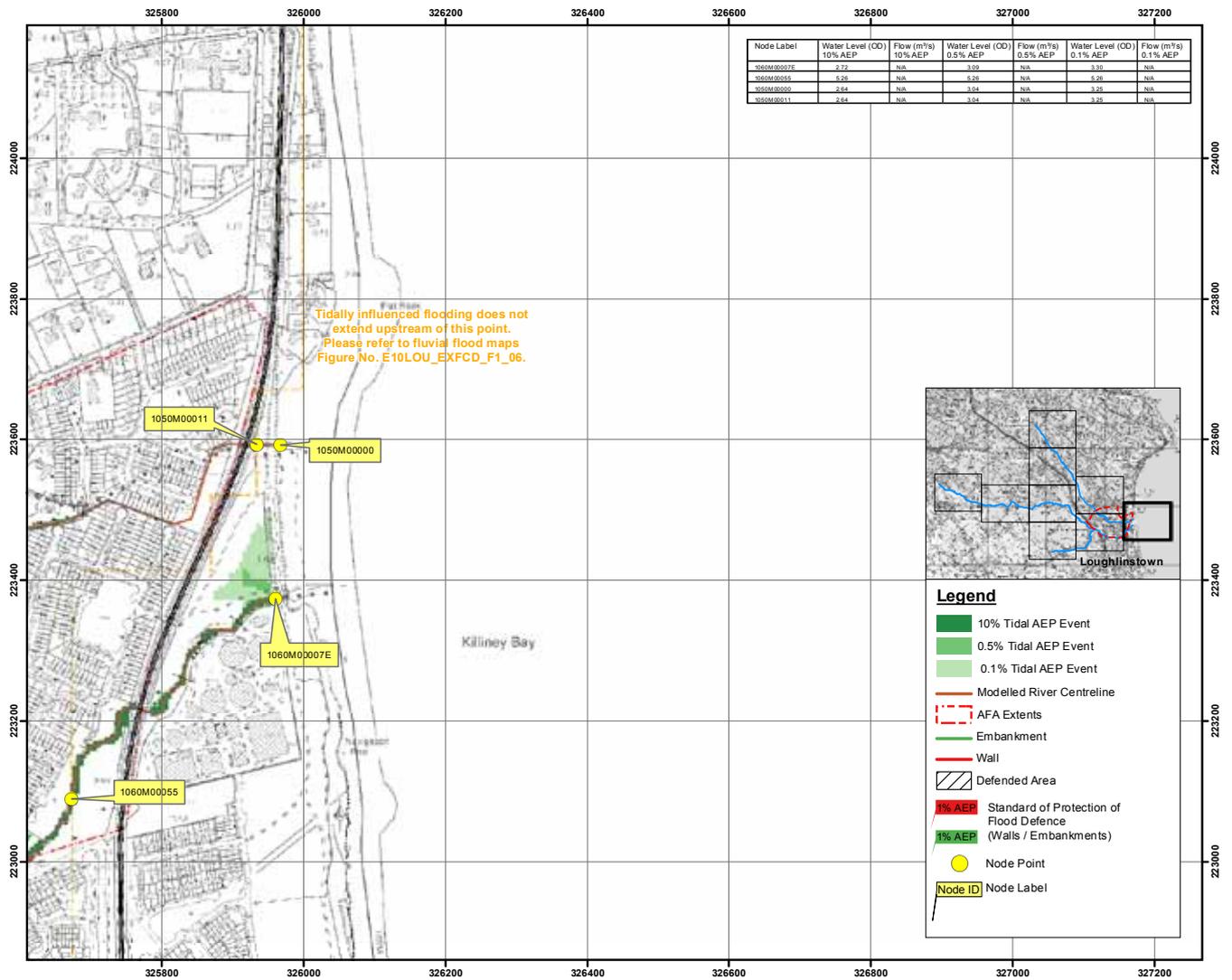


Figure 9 Dún Laoghaire-Rathdown Tidal Flood Extents (Source: Adapted from OPW/RPS)



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 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
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 coastal erosion will greatly affect coastal and marine ecosystems and species' habitats	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
Resource 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 water quality at risk	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 the actions is to reduce and address the current and future effects of sea level rise. The solutions adopted by Dún Laoghaire-Rathdown County Council include:

- 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

- Protection of wetland ecosystems along the coast in order to provide natural protection against flooding and erosion
- Regulatory measures, such as creating development and buffer zones, to ensure that no development takes place in areas subject to coastal flooding due to sea level rise

FLOODING



The effects of urbanisation and climate change both impact and increase the risk of flooding. This is the case for Dún Laoghaire-Rathdown, which has had an increase in urban areas and is also a coastal County that has a complex system of rivers, 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. Dún Laoghaire-Rathdown 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 of Dún Laoghaire-Rathdown

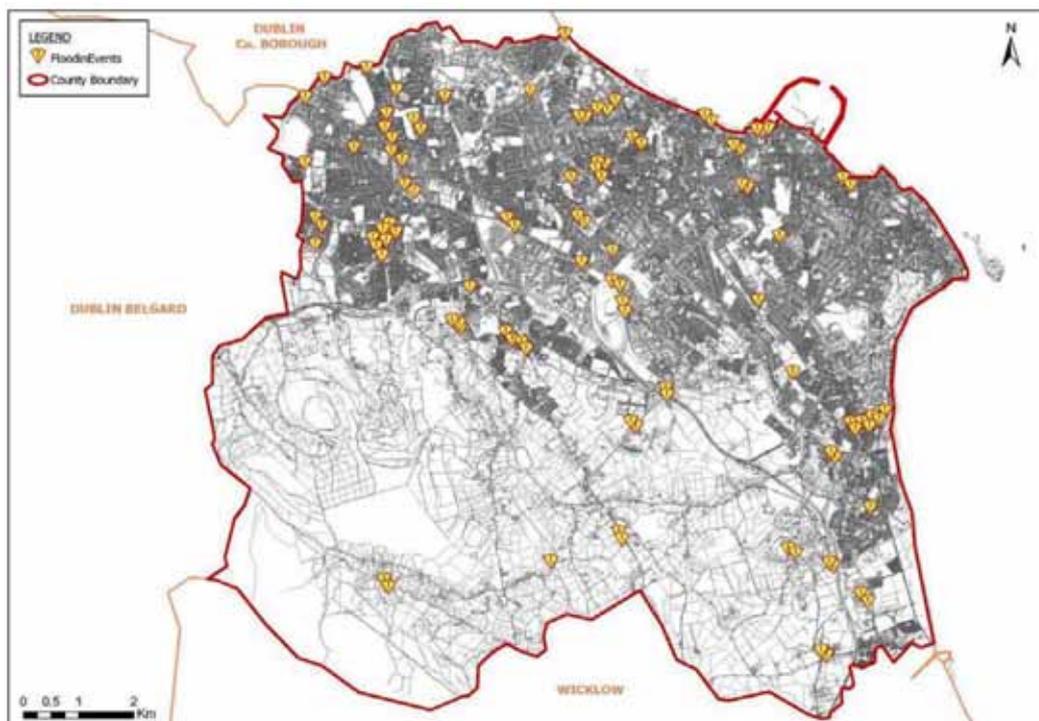


Figure 10 Flood Events in Dún Laoghaire-Rathdown, as Identified by the OPW

BASELINE ASSESSMENT

As outlined earlier in Table 1, there are very few records of significant flooding events between the years of 1963 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 from 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.

FLOOD RISKS

Dún Laoghaire-Rathdown faces significant flood risk throughout the County, particularly along its coast where

it is at risk of tidal flooding. Inland, it faces fluvial flood risk along the River Dodder and its many tributaries.

The extent of flood damage due to rivers may be seen in Figure 11 below, which depicts the potential fluvial flood risks. This shows how rivers flooding would impact a large population and would cause significant damage to the surrounding area.

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. Dún Laoghaire-Rathdown County Council therefore works to inform residents and business owners of their riparian responsibilities.

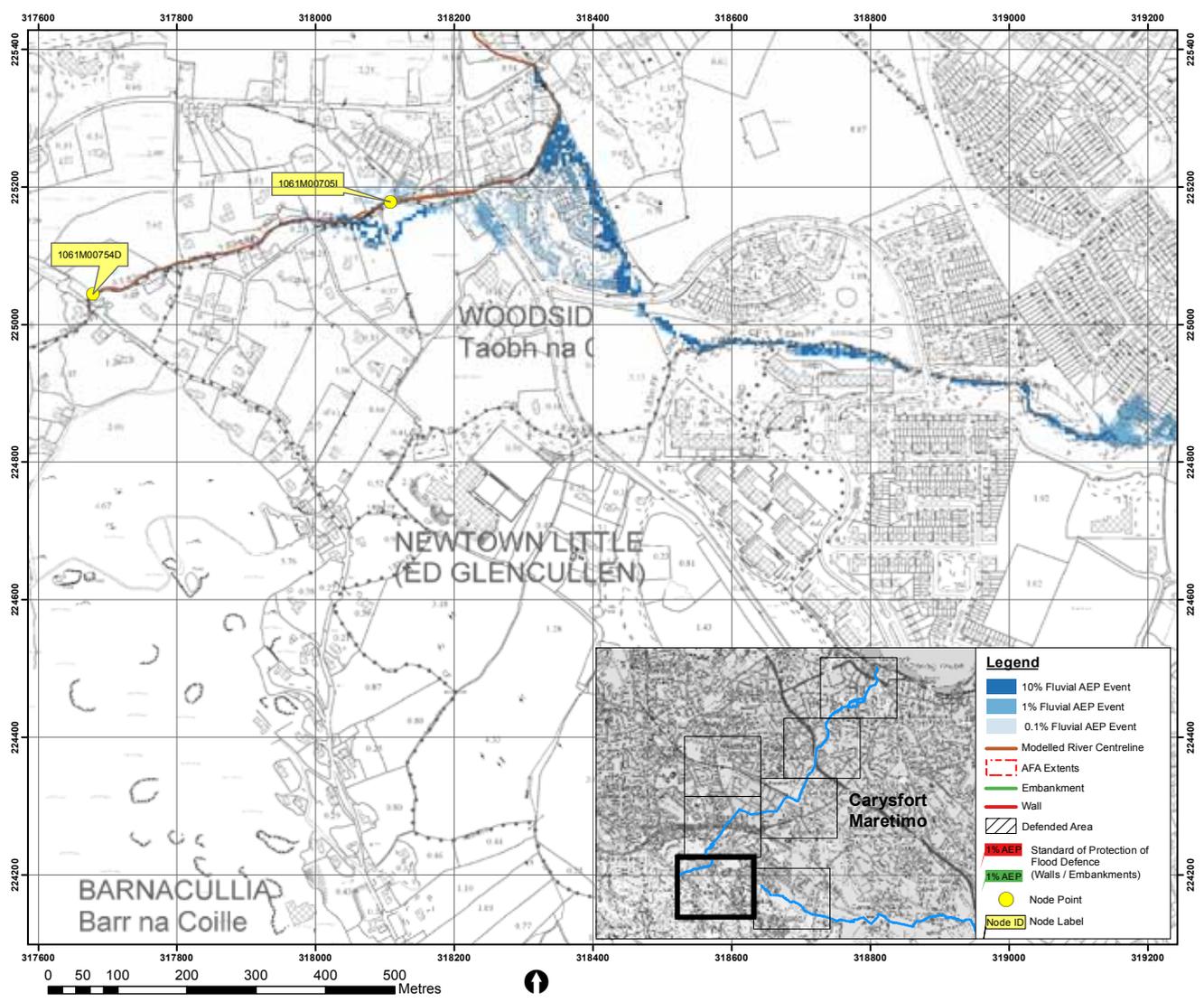


Figure 11 Fluvial Flood Risk (Source: Adapted from OPW/RPS)

FUTURE RISKS

With climate change, it is predicted that the probability of flood events occurring will increase, e.g. a 1-in-100-year event may become a 1-in-25-year event instead. 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 12 below depicts a fluvial study carried out in Dún Laoghaire-Rathdown 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 will be dependent on urban settlement patterns, land use and the quality of flood forecasting, warning and response systems in place. The Dublin Region is especially vulnerable to future risks, due to the projected population growth over the coming years. This increased risk of flooding will affect Dún Laoghaire-Rathdown's already vulnerable systems, in terms of increased pressure on water and sanitation systems, and damage to critical infrastructure and property.

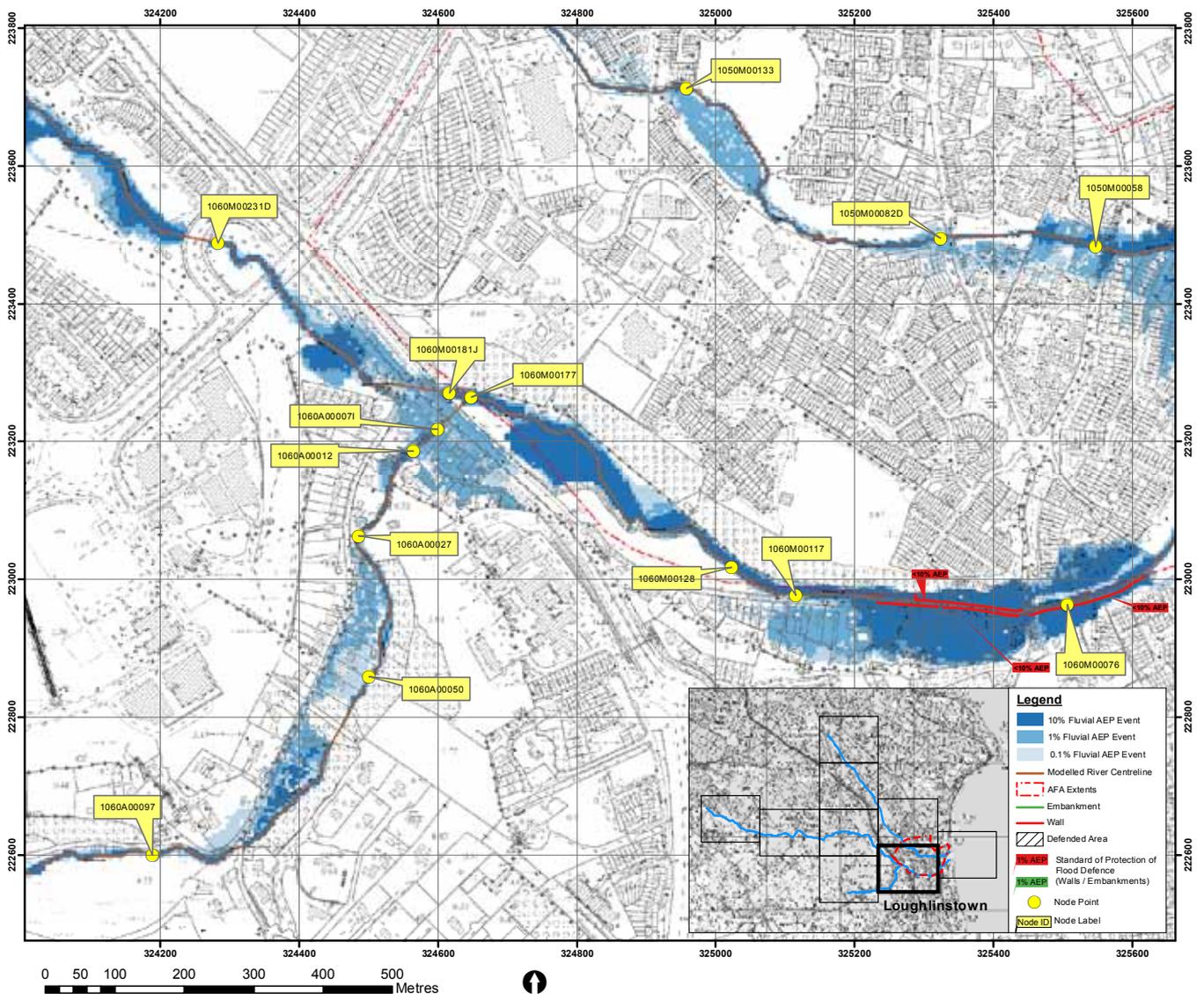


Figure 12 Flood Extent Mapping (Source: Adapted from OPW/RPS)



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
Resource Management	Flooding of landfill sites increases the risk of surface water 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 risk
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

The Dublin Local Authorities have increased flood resilience through the use of spatial planning and infrastructure projects (which include nature-based solutions). Some of these adaptive measures include:

- **Community and business flood resilience measures** – such as coastal 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
- **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



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. 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^[23,24,25].

BASELINE ASSESSMENT

Presently, the air quality in the Dublin Region is good, with levels of nitrogen dioxide (NO₂), sulphur dioxide (SO₂), carbon monoxide (CO), and particulate matter (PM₁₀ 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 whole 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 region'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 PM₁₀ and NO_x (nitrogen oxide), from road traffic, remain the biggest threat to air quality in urban areas^[26]. 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 CO₂ but are higher in particulate matter.

Dún Laoghaire-Rathdown 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 the County increases, so do airborne emissions and dust particles, which further aggravate health issues in the population.



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 Dún Laoghaire-Rathdown. 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 Dún Laoghaire-Rathdown 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, increased park and ride facilities, and restriction on heavy goods vehicles
- 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

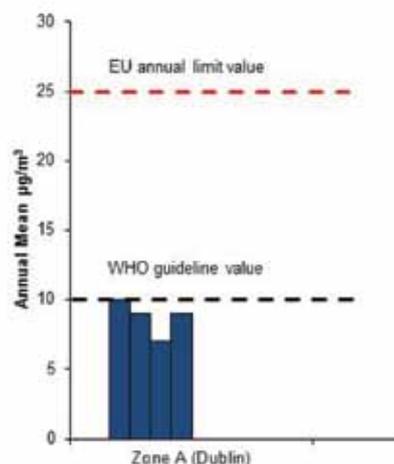


Figure 13 Annual Mean PM_{2.5} (Fine Particulate Matter) Concentrations at Individual Stations in 2016 (Source: EPA)

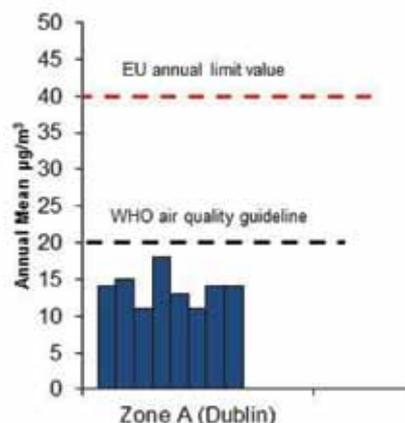


Figure 14 Annual Mean PM₁₀ (Particulate Matter) Concentrations at Individual Stations in 2016 (Source: EPA)

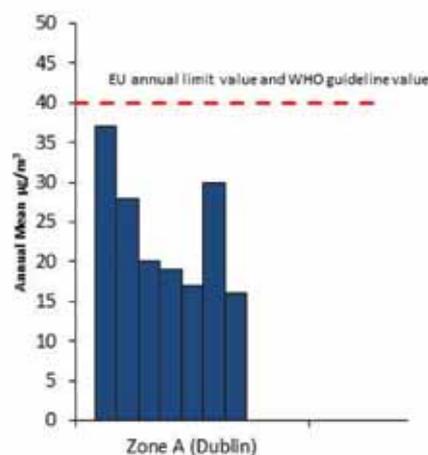


Figure 15 Annual mean NO₂ (Nitrogen Dioxide) Concentrations at Individual Monitoring Stations in 2016 (Source: EPA)



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”^[27].

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

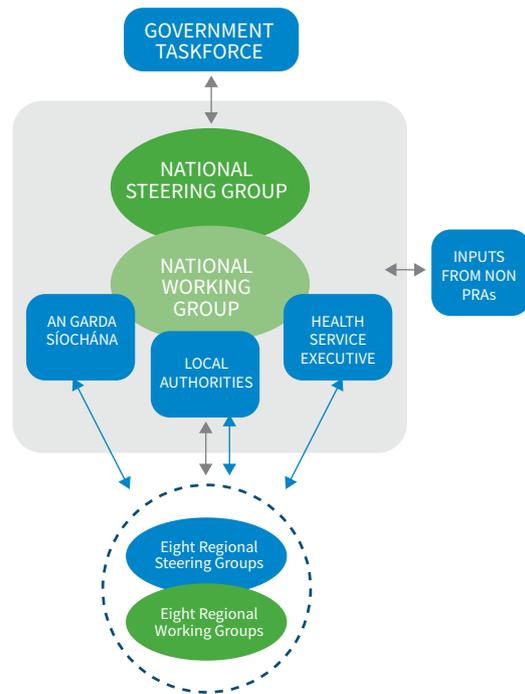


Figure 16 Structures for Implementation (Source: Major Emergency Management Framework)

EMERGENCY RESPONSE AT A LOCAL AND REGIONAL LEVEL

Dún Laoghaire-Rathdown County Council is part of the Major Emergency East Region, and is a Principal Response Agency (PRA), and the Dublin Fire Brigade is its Principal Emergency Service (PES). 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 Dún Laoghaire-Rathdown County Council 2017*⁽²⁸⁾ 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 DLRCC's Crisis Management Team (CMT).

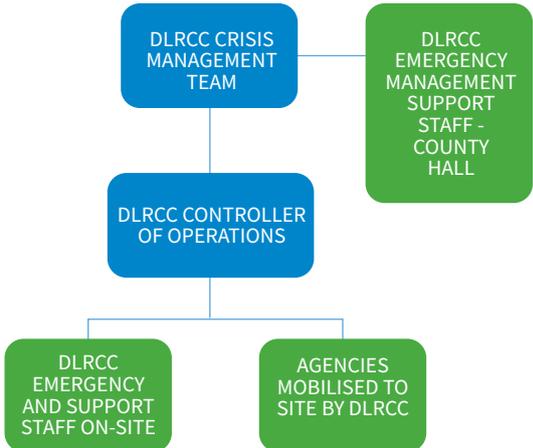


Figure 17 Local Authority Control of Resources (Source: Major Emergency Plan of DLRCC 2017)

The CMT is a strategic level management team within the Council 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 DLRCC's overall response to the major emergency
- Provide support to DLRCC's Controller of Operations on

- site and gain resources from DLRCC or externally
- Liaise with relevant government departments on strategic issues
- Ensure participation of DLRCC in the inter-agency coordination structures

EMERGENCY RESPONSE SERVICES & RESOURCES

The Dublin Fire Brigade provides the primary response to emergencies in the County. DLRCC 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 DLRCC 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 local authority area and Met Éireann issues public service severe weather warnings to DLRCC, 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.

DLRCC's severe weather assessment team has set measures to receive and respond promptly to public service severe weather warnings issued by Met Éireann. DLRCC's response to flood events is led by the Director of Municipal Services.

MITIGATION BASELINE

A photograph of industrial smokestacks emitting large plumes of white smoke against a dramatic, orange and blue sky at sunset or sunrise. The smokestacks are dark silhouettes against the bright, glowing sky. The smoke plumes are thick and billowing, with a mix of white and orange tones. The sky is a deep blue with a gradient of orange and red near the horizon.



DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL'S ENERGY USE & EMISSIONS

Dún Laoghaire-Rathdown County Council (DLRCC) 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 DLRCC consumed a total of 50.57 gigawatt hours (GWh) of primary energy in 2017. The energy database also shows that DLRCC improved its energy performance by 28.2% between the baseline year and 2017. This highlights a gap-to-target of 4.8%, meaning that DLRCC must improve its energy performance by a further 4.8% between now and 2020, in order to meet its 33% energy reduction target.

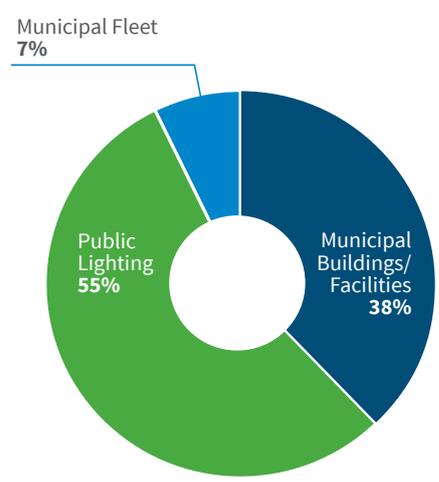


Figure 18 Primary Energy Consumption Sectors

The Council's public lighting was the highest energy consumer, accounting for 55% of the Council's overall energy consumption. Buildings and facilities were the second highest energy consumers, accounting for 38% of the total energy consumption, while the municipal fleet accounted for 7% of the total energy use.

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

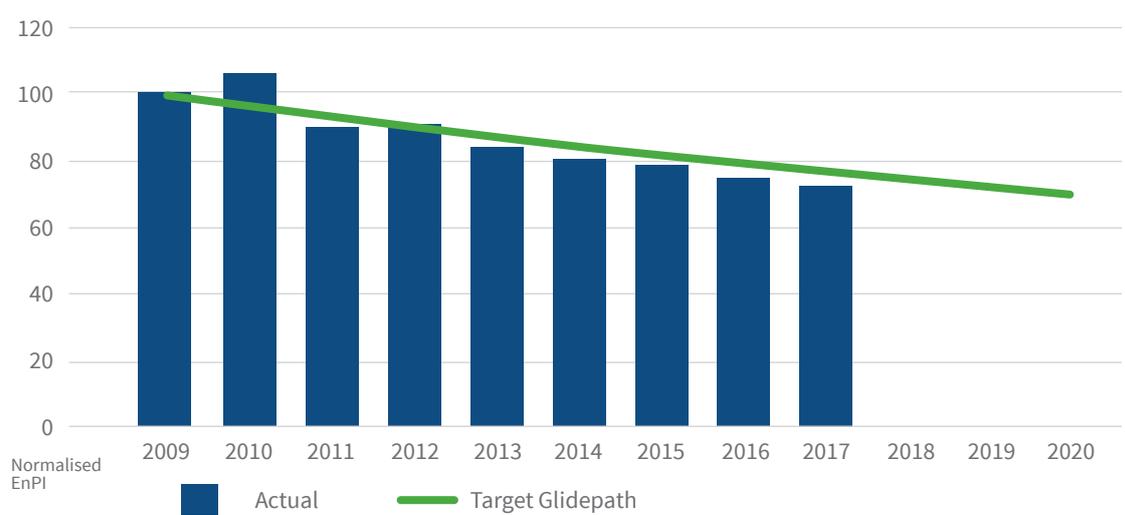
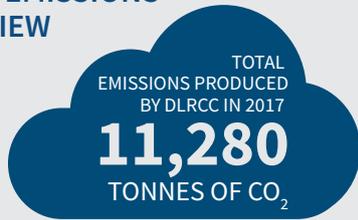
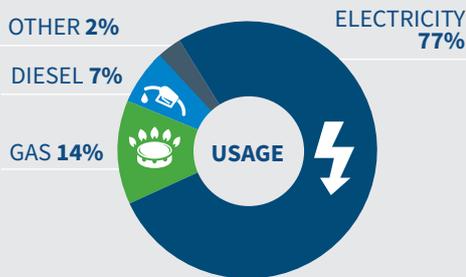


Figure 19 DLRC's Annual Energy Performance Compared to the 33% Glidepath

DLRCC EMISSIONS OVERVIEW



DLRCC'S EMISSIONS PER FUEL TYPE



DLRCC'S EMISSIONS PER CATEGORY

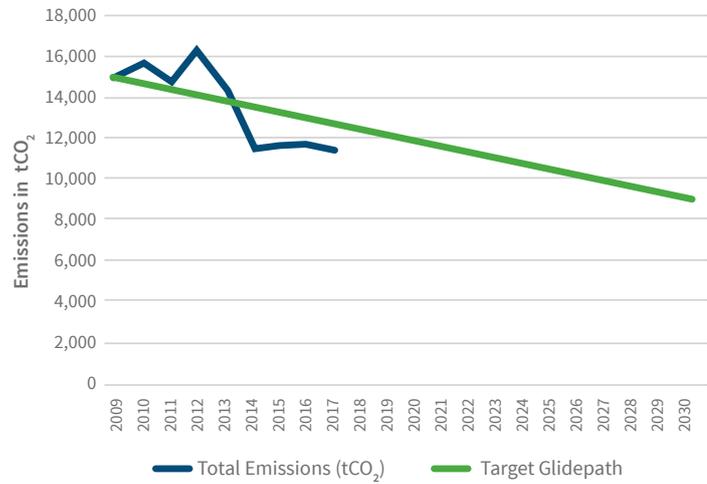
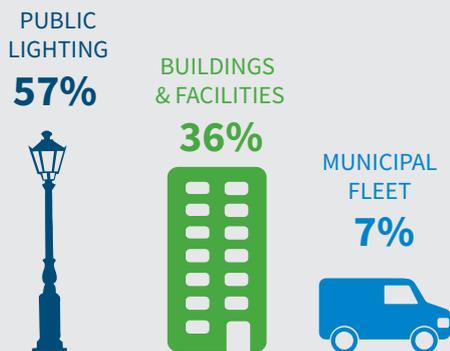


Figure 20 DLRCC's Emissions 2009-2017, with Projected Glide Path to the 40% Reduction Target by 2030

Figure 20 shows that DLRCC's emissions decreased from 14,920 tonnes of CO₂ in 2009 to 11,280 tonnes of CO₂ in 2017. This means that DLRCC is now 2,330 tonnes of CO₂ (16%) away from the 2030 target of a 40% emissions reduction from its baseline year.

In 2017, the Council's total emissions amounted to 11,280 tonnes of CO₂. Public lighting was the highest contributor, accounting for 57% of total emissions. This was followed by buildings and facilities, and the municipal fleet, each contributing 36% and 7% 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 was the second highest contributor of emissions at 14%. The majority of this gas 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 7% to the total emissions.

DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL'S SOCIAL HOUSING

DLRCC is responsible for the allocation, maintenance and refurbishment of its social housing stock, but not 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 the Council's social housing is based on DLRCC'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 21 below shows the estimated building energy ratings for all the total social housing stock in Dún Laoghaire-Rathdown. It can be seen that the most common rating was C2, which makes up 21% of the total social housing stock in the area; this is higher than the County-wide average D rating. 59% of the housing stock is rated C3 or better, which reflects the retrofitting work already carried out by the Council to upgrade the less efficient social housing stock.

The majority of the higher A and B ratings are made up of apartments, as many of these have been recently built. Most of the social housing stock in Dún Laoghaire-Rathdown was built prior to the 2011 domestic building regulations, which are more stringent on energy efficiency, and as a result, newly built or refurbished dwellings generally perform better. There were no A1 or A2 ratings in the social housing sector in Dún Laoghaire-Rathdown in 2016 and data gathered from SEAI's BER Research Tool for the same year did not contain any A1 or A2 dwellings, so these are not reflected in the charts. It should be noted that since then, DLRCC has provided new social housing (i.e. such as Rochestown House) that is up to Passive House standard. Only 5% of the buildings were found to be F and G-rated.

SOCIAL HOUSING EMISSIONS OVERVIEW

TOTAL EMISSIONS FROM SOCIAL HOUSING SECTOR IN 2016 WERE

14,050 tCO₂

59%

59% OF SOCIAL HOUSING STOCK WAS RATED **C3 OR BETTER**



74%
OF EMISSIONS CAME FROM NATURAL GAS

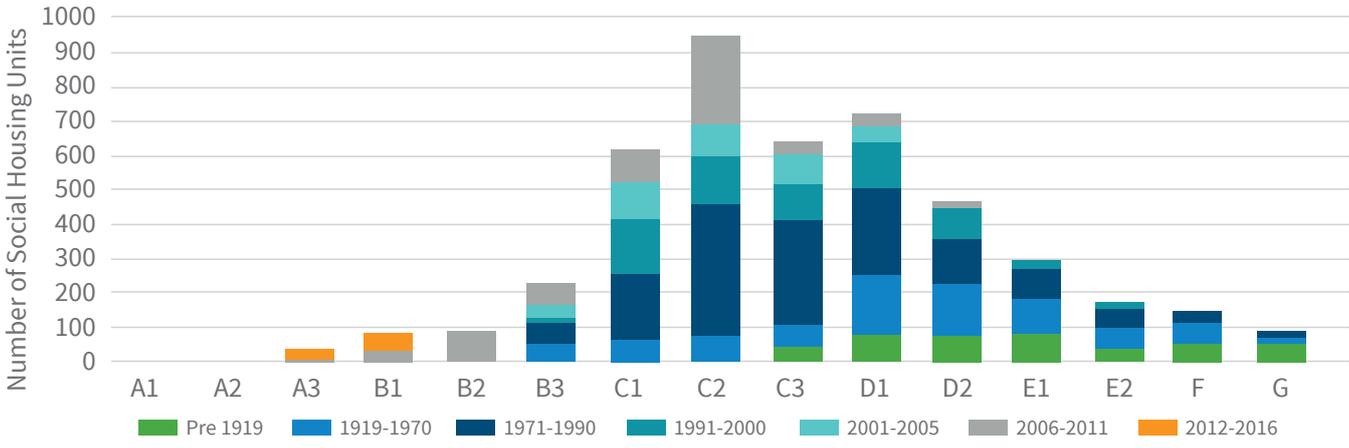


Figure 21 DLRCC's Social Housing Units by Construction Period and BER Rating, as in 2016

TOTAL EMISSIONS OF DÚN LAOGHAIRE-RATHDOWN AREA

The most recently-available information for the total emissions in the entire Dún Laoghaire-Rathdown area is based on Census 2016 data. Using this data, Codema was able to calculate that the total emissions for the Dún Laoghaire-Rathdown area amounted to 1,139,570 tonnes of CO₂eq in 2016. The sectors that produced the most emissions were the residential, transport and commercial sectors, accounting for 43.5%, 33.1% and 18.5% of the total emissions, respectively. The emissions attributed to Dún Laoghaire-Rathdown County Council amounted to only 1% of the total County emissions, with social housing contributing another 1.2%. This highlights the need for collaboration and action from all stakeholders to tackle the remaining 97.8% of emissions from public and private sector sources in the County.

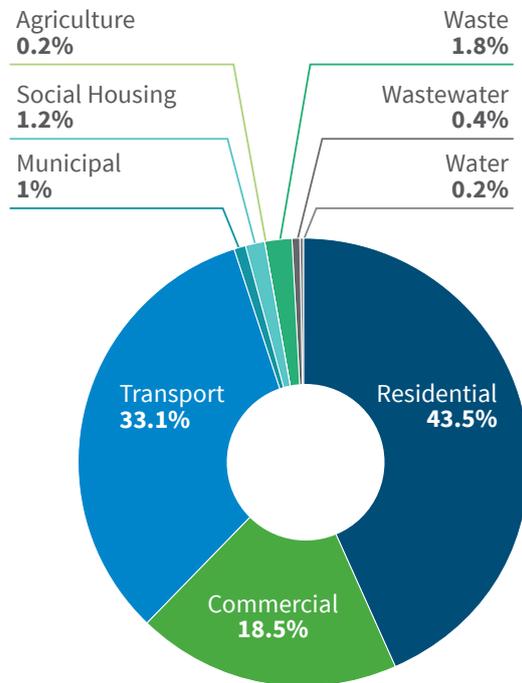


Figure 22 Total GHG Emissions for Dún Laoghaire-Rathdown Area per Sector



Photo Source: Fáilte Ireland

Further information

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



MILESTONE 3 – PLAN



Having established the current situation of Dún Laoghaire-Rathdown’s emissions, vulnerabilities to climate change-related risks 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 an initial workshop was continued with a second workshop to refine actions and follow up input from staff. This was also an opportunity for the four Dublin Local Authorities to exchange knowledge and establish regional groups in the various action areas. This section lays out the actions that DLRCC 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 DLRCC’s remit and with the aim of fostering greater collaboration across the various departments within the Council.

DLRCC 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, DLRCC will inform citizens through actions that raise awareness of climate issues and solutions and will facilitate projects undertaken by citizens and businesses towards climate resilience.

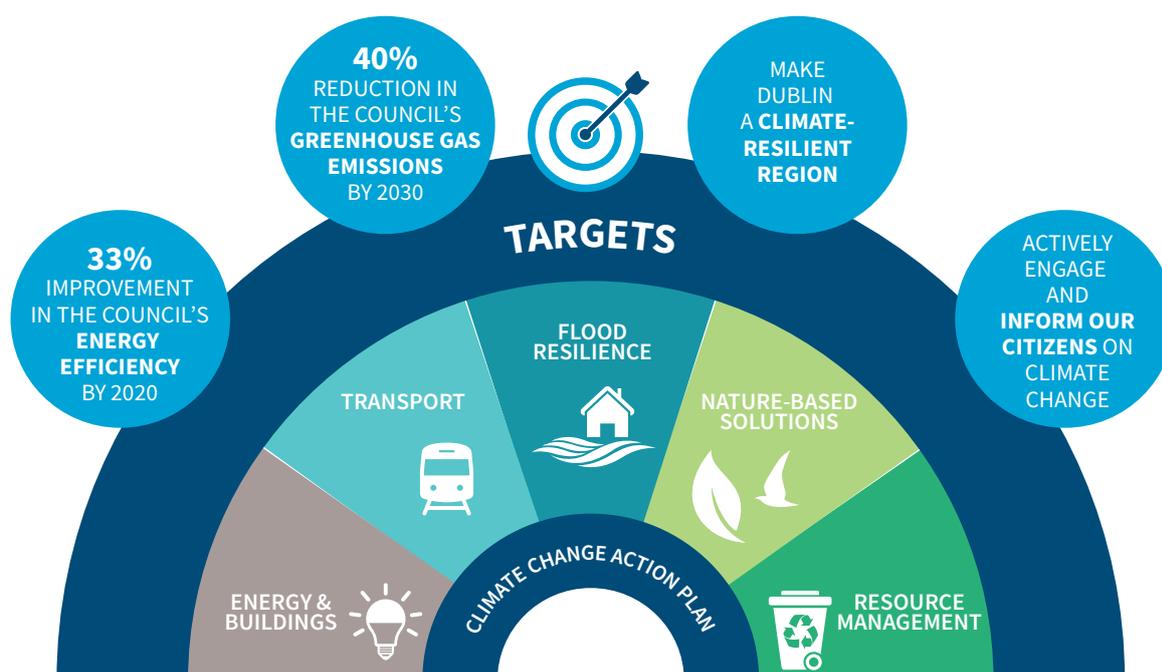


Figure 23 Visualising the Action Plan

ACTION AREAS:

ENERGY & BUILDINGS



TRANSPORT



FLOOD RESILIENCE



NATURE-BASED SOLUTIONS



RESOURCE MANAGEMENT





ENERGY & BUILDINGS





OVERVIEW

47 GWh
consumed in 2017



10,470
tonnes CO₂

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



Public lighting upgrades

Trialling 'smart'
lighting



Social housing retrofits

Trialling Home Energy
Saving Kits in dlr libraries



Building upgrades using
Energy Performance Contracts

STAKEHOLDERS TO WORK WITH AND INFLUENCE

PRIVATE
BUSINESSES

SEAI

PRIVATE
CITIZENS

ENERGY
SUPPLIERS

GOVERNMENT
DEPARTMENTS (e.g. DCCA)

DEVELOPERS





It is Council policy to support on an ongoing basis the Government Programme for the development of Energy Policy and Legislation through the implementation of supporting policies in this County Development Plan - particularly those promoting use of renewable energy sources, energy efficiency, sustainable transport and land-use planning.

- County Development Plan 2016 - 2022

In 2017, Dún Laoghaire–Rathdown County Council consumed 47 GWh of primary energy across its buildings and public lighting accounts, which amounted to 10,470 tonnes of CO₂. The actions outlined in this section show how, through energy master-planning, building energy upgrades, and the use of renewables, DLRCC will reduce the emissions from its operations and service delivery. While the energy source of electricity and the distribution and transmission of electricity are not the direct responsibility of DLRCC, there are actions that DLRCC can implement to support the uptake of renewable energy technologies, to improve energy efficiency and to reduce demand within the County.

While DLRCC is not responsible for the upgrading of private buildings in Dún Laoghaire–Rathdown, or for the energy used by its social housing tenants, it can retrofit its social housing stock to be more energy efficient and can help citizens to become more aware of their energy use by trialling the Home Energy Saving Kits in 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.

The *Dún Laoghaire–Rathdown Spatial Energy Demand Analysis* (SEDA) was produced by Codema in 2016 to better understand the current and future energy demand of the Dún Laoghaire–Rathdown 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.

Across Europe, there is a recognised need for increased local authority-led integration between planning for climate change and spatial planning tools and strategies. In the Dublin context, County Development Plans and other plans and strategies have a key role in directing evidence-based policy responses to both climate change mitigation and adaptation.

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”

Having regard to the preparation of future County Development Plans, Strategic Development Zone Planning Schemes and Local Area Plans, there is an opportunity to develop or further develop integrated and standalone ‘Climate Change’ chapters that address both climate change mitigation and adaptation. Future spatial planning policies and objectives can become more spatially based, having regard to mapping areas suitable for energy networks, district heating projects, larger scale renewable energy projects, areas suitable for sustainable urban drainage systems and green infrastructure etc., in the urban context.



CASE STUDY

The Dublin Region Energy Master Plan

DLR's SEDA was the starting point for holistic energy planning in the area and, building on this work, Codema will develop an energy master plan for the entire Dublin Region. The Dublin Region Energy Master Plan will be supported by SEAI's Research, Development and Demonstration (RD&D) programme for over two years and 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. The plan will focus on the energy areas where actions can be taken to introduce energy efficiency measures and reduce CO₂ emissions, such as district energy systems and renewable energy technologies.



Photo Source: Fáilte Ireland / Jason Baxter

ENERGY EFFICIENCY AND RENEWABLES

Constructing less carbon-intensive forms of development will build resilience to Climate Change. This also negates concerns related to security of fossil fuel supply and the rising costs as a result of the limited future availability of fossil fuel.

- County Development Plan 2016-2022

DLRCC Energy Team

The DLRCC Energy Team is taking innovative action to future-proof the County through projects that reduce dependency on fossil fuels by promoting energy efficiency and the uptake of renewable energy. The DLRCC Energy Team is a multi-disciplinary team of individuals with expertise in energy, engineering, architecture, housing, leisure services, community and cultural development. The team uses this range of knowledge to develop and implement first-class energy projects.

Highlights:

- In April 2017, DLRCC was awarded the ISO 50001 Energy Management System Certificate.
- Nomination at the 2018 SEAI Energy Awards for the completion of 12 social housing units at St George's Place, which meet the highest environmental standards and have an 'A1' rating.
- In August 2017, the DLRCC Energy Team was nominated for an SEAI Energy Award in the Energy Manager/Team of the Year category.
- Rochestown House Phase 2 has received an award from the RIAI for Best Sustainable Project in 2017. The project was also a finalist at the SEAI Energy Awards in 2016.
- Undertaking pilots to support green businesses; this includes solar energy battery storage of photovoltaic (PV) generated electricity at St Michael's Terrace, Plus Heat trial - Infra Red Heaters, and planned trials of Smart Meters.



DLRCC will lead by example in renewable energy uptake and energy efficiency through retrofits of DLRCC's buildings and social housing stock. Presently, DLRCC has several ongoing programmes to replace boilers, update lighting, improve insulation, and upgrade windows and doors. Where possible, DLRCC is also installing solar photovoltaic (PV) panels to reduce dependency on fossil fuels, such as the Mews social housing project, which has achieved nearly Zero Energy Building (nZEB) standard.

Energy Performance Contracting

In 2017, Codema met with Dún Laoghaire-Rathdown County Council's Energy Team to begin developing the Council's first Energy Performance Contract (EPC) project, involving Loughlinstown, Meadowbrook and Monkstown Leisure Centres. An EPC is a contractual agreement by an Energy Service Company (ESCO) to guarantee energy savings over an agreed period of time. Codema has now completed the initial appraisal phase of this project, which involved a detailed survey of each of the proposed buildings to assess their suitability for EPC, and to assess the potential for energy savings. The project has the potential to save 2.3 GWh of energy and 495 tonnes of CO₂ per year. Codema is currently preparing the necessary procurement and contract documentation, with the aim of having a signed contract by the middle of 2019.

Rochestown House

Rochestown House is one of DLRCC's Exemplar Projects, and involved the conversion and remodeling of an existing two-storey building into 34 one-bed units for older citizens eligible for social housing. The project features communal areas for the residents' social activities. This project has set a new standard, and DLRCC is now striving for all of its housing to meet nearly Zero Energy Building (nZEB) standard.

RESEARCH AND INNOVATION

Energy and technology are rapidly evolving sectors. To maximise the benefits of advances in technology, DLRCC is using the Smart Dublin programme as a platform 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.



CASE STUDY

LEDs and Smart Lighting

Public lighting represents a significant portion of DLRCC's energy use. As of November 2017, 21% of DLR's public lighting has been upgraded to LEDs, resulting in a 15% reduction in energy use. Being keen to use technology to further reduce energy demand, DLRCC has been trialling smart lighting with Central Management Systems (CMS). Together with ESB Telecoms and Silver Springs, DLRCC finalised a smart lighting CMS trial in Dundrum in September 2017, and has started a micro-SIM trial in Sandyford Industrial Estate. As a result of these trials, there are plans to continue upgrading public lighting in DLRCC by replacing sodium lights with LEDs and deploying CMS.

CASE STUDY

Energy Elephant – Smart Energy Monitoring

Energy Elephant is a mobile phone app that can be used by individuals and businesses to monitor their energy use. Users can take a photo of their energy bills, which the app then analyses and provides the user with information on the dashboard showing their current and projected energy use and carbon emissions. In 2016, DLRCC started using Energy Elephant to monitor its big energy users within the Council building stock. It is linked to monthly meter readings, which help generate accurate bills and energy usage to facilitate good energy management. The system helps generate reports to aid energy review and management.

ENERGY AWARENESS

We are working to reduce dependence on fossil fuels through promotion of renewables and encourage planning of energy networks into the future to allow for viable businesses, industry, schools, homes and travel

- County Development Plan 2016-2022

A key aspect of reducing energy use is awareness, and DLRCC 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 energy bills. The DLRCC Energy Team is actively engaging with students on the work being undertaken to transition the Dublin Region to a low-carbon energy future. This is being achieved through the Eco Conference for secondary schools and the Green Schools programme. DLRCC hopes to build on these programmes and expand its engagement with the public.

CASE STUDY

**Home Energy Saving Kits**

DLRCC, in partnership with Codema, is actively encouraging citizens to become more energy-aware by trialling Home Energy Saving Kits in 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.

The kits are also being trialled internally with staff working in DLRCC's County Hall, in order to encourage energy awareness not only at home but in a workplace setting as well.



ENERGY & BUILDINGS

NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
ENERGY PLANNING					
1	Create Dublin Region Energy Master Plan	2018 onwards	Codema	Website with e-Map	
2	Prepare DLR Sustainable Energy and Climate Action Plan	2019	Codema	SECAP document	
3	Develop and implement Public Lighting Master Plan	Ongoing	Environment and Climate Change	Plan completed and ongoing conversion to LEDs	
4	Evidence-based climate change chapter in <i>County Development Plan 2022-2028</i>	2020	Planning	Chapter with policies and development management standards	
ENERGY EFFICIENCY & RENEWABLES					
5	Deep retrofits of housing stock to nZEB or EnerPHit standard	Ongoing	Housing	# of units reaching nZEB or EnerPHit Standard	
6	Undertake energy efficiency works in the Council's housing stock	Ongoing	Housing	% of housing stock with energy efficiency measures implemented	
7	Review all significant energy users within the Council to increase energy efficiencies	Ongoing	DLRCC Energy Team, Codema	Review savings monthly through Energy Elephant	
8	Implement EPC project in 3 Council leisure centres	Ongoing	DLRCC Energy Team, Codema	Contract signed, measurement and verification of savings	
9	Apply for energy funding through SEAI's BEC, EXEED and deep retrofit programmes	Ongoing	DLRCC Energy Team, Codema	# of successful applications	
10	Continue upgrading public lighting to LEDs	Ongoing	Environment and Climate Change	# of lights upgraded	
11	Continued compliance with ISO50001	Ongoing	DLRCC Energy Team, Codema	Certification maintained	
12	Display Energy Certificates for public buildings	Ongoing	DLRCC Energy Team, Codema	# of DECs generated annually for public buildings	
13	Annual Monitoring and Reporting to SEAI	Ongoing	DLRCC Energy Team, Codema	M&R data submitted to SEAI annually	
14	Promote DLR's exemplar role of energy efficiency in public sector	Ongoing	DLRCC Energy Team, Codema	# of exemplar projects promoted	
15	Publish Energy Review annually	2019 onwards	Codema	Review published, # of recommendations implemented	



NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
RESEARCH & INNOVATION					
16	Facilitate the Small Business Innovation and Research (SBIR) challenge for climate change solutions	Ongoing	Smart Dublin	# of successful applications	
17	Monitoring of smart lighting trials in the County	Ongoing	Environment and Climate Change	Results from trial	
18	Continue to use Energy Elephant to monitor energy use in Council buildings	Ongoing	DLRCC Energy Team	Monthly energy reports	
ENERGY AWARENESS					
19	Energy awareness initiatives in Council owned buildings	Ongoing	DLRCC Energy Team, Codema	# of staff participating in events and activities	
20	Monitor and develop the Home Energy Saving Kits in dlr libraries	Ongoing	DLRCC Energy Team, Codema	# of kits borrowed	
ACTIONS AWAITING BUDGET					
21	Expand housing assistance programme to include tenant energy awareness	2020	Housing, DLRCC Energy Team	% of tenants attending programme	

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 - Building other than Dwellings
- dlrcoco County Development Plan 2016 - 2022
- Climate Action and Low Carbon Development Act 2015
- Energy Act 2016
- Energy Efficiency Directive (Article 14)
- Ireland's National Renewable Energy Action Plan (NREAP) - Energy White Paper
- National Energy Efficiency Action Plan (NEEAP)
- S.I. No. 243/2012 - European Union (Energy Performance of Buildings)
- S.I. No. 426/2014 - European Union (Energy Efficiency) Regulations
- Support Scheme for Renewable Heat



TRANSPORT





OVERVIEW

3.5 GWh
consumed in 2017

=

810
tonnes CO₂

TARGET



33%
IMPROVEMENT
IN ENERGY
EFFICIENCY
BY 2020



40%
REDUCTION
IN COUNCIL'S
GHG EMISSIONS
BY 2030

EXAMPLES OF MAIN ACTION TYPES

Increasing number of electric vehicles in Council fleet



Constructing segregated cycle routes

Promoting car sharing



Expanding bike sharing

Implementing and supporting cycling campaigns



Working with stakeholders to improve public transport routes

STAKEHOLDERS TO WORK WITH AND INFLUENCE

GENERAL PUBLIC

COMMUNITY GROUPS

GOVERNMENT DEPARTMENTS

ENVIRONMENTAL GROUPS

DUBLIN BUS, IRISH RAIL, BUS ÉIREANN, LUAS

NATIONAL TRANSPORT AUTHORITY



3

Dún Laoghaire-Rathdown County Council recognises that the current trends in transportation, in particular the domination of the private car as the preferred mode choice – are unsustainable... In response, the emphasis must be on developing an efficient transport network where an increased proportion of residents of the County are within reasonable walking/cycling distance of local services and quality public transport infrastructure. There must also be a focus on promoting and facilitating the optimum use of existing (and proposed) transport services.

- County Development Plan 2016-2022

DLRCC works with a range of stakeholders to improve sustainable transportation options in the Dublin Region. Key is the National Transport Authority (NTA), which, together with DLRCC and the other Dublin Local Authorities, has produced the *Greater Dublin Area Transport Strategy 2016-2035*. The study lays out a vision for transport in the Dublin Region and builds on the Government's *Smarter Travel - A Sustainable Transport Future* initiative.

The measures that DLRCC can take in this area are:

- Managing travel demand by ensuring land use and transport policies and practices are aligned as part of the planning process
- Planning and implementation of sustainable travel infrastructure including the development of improved walking and cycling routes, enhanced public realm areas, and facilitating the expansion of the EV charge point network
- Expansion of the Council's electric fleet
- Introduction of bike share and car clubs

Promotion of sustainable travel and road safety initiatives can improve the safety of the streets. Furthermore, these measures support citizens in choosing sustainable modes of transportation and ultimately, Ireland's transition to a low-carbon future.



OPERATIONS

Dún Laoghaire-Rathdown County Council's vehicle fleet consists of 246 vehicles; the Council is committed to increasing its electric fleet on a phased basis, with five electric cars and six electric vans currently in its fleet. In 2017, the fleet used 3.5 GWh of primary energy. This accounted for 7% of the Council's total emissions due to the reliance of the fleet on petrol and diesel.

Converting the fleet to low-carbon vehicles is essential to reducing carbon emissions, and the Council is implementing a replacement programme for the electrification of DLRCC's fleet, where possible, to be completed by 2030.

By upgrading its vehicles, the Council will reduce the impact of its fleet on local air quality by reducing nitrogen dioxide associated with diesel vehicles.



PLANNING & PUBLIC REALM

3 The sustainable urban village concept is based on the premise that people should be able to access most of their daily living requirements within easy reach, preferably within walking distance of their homes. This concept, which focuses on reducing the need to travel by private car, is central to the principles of sustainable development.

- County Development Plan 2016-2022

Planning for a region that is adapted to climate change is also about creating spaces that support high quality living. Key to encouraging people to walk and cycle is the design of streets and the public realm. DLRCC is working to implement street design guidelines that make the streets more inviting and improve the public realm. DLRCC is also in the process of developing a public lighting master plan that will contribute to Dún Laoghaire-Rathdown's transition into a low-carbon County. By converting lights to energy efficient LEDs, DLRCC is also improving the ambiance and safety of streets for pedestrians and cyclists.



Photo Source: Fáilte Ireland

ACTIVE TRANSPORT & BEHAVIOUR CHANGE

3 A key aim of Smarter Travel is to ensure that walking and cycling become the mode of choice for local trips. The Council will continue to promote and provide for the development of cycling and walking as healthy sustainable attractive transport modes in the County for commuting, short utility trips, recreation trips and trips to schools/ colleges. It is proposed that, over the lifetime of the [Development] Plan, the Council will develop a Walking and Cycling Policy for the County.

- County Development Plan 2016-2022

Encouraging people to walk or cycle will help DLRCC to respond to climate change. The Council is actively working to secure the development of a high quality walking and cycling network across the County to prioritise the safety of pedestrians and cyclists. Routes are being retrofitted on all key nodes in the County to enhance pedestrian and cyclists' facilities. Village improvement schemes are also being developed to enrich the public realm and enhance the pedestrian and cyclist environment. Furthermore, DLRCC is actively increasing the availability of cycle parking County-wide, including at public transportation stations, in order to add to the existing 2,000 bicycle parking spaces.

As part of the planning process, new developments are required to maximise permeability and connectivity for pedestrians and cyclists to create direct attractive links to adjacent road and public transport networks.

To encourage people to explore the region from its coast to mountains by foot or by cycling, DLRCC has developed a County-wide cycling map and leaflets for key off-road routes to support residents, commuters and visitors.



Photo Source: Dún Laoghaire-Rathdown County Council

BleeperBike – Stationless Bike Share

In November 2017, DLRCC launched Ireland’s first County-wide stationless bike sharing scheme. The trial has seen 50 BleeperBikes deployed at 12 locations across the County, including University College Dublin (UCD), Dalkey, Shankill, and Dún Laoghaire. The ‘smart’ bikes can be accessed via a mobile phone app that is used to locate and unlock bikes. Bikes can be parked at a BleeperBike Station or left at the user’s final destination. DLRCC plans to expand the scheme to 100 bikes, depending on the uptake.

SUSTAINABLE CAR USE

Electric Vehicles

Dún Laoghaire-Rathdown County Council is the first local authority in Ireland to trial charging points for electric vehicles on street lamps, with a pilot street lamp up and running on Crofton Road.

With over 12 electric charge points in the County available to the public, there are also plans to increase the number of public charge points, including the addition of charging units to public lighting poles. DLRCC will work closely with SEAI and ESB in the provision of additional on-street EV charging points around the County. DLRCC also seeks the provision of electric charging facilities for residential and commercial developments as part of the planning process. The Council is committed to increasing its electric fleet on a phased basis, with 5 electric cars and 6 electric vans currently in our fleet.



Photo Source: Dún Laoghaire-Rathdown County Council

Car Club

A pilot car club (short term car hire) was set up in the County in 2017, in conjunction with GoCar. This encourages the use of car club vehicles for occasional trips rather than owning a car. DLRCC is also planning to introduce by-laws for car clubs, and is encouraging the provision of car clubs in large residential and commercial developments to facilitate overall reduced car parking.



PUBLIC TRANSPORT



In order to ensure an efficient, reliable and effective bus system, it is intended, as part of the [Transport] Strategy, to develop the Core Bus network to achieve, as far as practicable, continuous priority for bus movement on the portions of the Core Bus Network within the Metropolitan Area. This will mean enhanced bus lane provision on these corridors, removing current delays on the bus network in the relevant locations and enabling the bus to provide a faster alternative to car traffic along these routes, making bus transport a more attractive alternative for road users.

- Transport Strategy for the Greater Dublin Area 2016-2035, NTA

The efficiency of any public transport system is directly correlated to population density. Therefore, the full value of investment in transport can only be realised when it is accompanied by reinforcing land use policies and practices.

DLRCC will work with relevant transportation bodies (National Transport Authority, Transport Infrastructure Ireland, Dublin Bus, Luas, Irish Rail, Bus Éireann, Road Safety Authority) to enhance public transport options and develop sustainable travel infrastructure.

The NTA is currently involved in many public transport projects in the County, including Metrolink and Bus Connects. It has also developed a range of integration measures to promote and integrate public transport provision, such as the Real Time Passenger Information system, the Leap Card integrated ticketing system and the national journey planner, which is a door-to-door journey planner that provides service information, directions, and time estimates for all journeys on public transport.



Photo Source: WikiCommons / Terencewiki



TRANSPORT

NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
OPERATIONS					
1	Increase number of electric vehicles in the Council fleet	Ongoing	Ballyogan Operations Centre	# of EVs procured	
PLANNING & PUBLIC REALM					
2	Reduce street parking	Ongoing	Traffic	Reduction in on-street car parking numbers	
ACTIVE TRAVEL & BEHAVIOUR CHANGE					
3	Promotion of road safety and active travel in schools	Ongoing	Traffic	# of road safety events and initiatives	
4	Develop and expand the County walking network	Ongoing	Traffic, Road Maintenance	Length of footway improved, # of new pedestrian crossings, # of pedestrian crossings upgraded with LED lights	
5	dlr Sports Partnership organised walks	Ongoing	dlr Sports partnership	# of walks, # of people attending	
6	Permeability and connectivity in planning process	Ongoing	Transport Planning	Adopted development plan includes permeability	
7	Develop and extend cycle network	Ongoing	Traffic	# km of cycle routes	
8	Cycle Training Programme in schools	Ongoing	Traffic	# of students trained	
9	Develop County bike sharing scheme	Ongoing	Traffic	# of bikes in County	
10	Cycle parking in public realm	Ongoing	Traffic	# of additional cycle parking spaces	
11	30 km/h speed limits	Ongoing	Traffic	# of roads with 30 km/h speed limit	
12	Road maintenance improvements	Ongoing	Road Maintenance	Km of regional and local roads with improvement works carried out	
PUBLIC TRANSPORT					
13	Expand bus network in the County	Ongoing	Traffic, NTA	Work with NTA on Bus Connects	



NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
14	Expand rail network in the County	Ongoing	Transport Planning	Work with NTA and Transport Infrastructure Ireland on MetroLink and Luas expansion	
15	Expand car clubs in the County	Ongoing	Traffic	Regulation of car clubs and number of car club vehicles	
16	Expand EV network in the County	Ongoing	Traffic, Public Lighting	# of EV charge points	
17	Engagement with citizens on new sustainable travel initiatives and schemes	Ongoing	Traffic	# of interactions from citizens on DLR Public Consultation Hub on infrastructure schemes and sustainable travel initiatives	

ACTIONS AWAITING BUDGET

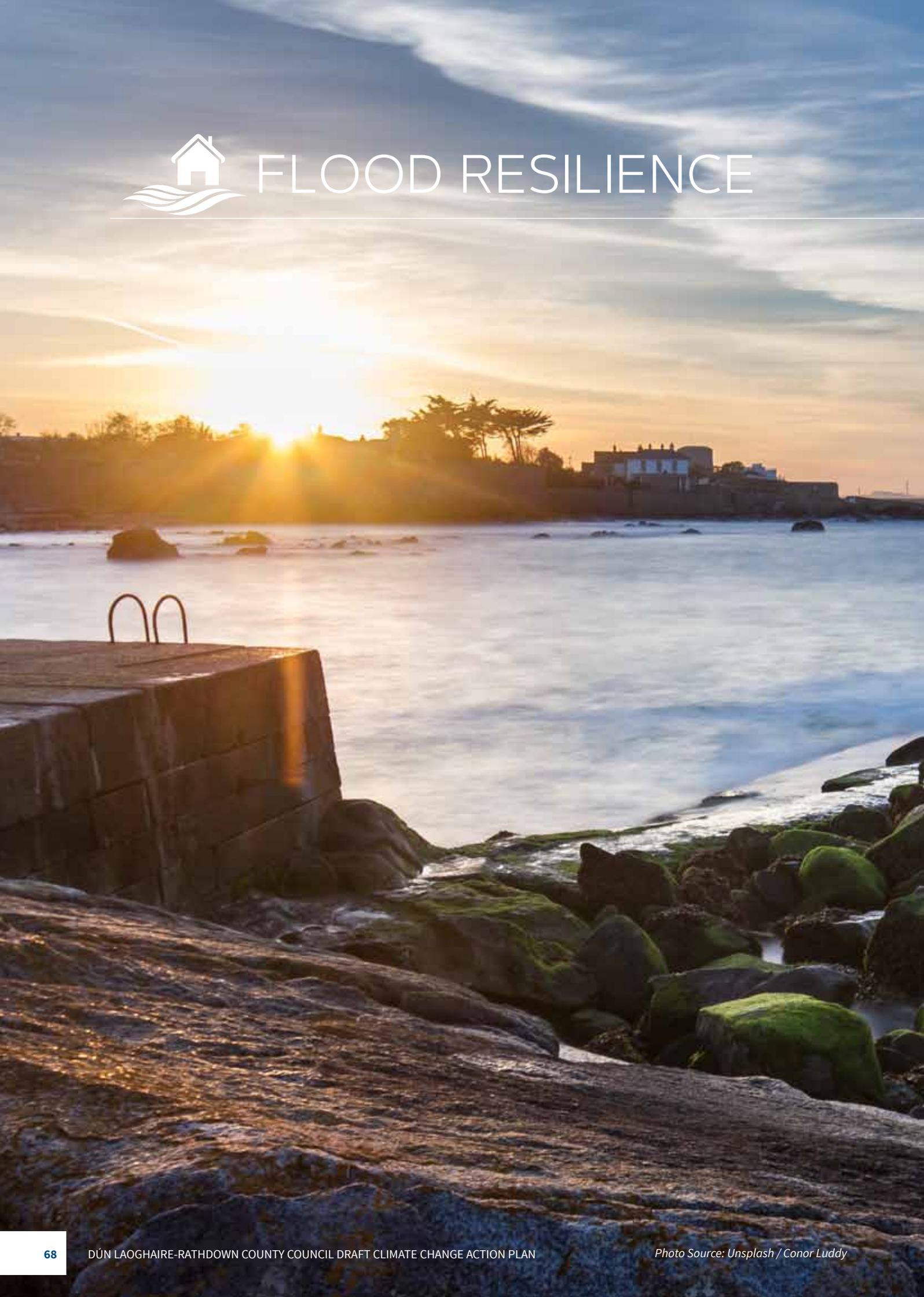
18	<i>Replacement of diesel hand sweepers/diesel power washers with electric models</i>	<i>Ongoing</i>	<i>Ballyogan Operations Centre</i>	<i>% reduction over initial benchmark, % of CO₂ saved</i>	
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EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Climate Action and Low Carbon Development Act 2015
- Design Manual for Urban Roads and Streets (DMURS)
- dlrcoco County Development Plan 2016 - 2022 (Policies ST11; ST2; ST3; ST5; ST7; ST8; ST10; ST24)
- Electric Vehicle Grant Scheme and VRT Relief
- Greater Dublin Area Transport Strategy 2016-2035
- National Cycle Policy Framework 2009-2020 and National Cycle Manual
- 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

4 MAIN RIVERS:
DODDER,
CARRICKMINES,
LOUGHLINSTOWN
& SHANGANAGH

17km
OF COASTLINE



TARGET



A CLIMATE-RESILIENT
REGION

REDUCTION/MITIGATION
OF FLOOD RISKS
IN REGION

EXAMPLES OF MAIN ACTION TYPES



STAKEHOLDERS TO WORK WITH AND INFLUENCE

OFFICE OF
PUBLIC WORKS

GENERAL
PUBLIC

ENVIRONMENTAL
GROUPS



GOVERNMENT
DEPARTMENTS

COMMUNITY
GROUPS

DEVELOPERS

3 One of the effects of Climate Change that can be anticipated, and a key Climate Change adaptation issue, is the management of rainfall runoff and the maintenance of quality standards as the global temperature increases and rainfall patterns change. Flood risk needs to be considered at all stages of the land use planning process and managed in an environmentally sensitive way. The Government publication ‘Flood Risk Management Guidelines’, (2009), intends to ensure a more rigorous and systematic approach to integrating flood risk management in the preparation of Development Plans, Local Area Plans and in the determination of individual planning applications.

- County Development Plan 2016-2022

In partnership with the Office of Public Works (OPW) and neighbouring local authorities, DLRCC is working to adapt the areas that are vulnerable to flooding, now and in the future. DLRCC is building flood defences that take into consideration current and future risks; DLRCC is looking at measures that include nature and have multiple benefits beyond flood defence, such as providing new spaces for recreation and habitats for birds and animals.

Flooding is a key climate change risk facing the Dublin Region. Climate change increases the frequency and duration of heavy rainfall events and storm surges, which increase the risk of pluvial, fluvial and tidal flooding in vulnerable areas of the County. Extreme rainfall and weather events can also place additional pressure on the urban drainage network, which can result in flooding. DLRCC is actively working with the OPW 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 nature-based solutions such as integrated wetlands, green infrastructure, and Sustainable urban Drainage Systems (SuDS) to be used for adaptation and mitigation responses to achieve flood resilience.

FLOOD RISK MANAGEMENT

3 The Council will ensure the implementation of the DoEHLG/OPW Guidelines ‘The Planning System and Flood Risk Management’ (2009) and DoECLG Circular PL2/2014 (or any updated/superseded document) in relation to flood risk management within the County.

- County Development Plan 2016-2022

DLRCC is working to adapt areas that are at risk of flooding by using comprehensive flood risk mapping. DLRCC works interdepartmentally to ensure that all solutions are assessed for options that could increase the capacity for biodiversity and recreation.



FLOOD DEFENCE

DLRCC will prioritise nature-based flood defences where possible. However, there are certain areas of the County that are not suited to soft solutions, such as parts of the Loughlinstown River. Therefore, DLRCC is building physical flood defences that take into consideration current and future risks.

CASE STUDY

Kilbogget Park Flood Alleviation

Recognising the risk of fluvial flooding for the Seafield/Bayview area of Loughlinstown, DLRCC is planning to implement a flood alleviation measure in the Deansgrange Stream in Kilbogget Park.

The approach taken by DLRCC will involve a combined green and grey solution, due to an existing culvert in the park. Given the number of homes at risk downstream, DLRCC has designed a means to regulate the flow of water during heavy rainfall events, and plans to construct a large screen in the park with a flow control structure. There will also be a sea viewing platform for birdwatchers.



Photo Source: Fáilte Ireland / Jason Baxter



FLOOD RESILIENCE

NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
FLOOD RISK MANAGEMENT					
1	Implement flood risk management guidelines	2019 onwards	Multi-departmental	# of projects following guidelines	
2	Coordinate Emergency Response Plans incorporating climate change	2020	Drainage, lead agencies, AGS, HSE	Quarterly meetings with neighbouring local authorities	
3	Implement Coastal Zone Management Plan	2019	Parks	Coastline maintained, improvement in habitats	
4	Implement coastal monitoring programme, map of vulnerable areas	2020	Parks	Map produced	
5	Develop and implement a biosphere work programme within the County	Ongoing	Parks	Work programme developed and implemented	
6	Develop a climate change impact GIS risk map with scenarios for the Dublin Region	2020	Climate Ireland, Environment and Climate Change, multi-departmental	GIS map developed	
7	Develop template to capture impacts, response and costs for all major climate events	2019	Environment and Climate Change	Template developed and issued	
8	Risk workshops to assess impacts on Council services	2019	All departments	Risks identified	
9	Establish a Working Group to deal with the Issue of Pluvial Flood Risk. This shall include: <ul style="list-style-type: none"> How to manage “urban creep” and the increase in impermeable surfaces Promotion of SuDS early in design process Development of pluvial flood forecasting through use of point rainfall forecasting Interim use of DCC “FLAG” meetings as a model for DLAs in relation to pluvial flood forecasting and response 	2019	Multi-departmental	Working group established	
10	Update DLA urban drainage and flooding policies for current knowledge of flood risk and the latest best practice in drainage design	2019	Multi-departmental	Policies updated	
FLOOD DEFENCE					
11	Cabinteely Park flood storage	2021	Water and Drainage, Parks	Project at feasibility stage	
12	Fernhill Park flood storage feasibility study	2021	Water and Drainage, Parks	Project at feasibility stage	



NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
13	Kilbogget Park flood storage	2021	Water and Drainage, Parks	Project completed	
14	Installation of screen monitoring cameras	Ongoing	Water and Drainage, Parks	Project completed	
15	Glenavon Park flood storage and integrated wetland	2021	Water and Drainage, Parks	Project completed	
16	Marlay Park enhanced flood storage	2021	Water and Drainage, Parks	Project completed	
17	Sandyford Park flood storage	2021	Water and Drainage, Parks	Project completed	
18	Corbawn coastal protection works	2019	Roads Maintenance	Project completed	

ACTIONS AWAITING BUDGET

19	<i>Promote and encourage community involvement in the retrofit of SuDS in existing developments</i>	<i>To be decided</i>	<i>Parks, Water and Drainage</i>	<i># of communities involved</i>	
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EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Arterial Drainage Acts
- Catchment-Based Flood Risk Management Plans (CFRMP)
- dlr Green Infrastructure Strategy (dlrcoco County Development Plan 2016 - 2022 Policy OSR3)
- dlr Green Roofs Guidance Document (dlrcoco County Development Plan 2016 - 2022)
- dlrcoco County Development Plan 2016 - 2022 (Policies CC14; CC15; CC16; CC17; EI3; LBH25; LHB34)
- Dublin Bay Biosphere Biodiversity Conservation and Research Strategy 2016-2020
- Dún Laoghaire-Rathdown Biodiversity Plan
- Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study 2011-2016
- EU Floods Directive 2007/60/EC
- Greater Dublin Strategic Drainage Study
- National Landscape Strategy for Ireland 2015-2025
- OPW - Implementing the National Flood Risk Policy
- Planning System and Flood Risk Management Guidelines
- Water Framework Directive 2000/60/EC
- Water Services Strategic Plan (2015)



NATURE-BASED SOLUTIONS





OVERVIEW



30 PUBLIC PARKS MAINTAINED BY DLRCC

300km²
DUBLIN BAY BIOSPHERE

18.9% ESTIMATED AVERAGE TREE CANOPY COVER IN DLR

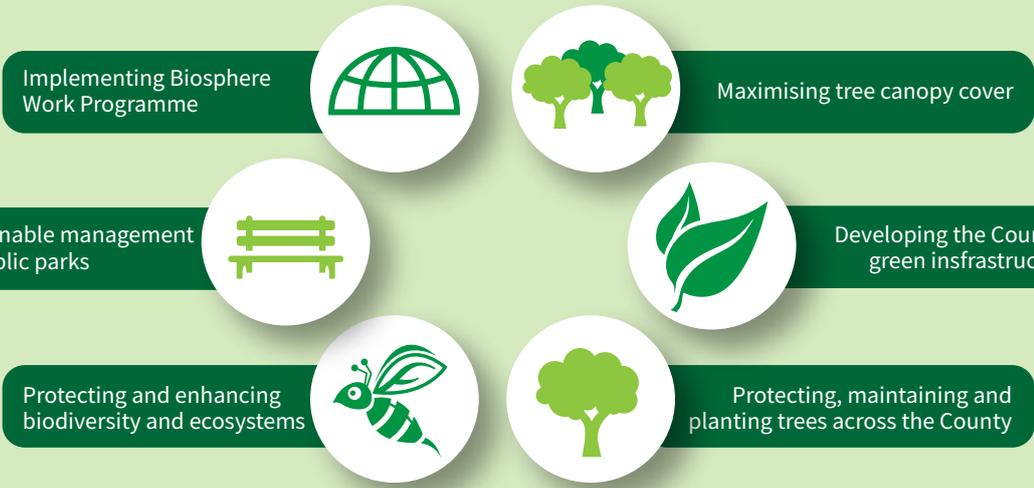


TARGET



- A CLIMATE-RESILIENT REGION
- PREVENTING HABITAT AND SPECIES LOSS
- PROTECTING NATIVE SPECIES, PARKS AND TREE COVER

EXAMPLES OF MAIN ACTION TYPES



STAKEHOLDERS TO WORK WITH AND INFLUENCE



3 The landscape, heritage and biodiversity of Dún Laoghaire-Rathdown represent some of the most important intrinsic assets of the County. Indeed, to a great degree they actually define the County. The heritage of the County encompasses built, archaeological, cultural and natural heritage, while the extensive network of public parks and open spaces provide important areas for passive and active recreation as well as key spaces for enhancing biodiversity.

- County Development Plan 2016-2022

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”^[29]

Nature-based solutions are provided by a combination of factors including the urban tree canopy, green infrastructure and sustainable urban drainage. These are critical in climate change mitigation and adaptation and perform many important functions. For example, they help to prevent flooding and erosion, regulate temperatures, absorb carbon and filter pollutants from the air. Some of these functions are:

- Vegetation, particularly trees through photosynthesis, sequesters and stores carbon as it grows, it can also reduce air pollution through filtration
- During storm events with high winds, trees act as a natural barrier to reduce wind speed and provide shelter
- Plants in wetland areas attenuate, filtrate and purify water
- Trees and plants reduce water runoff in extreme rain events, taking pressure off the urban drainage system, they also prevent soil erosion

All of the above have the added value of providing recreational opportunities while building resilience to climate change. DLRCC is working to ensure that biodiversity loss is minimised or prevented, and that increasing vegetative cover, particularly through tree planting, is maximised throughout the County. This involves working both internally and collaboratively across the four Dublin Local Authorities to protect and enhance existing greenfield sites, both public and private. DLRCC, together with the other Dublin Local Authorities, will cooperate in order to set standards for the incorporation of green infrastructure, sustainable urban drainage systems,

tree management, and the protection and conservation of biodiversity to maximise the benefits of nature-based solutions.

DLRCC is responsible for over 30 parks of varying sizes, and countless areas of public open space. These will continue to be protected and cared for to ensure that future generations can enjoy the benefits these amenities offer in terms of recreation, physical and mental health and well-being. These areas are vital in the constant adaptation to climate change and mitigating future impacts through acting as carbon sinks and flood protection.

CASE STUDY



Photo Source: Dún Laoghaire-Rathdown County Council

Fernhill Park

In 2017, DLRCC acquired Fernhill Estate and Gardens and embarked on an ambitious plan to convert the estate into a public park. The vision for this park is to create a space where residents and visitors can engage in recreational activities, while learning about the region’s natural and cultural heritage.

Given the diversity of the estate’s natural environment, which includes woodlands, parklands, agricultural land and gardens, the development of the park is an opportunity to put DLRCC’s biodiversity and tree plans into action. In October 2018, the Council secured €100,000 in funding to assist in developing a community garden within the park, which will directly benefit all the local people in the area and will foster a strong community spirit as it will be a place where everyone can come and interact in a nurturing and pleasant environment. By developing this community garden, DLRCC aims to raise awareness about the environment, and the need to protect local flora and fauna and of course sustainable food production, which can be sold in the café on the grounds of the park.



GREEN INFRASTRUCTURE

It is Council policy to develop a comprehensive network of County Greenways linking parks and public open spaces and to liaise with adjoining local authorities and other stakeholders to achieve and improve wider external linkages and corridors.

- County Development Plan 2016-2022

Green infrastructure delivers a wide range of services, from water purification and air quality management to recreation space. Green infrastructure also helps in climate change mitigation and adaptation, by reducing CO₂ in the air, absorbing water, and cooling the urban environment. Incorporating green infrastructure into the urban environment is a science that recognises which species of plants will suit the local environment and not cause harm or threaten the local ecosystem. Planning for the inclusion of green infrastructure in the urban environment is about understanding the role of nature in supporting life and making places liveable.

CASE STUDY

Cherrywood Way

The Cherrywood Planning Scheme aims to create a viable green infrastructure and open space network that conserves, maintains and enhances the unique character, heritage and distinctiveness of the Strategic Development Zone (SDZ) and enables residents, workers and visitors to enjoy a high quality, inclusive environment with good leisure and recreation amenities.

Core to the proposed green infrastructure network is 'The Cherrywood Way', a network of planned open spaces and green infrastructure throughout the Cherrywood Planning Scheme area. At its centre is the archaeologically-sensitive Tully Church site and its environs, which form the basis for a unique and distinctive flagship park. A network of greenways, ultimately extending beyond the Planning Scheme boundary, will link the principal open spaces.

TREE MANAGEMENT

It is Council policy to implement the objectives and policies of the Tree Strategy for the County... to ensure that the tree cover in the County is managed and developed to optimise the environmental, climatic and educational benefits which derive from an 'urban forest'.

- County Development Plan 2016-2022

Trees have multiple benefits in reducing the risk of climate change impacts. Through their root systems they reduce soil erosion, and sequester atmospheric carbon as part of the carbon cycle, meaning that over its lifetime, a single tree can absorb several tonnes of atmospheric carbon dioxide. The right tree in the right place can provide shelter from both wind and sun and help to reduce the urban heat island effect.

CASE STUDY



Photo Source: Dún Laoghaire-Rathdown County Council

The Heritage Tree Hunt

The trees throughout the County are a vital resource and help make Dún Laoghaire-Rathdown a great place to live, work and visit. DLRCC's Parks Team has developed a County-wide tree strategy (*dlr TREES 2011-2015*); a key part of this is to promote the national Heritage Tree Hunt, which is run by the Tree Council of Ireland.

The Heritage Tree Hunt is a survey of heritage trees in Ireland. It aims to record and catalogue information about Ireland's heritage trees, and capture their unique stories and images. It has a designated website that offers everyone the opportunity to access the Heritage Tree Hunt records, see the photos and read the stories behind these magnificent trees.

The *Tree Canopy Study*, carried out by UCD's School of Geography, estimates that in Dún Laoghaire-Rathdown, (where 59.8% of the land is built up) trees cover 18.9% of the total area, which is the highest of the four Dublin local authority areas, but can be as low as 3-10% in urban areas^[30]. DLRCC is now at an advanced stage in measuring the existing urban tree canopy and has embarked on a detailed survey of its street trees. Through mapping and documenting the tree population, DLRCC can now provide species-specific figures in relation to how these trees are helping to mitigate the effects of climate change.

CONSERVATION AND PRESERVATION



The Council will take a proactive approach to the landscape with policies that seek to conserve and enhance the strongly distinctive landscape character of the County by protecting landscape elements of significance that are intrinsically important or contribute to the general amenity of the County. Landscape assets are non-renewable resources that the Council will seek to protect.

- County Development Plan 2016-2022

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 and are home to a rich biodiversity of flora and fauna.

DLRCC has developed a range of plans and strategies (*Biodiversity Action Plan, dlr TREES 2011-2015 and Invasive Alien Species Action Plan*) to protect its biodiversity. As the Dublin Region'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 include the area between Howth Head and Dalkey will ensure that the mosaic of ecological systems that make up the biosphere are protected. The biosphere is the first in the world to include a national capital city; this is an opportunity for Dublin to be a world leader in biodiversity management in the urban context.

CASE STUDY



Photo Source: Fáilte Ireland / BigO Media

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 km². 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 km² 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 km² 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 km² 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(S)	INDICATORS	TARGET(S) IMPACTED
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ACTIONS CURRENTLY BUDGETED

OPERATIONS

1	Establish regional working group on nature-based solutions	2019	Parks and Biodiversity	Working group established	
2	Agree joint action plans to protect habitats and species native to the County	2020	Parks and Biodiversity	Action plans agreed and implemented	
3	Establish interdepartmental working group with engineers and planners	2019 onwards	Parks and Biodiversity	Working group established	
4	Workshop on NBS, green infrastructure and Sustainable urban Drainage Systems (SuDS)	2019	Parks and Biodiversity	Workshop undertaken, report of outcomes	
5	Produce regional floodplain management guidelines - use Santry River as demonstration	2019	Parks and Biodiversity	Guidelines produced	
6	Undertake a feasibility study to develop an ecosystems audit template	2021	Parks and Biodiversity	Template produced	
7	Assessment of the impact of climate change on biodiversity and ecosystem services	2019	Parks and Biodiversity, Drainage	Report and recommendations	

GREEN INFRASTRUCTURE

8	Develop and implement pollinator support actions	2019	Parks	Strategy completed	
9	Create region-wide map of green networks to support walking and cycling	2020	Parks and Traffic	Map produced	
10	Implement Public Open Space and Parks Strategy	Ongoing	Parks	Strategy produced	
11	Incorporate natural play space into existing parks	Ongoing	Parks	# of spaces incorporated	

TREE MANAGEMENT

12	Implement <i>dlr TREES 2011-2015</i> strategy by producing a map of trees in the County	Ongoing	Parks	Online map of trees and plants	
13	Develop Dublin tree and plant guide	Ongoing	Parks	Completion of tree and plant guide	
14	Update <i>dlr TREES 2011-2015</i> strategy	2019	Parks	# and variety of trees planted or removed per annum	



NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
TREE MANAGEMENT					
15	Promote the Heritage Tree Hunt	Ongoing	Parks	# of site visits	
CONSERVATION AND PRESERVATION					
16	Complete and climate proof <i>Biodiversity Action Plan, Invasive Alien Species Plan, and dlr TREES 2011-2015 strategy</i>	2019	Parks, Planning	Plans completed	
17	Review <i>Dublin Bay Biosphere Plan</i> and identify areas vulnerable to climate change	Ongoing	Parks, Engineering, Planning	Map of vulnerable areas and species' habitats, # of hectares protected	
18	Coordinate action on biodiversity across the four Dublin Local Authorities	Ongoing	Parks	Working group established	
19	Protect and conserve floodplains, wetlands, and coastal areas subject to flooding	Ongoing	Park	Map of areas to be protected	
20	Promote the natural, historical and amenity value of watercourses while maximising flood protection	Ongoing	Parks	Map of areas to be protected	
21	Launch awareness campaign to build awareness of native species	2019	Parks	Campaign launched, # of citizens participating in campaign activities	
22	Bee Friendly Estates - promote planting of pro-pollinator flora	2020	Parks, Environment and Climate Change	Increase in bee population	
23	Update hedgerow study	2020	Parks	2007 hedgerow study updated	
24	Development of community garden at Fernhill Park	2018 onwards	Parks	# of citizens using community garden, # of food produced on-site	
25	Deliver green roofs on civic buildings	Ongoing	Architects	# of Council buildings with green roofs	
ACTIONS AWAITING BUDGET					
26	<i>Develop demonstration sites to show how to combine nature conservation with existing land uses</i>	2022	Parks	<i>Demonstration sites implemented</i>	
27	<i>Produce A Guide to Sustainable Living in County Dublin</i>	2022	<i>Parks, Environment and Climate Change</i>	<i>Guide produced</i>	



NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
28	Identify further sites suitable for community gardens for local food production	Ongoing	Parks	Number of sites across County	
29	Sustainable gardening workshops	Ongoing	Parks, Environment and Climate Change	# of workshops held, # of attendees	
30	Support local communities through Lifelong Biodiversity Education	Ongoing	Parks, Communications	# of participants, yearly reports	
31	Assess benefit of increasing buffer distance of 10m from water courses to distances of 20m, 50m and 100m, in order to protect biodiversity and provide greater flood attenuation	To be decided	Parks	Comprehensive assessment completed	
32	Establish a grant scheme to landowners of riparian habitat for the planting of trees and enhancement of riparian habitats to increase resilience to climate change	2020	Biodiversity, Parks, Environment and Climate Change, Water and Drainage	# of hectares planted and enhanced	
33	Tree planting in areas identified for climate change resilience	2022	Biodiversity, Parks, Water and Drainage	# of hectares planted	
34	Pilot Demonstrator Projects for Rain Gardens and Blue-Green Streets – new builds and retrofitting	2020-2022	Parks and Landscape Services, Drainage, Roads Maintenance	Successful pilot trials (vegetation establishment, civic engagement, water quality, stormwater mitigation)	

RELEVANT LEGISLATION/POLICIES/GUIDANCE

- All-Ireland Pollinator Plan 2015-2020
- dlr Green Infrastructure Strategy (dlrcoco County Development Plan 2016 - 2022 Policy OSR3)
- dlr TREES 2011 - 2015
- Dublin Bay Biosphere Biodiversity Conservation and Research Strategy 2016-2020
- Dublin Tree Canopy Study (2017)
- Dún Laoghaire-Rathdown Biodiversity Plan
- dlrcoco County Development Plan 2016 - 2022 (Policies LHB2, LHB4, LHB7, LHB11; LHB12; LHB13, LHB16, LHB18; LHB19; LHB19; LHB20; LHB21; LHB22; LHB23; LHB24; LHB25; LHB26; LHB28; OSR1; OSR2; OSR3; OSR6; OSR8; UD7)
- EU Biodiversity Strategy
- EU Birds Directive 2009/147/EC
- EU Environmental Impact Assessment Directive 2014/52/EU
- EU Habitats Directive 92/43/EEC
- EU (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018
- European Communities (Birds and Natural Habitats) Regulations 2011 S.I. 477 of 2011
- EU (Planning and Development) (Environmental Impact Assessment) Regulations 2018 S.I. 296 of 2018
- EU Regulation on Invasive Alien Species - EU Regulation 1143/2014
- EU Strategy on Green Infrastructure 2013
- Green Low Carbon Agriculture Environment Scheme (GLAS)
- National Biodiversity Action Plan 2017-2021
- National Landscape Strategy for Ireland 2015-2025
- Water Framework Directive 2000/60/EC
- Wildlife (and Amendment) Acts 1976-2012



RESOURCE MANAGEMENT



OVERVIEW

64% RECYCLING RATE IN COUNTY HALL

WASTE AND WASTE-WATER ACCOUNTED FOR **2.2%** OF DLR'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



STAKEHOLDERS TO WORK WITH AND INFLUENCE

GENERAL PUBLIC

IRISH WATER

EASTERN MIDLANDS WASTE REGION

GOVERNMENT DEPARTMENTS

PRIVATE BUSINESSES

COMMUNITY GROUPS, TIDY TOWNS, IBAL



In partnership with the Eastern Midlands Waste Region, the Dublin Local Authorities develop and implement the policies and actions laid out in the region's Waste Management Plan. This plan serves as the framework for the prevention and management of wastes in a safe and sustainable manner.

The strategic vision of the regional waste plan is to rethink the approach to managing waste by viewing waste streams as valuable material resources. Making better use of our resources and reducing the leakage of materials will help the region transition from a linear to a circular economy and deliver both environmental and economic benefits.

The waste plan sets out three overall performance targets that underpin its policies. These are:

- 10% reduction in waste generated by local authorities
- 1% reduction per annum in the quantity of household waste generated per capita over the period of the Plan
- Achieve a recycling rate of 50% of managed municipal waste by 2020
- 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

Illegal Dumping SBIR Challenge

Smart Dublin, 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.

WASTE MANAGEMENT

3 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)

DLRCC, in conjunction with the Eastern-Midlands Regional Waste Office, will introduce a comprehensive waste prevention and recycling programme within the Council and will strive to reduce the waste produced in DLRCC's buildings and operations.

Central to preventing the production of waste is changing the procurement of products used by the Council. A priority for DLRCC is to review procurement procedures and identify opportunities to source environmentally-friendly products to use in its operations. For example, DLRCC is committed to reducing the use of disposable cups. It is supporting the Conscious Cup campaign in its staff canteen and incentivising staff that use reusable cups. The Council is also requesting suppliers of catering services in public buildings and at Council events to avoid single-use items and minimise waste. 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 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.





LITTER & RECYCLING IN THE PUBLIC REALM



Waste Management 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. DLRCC is also actively working with the Eastern Midlands Regional Waste Office to inform people about what they can and cannot recycle.

CASE STUDY



Photo Source: Dún Laoghaire-Rathdown County Council

Smart Bins

Dún Laoghaire-Rathdown County Council looked to improve the efficiency of its public waste collection service and reduce operational costs and emissions. In December 2014, the Council purchased 400 smart Big Belly bins to trial within the DLR area.

Smart bins come with a built-in solar compactor, which gets triggered when rubbish reaches a certain level. As the rubbish is compacted, the capacity is up to eight times greater than a traditional bin. The bin is wifi-enabled, so can communicate with the relevant waste management division when the waste reaches 85% capacity. This system means that the Council can monitor real-time levels of waste, and better plan and organise waste collection based on actual waste levels.

This smart waste system has provided a number of benefits, such as lower emissions due to the reduction in the number of bin collections required by the Council's fleet vehicles, and this improved efficiency within the fleet has reduced energy consumption by 85,000 kWh per year.

CASE STUDY

Recycling Ambassador Programme

DLRCC supported the Recycling Ambassador Programme, which was a VOICE initiative funded by the Department of Communications, Climate Action and Environment (DCCA) and REPAK. It 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 in the recycling bins. 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

CASE STUDY

Recycling Centre

There are three Recycling Centres throughout the county namely Ballyogan Recycling Park, Shanganagh Recycling Centre in Shankill and Eden Park Recycling Centre in Glasthule.

Ballyogan Recycling Park is the main recycling centre in the County and is located near the Ballyogan Wood Luas stop. It has won national awards for its design, the diversity of materials accepted and its accessibility to users of the facility in that it is open 360 days per year.

The recycling centres accept household waste including electrical waste for recycling for free. Ballyogan Recycling Park also accepts garden waste and a range of household hazardous wastes and bulky items which incur a vehicle based charge. To assist people, the recycling centres also promote the reuse of items and provide tips on how to recycle.



RESOURCE MANAGEMENT

NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
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ACTIONS CURRENTLY BUDGETED

WASTE MANAGEMENT

1	Monitor and enforce waste regulation	Ongoing	WERLA	Environmental Performance Assessment from EPA	
2	Assess waste in Council owned and operated buildings and plan actions to be taken	Ongoing	Environment and Climate Change	Report outlining current situation and plan of action to be taken	
3	Run staff recycling awareness campaign	Ongoing	Environment and Climate Change	# of campaigns held	
4	Identify neighbourhoods/ areas in region in need of bring banks	Ongoing	Environment and Climate Change	# of areas identified, # of new bring banks established	
5	Apply for Local Authority Prevention Network grants	Ongoing	Environment and Climate Change	# of grants for waste-related projects	
6	Develop Stop Food Waste campaigns in DLR	Ongoing	Environment and Climate Change	# of people engaged	
7	Continue environmental awareness campaigns to support public in their efforts to manage their resource use	Ongoing	Environment and Climate Change	# of campaigns held	
8	Promote Reuse Month annually	Ongoing	Environment and Climate Change	# of Council run events	
9	Use Eco-Merit programme to advise businesses on how to become resource efficient	Ongoing	Environment and Climate Change	# of businesses participating	
10	Secondary School Eco Conference	Ongoing	Environment and Climate Change	Continued participation of schools in conference workshops	
11	Maintain and increase Green Schools Programme participation	Ongoing	Environment and Climate Change	# of schools participating	
12	Work in partnership with resident/community groups in climate-related programmes	Ongoing	Environment and Climate Change	# community groups	

LITTER & RECYCLING IN THE PUBLIC REALM

13	Run anti-dumping and anti-litter campaigns using SBIR challenges	Ongoing	Smart Dublin, Environment and Climate Change	# of campaigns, # of people reached	
14	Anti-dumping initiatives/ anti-litter campaigns	Ongoing	Environment and Climate Change	# of campaigns, # of people reached	



NO	ACTION	TIMEFRAME	LEAD(S)	INDICATORS	TARGET(S) IMPACTED
15	Marine litter clean up days	Ongoing	Environment and Climate Change	# of days held, # of participants	
16	Introduce leaf composting programme	Ongoing	Environment and Climate Change	Number of residents' associations participating	
17	Support and promote local Tidy Town initiatives	Ongoing	Environment and Climate Change	# of initiatives supported annually by Council	
18	Community fridge programme	2018 onwards	Environment and Climate Change	Programme launched	
19	Monitoring of Big Belly Bins in County	Ongoing	Cleansing	Reduced energy consumption of fleet, # of bins in County	
20	Collaboration with Refill.ie to reduce single use drinking water bottles	2019	Environment and Climate Change	Feasibility assessed	

PROCUREMENT

21	Climate related evaluation criteria in all DLRC tenders	2019	Corporate Services	Criteria developed and implemented	
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ACTIONS AWAITING BUDGET

22	<i>Expand housing assistance programme to include tenant waste and water awareness</i>		<i>Housing, Environment and Climate Change</i>	<i>Programme developed</i>	
23	<i>Waste management guidelines developed for developers of new housing schemes</i>		<i>Housing, Environment and Climate Change</i>	<i>Guidelines are developed and signed off on</i>	

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Climate Action and Low Carbon Development Act 2015
- Directive 2008/98/EC on Waste (Waste Framework Directive)
- dlrcoco County Development Plan 2016-2022 (Policies EI16; SIO5; SI19; SN3; SN29; QHO2)
- Dún Laoghaire-Rathdown Litter Management Plan 2018-2020
- Dún Laoghaire-Rathdown Local Economic and Community Plan 2016-2021 (Policies 14.7; 16.6)
- Eastern-Midlands Region Waste Management Plan 2015-2021
- Water Services Strategic Plan (2015)

MILESTONE 4: IMPLEMENTATION



The ownership and implementation of this Climate Change Action Plan (CCAP) clearly resides with Dún Laoghaire Rathdown County Council (DLRCC). 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.

DLRCC has established a Climate Team that aims to gather and coordinate these individual actions to address the interconnected challenges of climate mitigation, climate adaptation and carbon-free sustainable energy. The Climate Team consists of representatives from across the departments that are crucial to tackling climate change.

The mandate of Dún Laoghaire-Rathdown County Council's Climate 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
- 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, funding applications 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 DLAs 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*. 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 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, DLRCC 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, DLRCC 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 Team within Dún Laoghaire-Rathdown County Council (working in close association with the CARO) will report directly to the Environment, Climate Change and Energy Strategic Policy Committee (SPC), and to the Chief Executive's Office, through the Director of Infrastructure and Climate Change. 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 and updated on an annual basis, with a review and revision every five years. This draft of the Climate Change Action Plan was developed through DLRCC's Environment, Climate Change and Energy SPC and approved by the full County Council. The Director of Infrastructure and Climate Change 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 Department of Communications, Climate Action and Environment (DCCA), 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 AND ENERGY

DLRCC, 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, DLRCC 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 Dún Laoghaire-Rathdown 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 Dún Laoghaire-Rathdown had been established.

METHODOLOGY

The first step of 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 Dún Laoghaire-Rathdown, 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. Resource 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 DLRCC'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 (most urgent and should be addressed first) shown in red and dark orange, and the low risk 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 Dún Laoghaire-Rathdown'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		
Resource 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 water 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 water quality at risk	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 DÚN LAOGHAIRE-RATHDOWN

This section examines the resulting total emissions from the different sectors in Dún Laoghaire-Rathdown in 2016. The emissions from the various sectors in Dún Laoghaire-Rathdown total 1,139,570 tonnes of CO₂ equivalent. The sectors that produced the most emissions were the residential, transport and commercial sectors, producing 43.5%, 33.1% and 18.5% respectively, of the total emissions in Dún Laoghaire-Rathdown. From this analysis, these three sectors should be the main targets of energy and emission reduction initiatives.

Figure 25 illustrates the total CO₂ equivalent emissions in tonnes of CO₂ by sector and fuel type. Waste and wastewater are all expressed as CO₂ equivalent, and are not broken down by fuel type, as the data provided for these was in terms of GHG emissions, not fuel type.

From this analysis, Codema found that the residential sector used the most electricity in Dún Laoghaire-Rathdown and had the highest emissions from electricity (51%). The residential sector also had the highest CO₂ emissions for natural gas, accounting for 83% of the total gas emissions in Dún Laoghaire-Rathdown. Meanwhile, the transport sector accounted for 99.7% of all diesel emissions in Dún Laoghaire-Rathdown. It should be noted that the residential, transport and commercial sectors had the highest emissions and consumed more fossil fuels than other sectors.

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

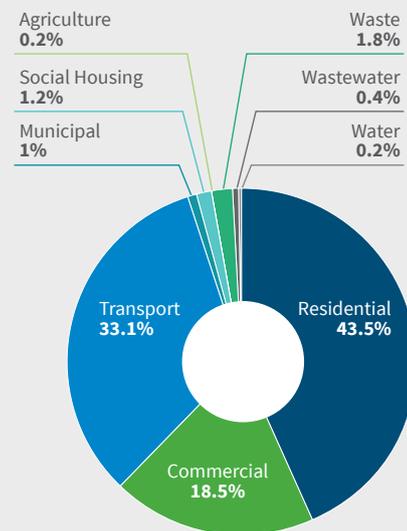


Figure 24 Share of Total Emissions in Dún Laoghaire-Rathdown

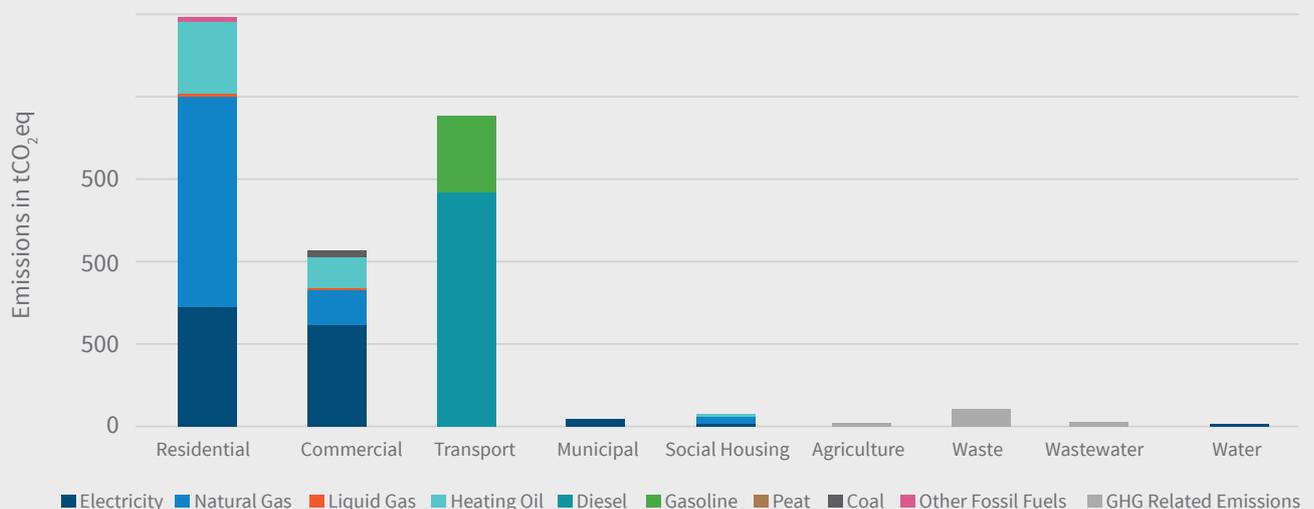


Figure 25 Total tCO₂eq Emissions in Different Sectors

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TABLE OF TABLES

Table 1	Major Climatic Events in Dublin
Table 2	Climate Variables Projection: 30 Year Overview
Table 3	Extreme Weather Events Risk Matrix
Table 4	Sea Level Rise Risk Matrix
Table 5	Flooding Risk Matrix
Table 6	Consequence Scoring Matrix
Table 7	Climate Risk Matrix to Identify Potential Future Risks
Table 8	Dún Laoghaire-Rathdown's Climate Change Risk Matrix
Table 9	Dún Laoghaire-Rathdown's 2016 Energy & Emission Inventory in the Covenant of Mayors for Climate and Energy

TABLE OF FIGURES

Figure 1	Examples of some Mitigation and Adaptation Solutions and their Crossovers
Figure 2	Institutional and Policy Context
Figure 3	ICLEI Five Milestone Approach, Adapted for the Dublin Context
Figure 4	Timeline of Major Climatic Events in Dún Laoghaire-Rathdown
Figure 5	Annual Rainfall (1941-2010)
Figure 6	Mean Surface Air Temperature (1900-2011)
Figure 7	Dublin Airport Wind Trends (1944-2010)
Figure 8	Dublin Annual Average Sea Level 2000-2016
Figure 9	Dún Laoghaire-Rathdown Tidal Flood Extents
Figure 10	Flood Events in Dún Laoghaire-Rathdown, as Identified by the OPW
Figure 11	Fluvial Flood Risk
Figure 12	Flood Extent Mapping
Figure 13	Annual Mean PM _{2.5} (Fine Particulate Matter) Concentrations at Individual Stations in 2016
Figure 14	Annual Mean PM ₁₀ (Particulate Matter) Concentrations at Individual Stations in 2016
Figure 15	Annual mean NO ₂ (Nitrogen Dioxide) Concentrations at Individual Monitoring Stations in 2016
Figure 16	Structures for Implementation
Figure 17	Local Authority Control of Resources
Figure 18	Primary Energy Consumption Sectors
Figure 19	DLRCC's Annual Energy Performance Compared to the 33% Glidepath
Figure 20	DLRCC's Emissions 2009-2017, with Projected Glide Path to the 40% Reduction Target by 2030
Figure 21	DLRCC's Social Housing Unit Age and BER Rating, as in 2016
Figure 22	Total GHG Emissions for Dún Laoghaire-Rathdown Area per Sector
Figure 23	Visualising the Action Plan
Figure 24	Share of Total Emissions in Dún Laoghaire-Rathdown
Figure 25	Total tCO ₂ eq Emissions in Different Sectors

ABBREVIATIONS

AAMP	Ambient Air Quality Monitoring Programme	KPI	Key Performance Indicator
AASL	Annual Average Sea Level	kWh	Kilowatt hour
AEP	Annual Event/Exceedance Probability	M&R	Monitoring and Reporting
BER	Building Energy Rating	MSL	Mean Sea Level
CARO	Climate Action Regional Office	NAF	National Adaptation Framework
CCAP	Climate Change Action Plan	NEEAP	National Energy Efficiency Action Plan
CFRAM	Catchment Flood Risk Assessment and Management	NMP	National Mitigation Plan
CMS	Central Management Systems	NO₂	Nitrogen Dioxide
CMT	Crisis Management Team	NO_x	Nitrogen Oxide
CO	Carbon Monoxide	NPF	National Planning Framework
CO₂	Carbon Dioxide	NREAP	National Renewable Energy Action Plan
CO₂eq	Carbon Dioxide Equivalent	NTA	National Transport Authority
COP	Conference of the Parties	nZEB	nearly Zero Energy Building
DAFM	Department of Agriculture, Food and the Marine	ODM	Observed Difference in Mean
DCC	Dublin City Council	OPW	Office of Public Works
DCCA	Department of Communications, Climate Action and Environment	PES	Principal Emergency Service
DMURS	Design Manual for Urban Roads and Streets	PM₁₀	Particulate Matter
DHPLG	Department of Housing, Planning and Local Government	PM_{2.5}	Fine Particulate Matter
DLAs	Dublin Local Authorities	PRA	Principal Response Agency
DLR	Dún Laoghaire-Rathdown	PV	Photovoltaic
DLRCC	Dún Laoghaire-Rathdown County Council	RD&D	Research, Development and Demonstration
DTTAS	Department of Transport, Tourism and Sport	SBIR	Small Business Innovation Research
EIA	Environmental Impact Assessment	SDZ	Strategic Development Zone
EMRW	Eastern Midlands Regional Waste	SEAI	Sustainable Energy Authority of Ireland
EPA	Environmental Protection Agency	SEAP	Sustainable Energy Action Plan
ETS	Emissions Trading Scheme	SECAP	Sustainable Energy and Climate Action Plan
EU	European Union	SEDA	Spatial Energy Demand Analysis
GDA	Greater Dublin Area	SO₂	Sulphur Dioxide
GHG	Greenhouse gas	SPC	Strategic Policy Committee
GLAS	Green Low Carbon Agriculture Environment Scheme	SuDS	Sustainable urban Drainage Systems
GWh	Gigawatt hour	tCO₂	Tonnes of carbon dioxide
ICLEI	International Council for Local Environmental Initiatives	UCD	University College Dublin
IPCC	Intergovernmental Panel on Climate Change	UNDP	United Nations Development Programme
km	Kilometre	UNESCO	United Nations Educational, Scientific and Cultural Organisation
		VOICE	Voice of Irish Concern for the Environment
		WHO	World Health Organisation
		WMO	World Meteorological Organisation





